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Determining a WACC estimate for Port of Melbourne

A report prepared in context of the Pricing Order for the 2020-21 Tariff Compliance Statement

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Snapshot

The table below provides a short summary of the reasons for the difference between the weighted average cost of capital estimate Synergies has calculated for the 2020-21 Tariff Compliance Statement (TCS) compared to the estimate calculated for the 2019-20 TCS.

Chapter	Element	2019-20 TCS	2020-21 TCS
	WACC estimate	Point estimate of 10.46% from a range of 10.07% to 10.92%. We adopted a range based on variations in the MRP and asset beta.	8.93%
2	**WACC formulation**	Pre-tax nominal as required by the Pricing Order	No change
3	**One or a combination of well accepted approaches**	In the 2019-20 TCS, this section considered and responded to the guidance provided by the ESC in the previous Statement of Regulatory Approach (SoRA, version 1.0) regarding the requirements of the Pricing Order on well accepted.	The 2020-21 TCS considers and responds to the guidance provided by the ESC in the revised SoRA (version 2.0), published in April 2020.
4	**Benchmark efficient entity (BEE)**	Comparator set of 19 entities with FTSE Developed classification across (i) Marine and Ports Services (11), (ii) Railroads (8). We did not apply a market capitalisation threshold.	Comparator set of 13 entities with FTSE Developed classification across (i) Marine and Ports Services (7), (ii) Railroads (6), with a market capitalisation above US$200 million.
5	**Cost of equity approaches**	90% weighting on the SL CAPM, 5% weighting on the Black CAPM, 5% weighting on the FFM.	100% weighting on the SL CAPM, with the Black CAPM and FFM used as cross-checks.
6.3	**Risk-free rate**	1.96% 20-day average of the 10-year Australian Government bond yield to 29 March 2019 (being the last business day of March 2019)	0.90% No change to approach. Updated to reflect the 20-day period to 31 March 2020
6.9	**Market risk premium**	Point estimate of 7.77% with a lower range value of 7.34%. Based on a 50% weighting to the Ibbotson MRP, a 25% weighting to the Wright MRP, and a 25% weighting to Dividend Discount Models (DDMs). The lower end of the range gave a higher weighting to Ibbotson (66.7%) and corresponding lower weightings to Wright and DDM (16.7% respectively)	Point estimate of 7.57% MRP is now based on a 70% weighting to the Ibbotson MRP, a 15% weighting to the Wright MRP, and a 15% weighting to Dividend Discount Models (DDMs) used by IPART, the ERA and the QCA.
7	**Beta**	0.70 (low and point estimate) - 0.75 (high) Based on the median and average of 5-year and 10-year asset betas for the 19 comparator benchmark efficient entities.	Point estimate of at least 0.70 from a range of at least 0.70 to at least 0.75 Comparator set now consists of 13 entities. We have applied a US$200 million market capitalisation filter to the comparator set.
8	**Capital Structure**	30% Reflected the midpoint (rounded to the nearest 5%) of the updated median gearing ratio for the 10 investment-grade listed benchmark efficient entities (21%) and the average acquisition gearing of Australian port privatisations (42%) and is	30% No change to approach. Reflects the midpoint of the updated median gearing ratio for the 9 investment-grade listed benchmark efficient entities (20%) and the average acquisition gearing of Australian port privatisations (42%)

Chapter	Element	2019-20 TCS	2020-21 TCS
		consistent with the average gearing of our comparator set.	and is consistent with the average gearing of our comparator set.
9	**Return on debt**	5.24% 80% weighting to the 2017-18 'on-the-day' cost of 5.45%, 10% weighting to the 2018-19 'on-the-day' cost of 4.58%, and 10% weighting to the 2019-20 'on-the-day' cost of 4.21%.	5.04% 70% weighting to the 2017-18 'on-the-day' cost of 5.45%, 10% weighting to the 2018-19 'on-the-day' cost of 4.58%, 10% weighting to the 2019-20 'on-the-day' cost of 4.21%, and 10% weighting to the 2020-21 'on-the-day' cost of 3.42%. Weightings will continue to be adjusted 10% each year towards a 10-year trailing average approach.
9.4	**Notional credit rating**	BBB	No change
9.7	**Debt risk premium**	3.18% Based on the trailing average return on debt of 5.24%, a risk-free rate of 1.96%, and debt raising costs of 0.10%	4.04% Based on the trailing average return on debt of 5.04%, a risk-free rate of 0.90%, and debt raising costs of 0.10%
9.8	**Debt raising costs**	0.10% PwC (2013), p.6	0.10% No change
10	**Gamma**	0.25 Equal weighting (rounded to the nearest 0.05) to the gamma value implied by finance theory (zero), the equity ownership approach (0.50) and market valuation studies (0.25)	0.33 Two-thirds weighting to the equity ownership approach (0.50), and a one-third weighting to the financial practitioner approach (zero) Market valuation studies (0.25), such as those used by IPART, are used as a cross-check, along with gamma estimates from academic literature (zero).
11	**SL CAPM**	Point estimate of 12.55% from a range of 12.00% to 13.27%	10.60% No change to SL CAPM methodology
Att. K	**Black CAPM**	Point estimate of 12.55% from a range of 12.00% to 12.96	10.60% Used as a cross-check for the SL CAPM. Estimate is identical to SL CAPM estimate when equity beta is 1.00.
	Zero beta premium	3.36% Based on updated Synergies estimate to the end of 2018.	4.56% Based on updated Synergies estimate to the end of 2019.
Att. K	**Fama-French Model**	14.77% (low) – 15.37% (point estimate and high) depending on MRP	11.77% Used as a cross-check for the SL CAPM
	Market excess returns	1.07 equity beta and 7.34%-7.77% risk factor premium	1.03 equity beta and 7.57% risk factor premium. Calculation of risk factor premium follows updated MRP methodology.
	High-minus-low factor	0.17 equity beta and 5.74% risk factor premium	0.04 equity beta and 5.03% risk factor premium. Calculation of risk factor premium is unchanged. Updated data
	Small-minus-big factor	0.32 equity beta and 2.04% risk factor premium	0.19 equity beta and 2.63% risk factor premium. Calculation of risk factor premium is unchanged. Updated data

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Figures and Tables

Executive Summary

The purpose of this report is to provide an estimate of the return on capital for the Port of Melbourne (PoM) for its 2020-21 Tariff Compliance Statement (TCS) under the regulatory framework established by the *Port Management Act (Vic) 1995* and Pricing Order.

To determine an estimate of the return on capital that is consistent with the Pricing Order, the key requirement is that the Port Licence Holder (PoM) must use one or a combination of well accepted approaches that distinguish the cost of equity and debt and so derive a weighted average cost of capital (WACC).

This requirement reflects the unique nature of the Pricing Order, which establishes a set of processes for PoM to follow in setting prices for its Prescribed Services that allow it a a reasonable opportunity to recover the efficient cost of providing those services. The Pricing Order therefore places the initial onus on PoM to interpret the meaning of the Pricing Order, including the meaning of the phrase "well accepted" in the context of deriving a WACC estimate.

Estimating the WACC is an inherently imprecise exercise, in particular for determining the cost of equity. Unlike, for example, the cost of debt, where there are observable benchmarks, the cost of equity can only be inferred. Not only is there controversy over the most appropriate model to apply to infer the cost of equity, but there is also controversy over parameter values in respect of each model. This lack of observability and lack of universal consensus amongst finance practitioners, academics and even regulators means that there is a range of outcomes that are compliant with the Pricing Order.

The discretions afforded to PoM under the Pricing Order are therefore important in the context of estimating the WACC, particularly in the global markets in which debt and equity finance is secured. These discretions allow PoM to present a position on the WACC that is compliant with the Pricing Order and achieves the objectives of the PMA.

The Pricing Order confers important discretions on the Port Licence Holder in relation to the cost of capital. In forming our views on a compliant cost of capital, we have had the benefit of the ESC's Interim Commentary on past TCS submissions[1] and the

[1] ESC (2019), Interim commentary -Port of Melbourne tariff compliance statement 2019-20, together with an accompanying report prepared by Frontier Economics; ESC (2018), Interim commentary -Port of Melbourne tariff compliance statement 2018-19; ESC (2018), Interim commentary -Port of Melbourne tariff compliance statement 2017-18.

publication of the ESC's Statement of Regulatory Approach.[2] This has led to refinements in our approach over time. We respond to this commentary throughout the report.

WACC formulation

The Pricing Order requires that the WACC must be calculated on a pre-tax nominal basis. The pre-tax nominal formulation adjusts for taxation and dividend imputation in the WACC formula rather than in the cash flows and is expressed as follows:

$$\frac{R_e}{\left(1-t_c\left[1-\gamma\right]\right)}*\frac{E}{E+D}+R_d\,\frac{D}{E+D}$$

Where:

Re = post-tax return on equity

Rd = pre-tax return on debt

D = proportion of debt within the assumed capital structure

E = proportion of equity within the assumed capital structure

t = corporate tax rate

γ = gamma (value of imputation credits)

Benchmark Efficient Entity

In compliance with the Pricing Order, we have identified a benchmark efficient entity (BEE) for PoM that is assumed to be in the same industry with the same risk profile as PoM in its provision of Prescribed Services.

The ESC has maintained its view that, for the purposes of defining the BEE, the Prescribed Services are provided by a port in Australia. However, in practice, we have found there are very limited listed companies in Australia that have similar risks to this assumed BEE. Consequently, it has been necessary for us to follow a well accepted alternative for such situations that is used by economic regulators (as well as finance practitioners and academics) and supplement our sample of comparable Australian listed entities with international listed entities with comparable risks. An element of judgement is required in this task.

2 ESC (2020) Statement of Regulatory Approach – version 2.0; ESC (2017), Statement of Regulatory Approach.

To this end, we expanded the port and marine services comparator sample to include listed railroads based on a first principles analysis of the typical systematic risks of these businesses and their similarities (in aggregate) to the BEE. We then reviewed the business operations for each listed company in our international sample and eliminated companies whose systematic risks did not appear comparable to the BEE.

We have revisited the issue of a market capitalisation threshold for the BEE. We consider that it is very unlikely that a relatively small entity could perform activities that are comparable to the BEE, which is reflective of the largest container port in Australasia. We have therefore adopted the threshold that companies with a market capitalisation below US$200 million cannot helpfully inform the cost of capital for the BEE.

Combination of well accepted cost of equity approaches

PoM considers that the interpretation of well accepted approaches is not limited to acceptance by economic regulators. It is not necessary that an approach be used by at least one economic regulator. This is because relevant approaches could be well accepted in relevant spheres outside of economic regulatory applications. The overarching matters that are relevant to assessing the well accepted-ness of an approach are those expressed in the objectives of the PMA. This in turn requires that appropriate weight should be placed on approaches such as those used by finance practitioners engaged in deriving a return on capital.[3]

Based on well-established market practice in the finance industry, Australian and international regulatory precedent, academic recognition and empirical performance, there is a range of cost of equity models that are well accepted within relevant spheres (regulators, finance practitioners and academics) and, in turn, compliant with the Pricing Order.

However, for the 2020-21 TCS submission, we have determined the cost of equity estimate for the BEE for PoM using the Sharpe-Lintner Capital Asset Pricing Model (SL CAPM), with the Black CAPM and Fama-French Model (FFM) employed as cross-checks. In our view, the Black CAPM and the FFM are capable of being well accepted in the context of the Pricing Order and PoM could revisit the application of these models in the future.

3 Port of Melbourne (2020), 2020 - 2021 Tariff Compliance Statement, General Statement, May, section 9.2.3.2

Estimation of cost of equity

SL CAPM

The SL CAPM is expressed as follows:

$$Re = R_f + \beta_e * [E(R_m) - R_f]$$

Where:

Rf = the risk-free rate of return

E(Rm) = the expected return on the market

[E(Rm) – Rf] = the market risk premium

βe = equity beta (measures systematic risk)

Our approach to estimating the above parameters is summarised below.

Total market return

Given the inherent volatility in the risk-free rate over time, it is informative to evaluate the expected value of the total market return (TMR) outcome (which in the formula above is expressed as $E(R_m)$ and measured as the risk-free rate plus the MRP). This is because evidence from market practitioners indicates that the required return on capital does not necessarily change one-for-one with observed government bond yields, especially when yields are low (as they are at present). This ensures that the approach to PoM's return on equity is consistent with the pricing principles and capable of achieving the regulatory objectives. Due to PoM's point estimate equity beta of 1.0, the total market return coincides with PoM's point estimate post-tax return on equity under the SL CAPM.

For the risk-free rate, the Commonwealth Government bond yield is most commonly used as a proxy by academics, regulators (including by the ESC) and finance practitioners. We have assumed a ten-year term to maturity, balancing the liquidity of available long-term bond instruments in the Australian market, and the long-term nature of the PoM investment.

In general, a commonly used approach to estimate the risk-free rate is to use short averaging periods close to the commencement of each regulatory period (although IPART and OTTER also take longer averaging periods into consideration). Consistent with this well accepted approach, our estimates are produced over a twenty-day period to 31 March 2020. The resulting estimate is 0.90%. IPART's approach produces a risk free rate of 2.00% and provides a cross check that is conservative when compared to finance practitioners.

The market risk premium (MRP) is a function of the difference between the expected equity market return and the risk-free rate of return. It is an inherently forward-looking parameter, which is not observable and is difficult to estimate. In the 2020-21 TCS submission, we have relied upon the following well accepted methodologies:

- the Ibbotson approach, which calculates the MRP by taking the difference between the long-term observed average return on market and the risk-free rate. This method assumes that the market risk premium remains stable over time, and the overall return on the market will fluctuate largely in-step with the risk-free rate of return;

- the Wright approach, which calculates the MRP by taking the difference between the long term observed average return on market and the current risk-free rate of return. This method assumes that the overall return on equity remains stable over time, and does not fluctuate in-step with the risk-free rate of return; and

- dividend discount models (DDMs), which are forward looking approaches which estimate the market risk premium by reference to dividend yields, long-term expected dividend growth and a transitional path between these values. We employ dividend models used by IPART, the ERA and the QCA.

We provide evidence that all of these approaches are used by economic regulators in Australia and overseas. For the 2020-21 MRP estimate of 7.57%, we have placed 70% weighting on the Ibbotson MRP (6.42%), 15% weighting on the Wright MRP (10.74%), and 15% weighting on DDMs (9.75%). The resulting TMR (risk free rate plus market risk premium) is 8.47%.

As cross-checks, we have considered TMRs from surveys and independent expert reports, which are likely to provide the strongest indication of outcomes in a workably competitive market, and from regulators. These cross-checks reveal that:

- the median (average) total market return from independent expert reports in the Connect 4 database is 9.71% (9.68%);

- total market returns reported in the KPMG and Fernandez et al. surveys range from 8.7% to 10.3%; and

- recent TMR estimates from IPART, which rely on a combination of long-term and short-term risk-free rate averaging, range between 9.85% and 10.15%.[4]

As a result, our proposed TMR produced by a combination of well accepted approaches is supported by these various cross-checks, all of which significantly exceed the 8.47% TMR for PoM.[5]

Beta

We have used a well accepted approach to form a comparator set from which to estimate an asset beta for the BEE. An asset beta range of at least 0.70 to at least 0.75 (with a point estimate of 0.70) has been estimated based on a comparator set of 13 companies, consisting of 7 Marine Ports and Services firms and 6 Railroads (the same listed firms that informed our gearing assessment).

Commentary from the ESC and Frontier Economics raised concerns about reliance on railroads for the BEE's comparator set, predominantly in regard to the assertion that the Class I railroads are subject to greater competitive pressure than the BEE. However, the majority of traffic carried on Class I railroads is bulk commodities, a sector where railroads are less likely to face intense competition. We have also addressed Frontier Economics' recommended inclusions and exclusions regarding specific firms in the comparator set.

We recognise that statistical filtering has been an ongoing source of contention with the ESC. While the practice is well accepted among practitioners and regulators, another well accepted practice is to apply a market capitalisation filter; the adoption of a US$200 million market capitalisation filter results in all identified comparators meeting standard statistical tests.

Given the gearing estimate of 30%, this asset beta range translates into an estimated equity beta range of 1.0-1.07 (with a point estimate of 1.0).

SL CAPM cost of equity

Our point estimate of the pre-tax cost of equity for the BEE based on the SL CAPM is 10.60%.

[4] The lowest TMR currently determined by an Australian regulator (based on the risk free rate as at 31 March, 2020) is 6.8%% by the ERA.

[5] Although it is acknowledged that the TMR adopted exceeds that allowed by some regulators in Australia.

Capital Structure

To inform PoM's benchmark capital structure, we have had regard to the listed comparator set from a first principles analysis perspective, as well as recent Australian port acquisition comparators, including major landlord ports in Australia comparable to PoM.

Our benchmark capital structure range extends from 20% (based on the median of investment-grade listed comparators) to 42% (average and median of the acquisition comparators). We have chosen the mid-point of this range which is 30% (rounded down from 31%) consistent with our approach to deriving a point estimate from other estimated ranges.

Cost of debt

The cost of debt calculation is the sum of the risk-free rate and an estimate of the debt risk premium consistent with the risk profile of the BEE.

This approach is well accepted in financial markets and by economic regulators in Australia and internationally, underpinned by the concept of credit spreads reflecting different credit and liquidity risks associated with government and corporate bonds respectively.

The return on debt calculation can be expressed as follows:

$$R_d = R_f + DRP + DRC$$

Where:

Rf = risk-free rate

DRP = debt risk premium

DRC = debt raising costs

We have used the same risk-free rate estimate as derived in our cost of equity calculation.

For the debt risk premium, we consider that both the Reserve Bank of Australia (RBA) and Bloomberg data series represent a well accepted data source for return on debt estimation purposes. Consistent with our approach to estimating cost of equity parameters, in the absence of any substantive grounds to favour one over the other, we have calculated a simple average of these comparable series.

An assumption of ten basis points has been used for debt raising costs based on authoritative evidence gathered by PwC of debt raising costs for Australian corporates, based on surveys and interviews with legal firms, banks and credit rating agencies that are involved in the corporate bond raising process.[6]

Consistent with the approach applied under the Australian national energy framework, we consider that the choice between the on-the-day and trailing average approach to estimating the cost of debt is appropriately made by the regulated entity provided the calculation reflects an efficient benchmark. Both the on-the-day and trailing average approaches are well accepted by Australian regulators.

In the 2018-19 TCS, we commenced a trailing average approach, which is currently adopted by several Australian regulators. This year, the trailing average calculation places an 70% weighting on the 2017 return on debt estimate, a 10% weighting on the 2018 return on debt estimate, a 10% weighting on the 2019 return on debt estimate, and a 10% weighting on the 2020 return on debt estimate. With each subsequent year, 10% of the 2017 weighting will be refreshed with the prevailing return on debt estimate.

This approach has been adopted on the basis of its lower volatility over time, and because it is more consistent with the debt management practices of a benchmark efficient entity. It is also in line with our approach to other WACC parameters, which, where possible, are based on long-term averages. This methodology is also consistent with the approach currently in use by the AER.

Table 1 shows our 2020 on-the-day cost of debt estimate for the BEE of 3.42%, to which a 10% weighting is applied in the trailing average calculation.

Table 1 2020 on-the-day cost of debt estimate for the BEE (assuming BBB credit rating)

Averaging period	RBA	Bloomberg	Average
BBB DRP based on 20 days to 31 March 2020	2.68%	2.16%	2.42%
Risk-free rate based on 20 days to 31 March 2020	0.90%	0.90%	0.90%
Debt raising costs	0.10%	0.10%	0.10%
2020 on-the-day cost of debt	**3.68%**	**3.16%**	**3.42%**

Source: RBA, Bloomberg, Synergies calculations

This 2019 on-the-day cost of debt estimate is then used as an input in the trailing average calculation, as displayed in Table 2. This results in a cost of debt estimate of 5.04%.

6 PwC (2013). Energy Networks Association: Debt financing costs, June.

Table 2 Trailing average cost of debt calculation

Time period	Estimate	Weighting
2017 on-the-day cost of debt	5.45%	70%
2018 on-the-day cost of debt	4.58%	10%
2019 on-the-day cost of debt	4.21%	10%
2020 on-the-day cost of debt	3.42%	10%
Cost of debt	**5.04%**	

Note: Assuming a risk-free rate of 0.90% and debt raising costs of 0.10%, this implies a DRP of 4.04%

Source: RBA, Bloomberg, Synergies calculations

Gamma

Gamma is a product of the following two inputs that must be estimated:

- the portion of franking credits distributed to investors (the distribution rate); and
- the utilisation value per dollar of franking credits distributed (also referred to as the utilisation rate or 'theta').

In identifying well accepted approaches to gamma, we have reviewed relevant finance industry evidence (particularly from independent expert reports and surveys), Australian regulatory practice, and academic literature.

Our gamma estimate for 2020-21 is 0.33 from a range of 0 to 0.5. The lower end of this range is based on the gamma value widely applied by finance practitioners as evidenced by surveys and independent expert reports, and the upper end of the range is informed by the equity ownership approach used by various Australian regulators. Our point estimate of 0.33 for gamma places a one-third weighting to a well accepted approach widely applied by finance practitioners (zero value), and a two-thirds weighting to the equity ownership approach (0.50 value). The equity ownership approach estimate of 0.50 reflects recent regulatory decisions.

The proportional weights assigned to these well-accepted approaches recognises the methods of valuing imputation credits that have emerged in an Australian regulatory context, while also giving appropriate emphasis to the overwhelming views of Australian financial practitioners as persistently reported by survey respondents, and as elucidated in comprehensive independent expert commentary.

Previously, we placed a weighting of one-third on market approaches (as applied by IPART), and a weighting one-third on non-market approaches (as applied by the AER, ERA, QCA and other Australian regulators), for a combined weighting of two-thirds on Australian regulatory precedent. We continue to place a weighting of two-thirds on regulatory precedent, but we have replaced the one-third weighting on market approaches with an additional one-third weighting on non-market approaches.

We have employed two cross-checks to examine the appropriateness of our gamma estimate of 0.33 for the BEE:

- Dividend drop-off studies (the market approach currently used by IPART), which provide a gamma estimate of 0.25; and
- Estimates of gamma from peer-reviewed financial academic literature, which provide a gamma estimate of 0.

These cross checks imply that our gamma estimate of 0.33 is likely to be situated at the upper end of the range of values (hence lowering the required return on equity) that would likely be applicable to the BEE when seeking to raise capital from investors in the workably competitive market for infrastructure finance.

Synergies' WACC estimate

Our pre-tax nominal WACC point estimate for the BEE for PoM under the Pricing Order is 8.93%. This value is derived from well accepted approaches in accordance with the Pricing Order and the objectives of the Port Management Act.

Table 3 WACC estimate for PoM

Parameter	2017-18 TCS	2018-19 TCS	2019-20 TCS	2020-21 TCS
Risk-free rate	2.81%	2.74%	1.96%	0.90%
Capital structure	30%	30%	30%	30%
Gamma	0.25	0.25	0.25	0.33
Corporate tax rate	30%	30%	30%	30%
CAPM Parameters				
Ibbotson MRP	6.53%	6.56%	6.48%	6.42%
Wright MRP	9.01%	8.86%	9.54%	10.74%
Dividend Discount Models (DDMs)	-	-	8.56%	9.75%
Ibbotson MRP weighting	*50%*	*50%*	*50%*	*70%*
Wright MRP weighting	*50%*	*50%*	*25%*	*15%*
DDMs weighting	*0%*	*0%*	*25%*	*15%*
Weighted MRP	7.77%	7.71%	7.77%	7.57%
Asset beta	0.70	0.70	0.70	0.70
Equity beta	1.00	1.00	1.00	1.00
SL CAPM	13.66%	13.48%	12.55%	10.60%
Debt beta	0.00	0.00	0.00	0.00
Debt risk premium	2.54%	2.53%	3.18%	4.04%
Debt raising costs	0.10%	0.10%	0.10%	0.10%

Parameter	2017-18 TCS	2018-19 TCS	2019-20 TCS	2020-21 TCS
Return on debt (pre-tax)	5.45%	5.37%	5.24%	5.04%
Pre-tax nominal WACC	**11.54%**	**11.52%**	**10.46%**	**8.93%**

Cost of equity cross-checks

We have estimated the Black CAPM return on equity as a cross-check on the SL CAPM return on equity estimate. As detailed in Attachment K, the pre-tax return on equity using the Black CAPM is identical to the SL CAPM (10.60%) assuming an asset beta of 1.0.

We have also estimated the FFM return on equity as a cross-check on the SL CAPM return on equity estimate. As detailed in Attachment K, the pre-tax return on equity using the FFM is 11.77%.

If a weighting of 5% were applied to the FFM (in conjunction with a 5% weighting on the Black CAPM and a 90% weighting on the SL CAPM), the resulting pre-tax WACC would be 9.02%, compared to 8.93% when 100% weight is given to the SL CAPM.

Benchmarking the WACC for the BEE

The inherent complexity in benchmarking WACCs can readily be seen in the different components and approaches that can be adopted for the purposes of benchmarking. Here, there are two principal sources of difference:

- those relating to the intrinsic characteristics of the entities and their commercial and regulatory environments
- those relating to the WACC assessment itself, arising from differences in methods for quantifying the cost of debt and the impact of tax across the comparator set.

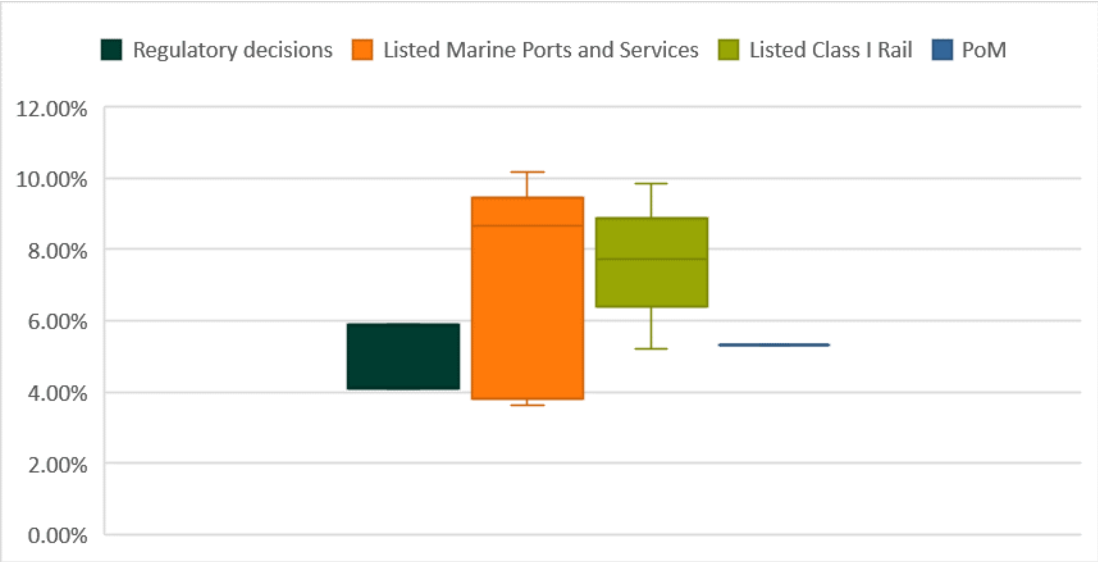
In presenting benchmarked relevant WACC estimates, we believe the following are most relevant:

- Post-tax unlevered cost of equity margins – on the basis that it removes the distracting influence of the cost of debt and best relates to the relevant workably competitive market for the assessment of PoM's cost of equity, which is an international capital market. The evidence is clear that in such a market, a post-tax comparison is the most informative because international investors cannot access imputation credits; and

- Pre-tax nominal WACC adjusted for the BEE's trailing average cost of debt, reflecting the requirements of the Pricing Order.

The figure below depicts the post-tax unlevered cost of equity margins for the comparator set and shows PoM's post-tax unlevered cost of equity margin is within the range of comparable Australian regulatory transport decisions and is situated towards the lower end of cost of equity margins for Listed Marine Ports and Services and Class I railroads.

Post-tax unlevered cost of equity margins



Data source: Synergies calculations, various regulatory decisions, Bloomberg

The next figure depicts the pre-tax nominal WACC margins for the comparator set, adjusted for the BEE's trailing average cost of debt and shows:

- PoM's pre-tax nominal WACC margin range is situated within the range of relevant Australian regulatory transport decisions. This is despite the ERA having implemented a substantial decrease in the MRP along with an increase in gamma. Together, these changes decreased the pre-tax nominal WACC for Pilbara railways by approximately 200 basis points (even before taking lower risk-free rates into consideration).

- PoM's pre-tax nominal WACC margin is at the very low end of the WACC margin range for listed Class I railroads, and within the range of WACC margins for listed Marine Ports and Services entities.

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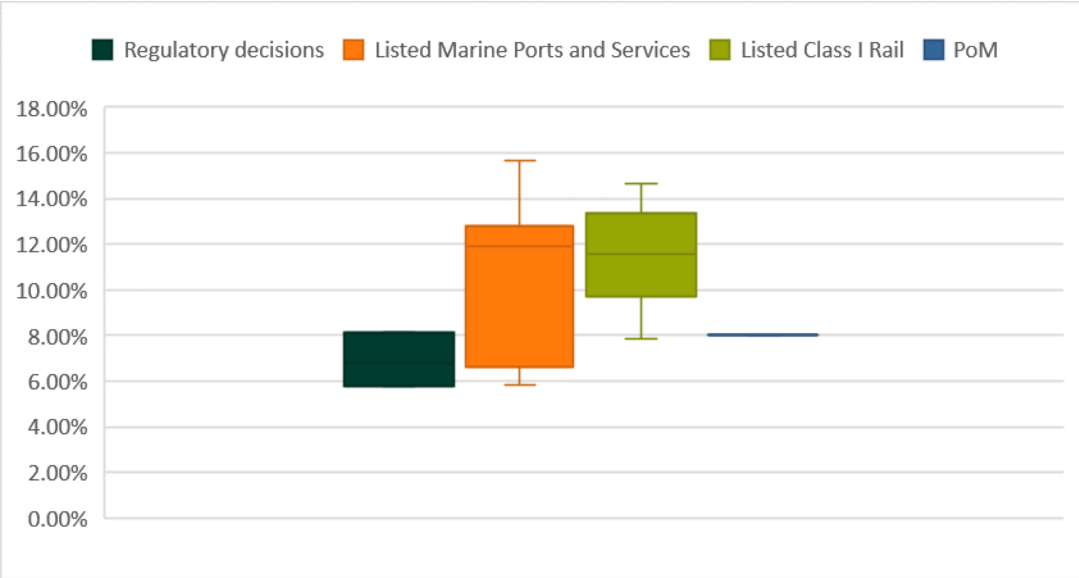
Pre-tax WACC margins adjusted for the BEE's trailing average cost of debt



Note: Both regulatory and listed WACC margins have been adjusted for the BEE's trailing average cost of debt.
Data source: Synergies calculations, various regulatory decisions, Bloomberg

This demonstrates that the proposed WACC estimate satisfies the requirements of the Pricing Order.

1 Introduction

Synergies has been engaged by Port of Melbourne (PoM) to provide an opinion on PoM's appropriate weighted average cost of capital (WACC) in accordance with the requirements of the Pricing Order.

The WACC has been estimated in the context of PoM submitting its 2020-21 Tariff Compliance Statement (TCS) to the Essential Services Commission (ESC) under the Pricing Order. For ease of reference, each chapter of this report begins with a very brief description of the relevant parameter values and identifies any changes to the 2019-20 TCS.

The Prescribed Services under the Pricing Order are the relevant services for the assessment of the WACC.

This report is structured as follows:

- Chapter 2 – WACC formulation
- Chapter 3 – discusses the requirements of the Pricing Order and the use of well-accepted approaches
- Chapter 4 – defines the benchmark efficient entity (BEE)
- Chapter 5 – analyses alternative well-accepted return on equity models
- Chapter 6 – estimates the return on the market as a whole
- Chapter 7 – estimates beta for the BEE
- Chapter 8 – assumed capital structure
- Chapter 9 – estimates the return on debt
- Chapter 10 – estimates the value of gamma
- Chapter 11 – proposes a WACC estimate for the BEE
- Attachment A – presents supplementary evidence on cost of equity approaches
- Attachment B – presents supplementary information on market risk premium estimates
- Attachment C – summarises Australian regulatory precedent on beta determination
- Attachment D – elaborates on the first principles analysis

- Attachment E – contains additional commentary on Frontier Economics' report to the ESC
- Attachment F – presents a risk profile comparison of PoM and Dalrymple Bay Coal Terminal (DBCT)
- Attachment G – presents our full list of asset beta estimates and beta diagnostics
- Attachment H – presents gearing ratios for our comparable companies set
- Attachment I – restates our previous responses to the ESC's commentary on academic evidence for gamma
- Attachment J – provides additional detail on the benchmarking analysis conducted in Chapter 11.
- Attachment K – contains details of our calculations for the Black CAPM and FFM cross-checks

2 WACC formulation

Chapter overview
This chapter sets out the pre-tax nominal WACC formulation that we have used as required by the Pricing Order. This formulation is unchanged from the 2019-20 submission.

2.1 Introduction

An infrastructure service provider, such as PoM, requires significant funding to invest in and operate its capital-intensive business. These funds must be raised either from PoM's shareholders or lenders. The sum of the returns required by equity and debt holders – weighted by the proportions of equity and debt used in the capital structure – is often referred to as the weighted average cost of capital (WACC).

2.2 Chosen WACC formulation

2.2.1 Post tax nominal WACC

The approach most commonly applied to estimate WACC in Australian regulatory regimes is the post-tax nominal 'vanilla' WACC. In other words, the rate of return estimate is expressed as a weighted sum of the returns on equity and debt in inflation-adjusted and after-tax terms. Under the post-tax nominal 'vanilla' WACC formula, tax is modelled as a cost in the cash flows rather than forming part of the WACC calculation. It is expressed as follows:

$$\text{Nominal post-tax WACC} = R_e \frac{E}{E+D} + R_d \frac{D}{E+D}$$

Where:

Re = post-tax return on equity

Rd = pre-tax return on debt

D = proportion of debt (gearing) within the assumed capital structure

E = proportion of equity within the assumed capital structure

2.2.2 Pre-tax nominal WACC

In contrast, the Pricing Order requires the WACC formula to be expressed in pre-tax nominal terms. The pre-tax nominal formulation adjusts for taxation and dividend imputation in the WACC formula rather than the cash flows of the business. It is expressed as follows:

$$\text{Nominal pre-tax WACC} = \frac{R_e}{(1-t_c[1-\gamma])} * \frac{E}{E+D} + R_d \frac{D}{E+D}$$

Where:

Re = post-tax return on equity

Rd = pre-tax return on debt

D = level of debt within the capital structure

E = level of equity within the capital structure

t = corporate tax rate

γ = gamma (value of imputation credits)

An underlying assumption of the pre-tax nominal WACC formulation is that the BEE will pay the Australian statutory corporate income tax rate of 30%. This is a standard approach across the broader finance community, whether it be in academic literature, the corporate finance industry or incentive-based regulatory frameworks, whereby the cost of capital is established having regard to benchmark efficient costs rather than the actual costs of the regulated entity. We will continue to monitor developments with the corporate tax rate in future submissions.

In effect, the return required by equity investors is multiplied by this tax wedge, which converts the post-tax return on equity to a pre-tax cost of equity. This value is assumed to provide sufficient revenues to meet the BEE's tax liabilities.

3 Use of one or a combination of well-accepted approaches

Chapter overview
This chapter presents our views on the relevant considerations for well-accepted in the context of the Pricing Order.

3.1 Requirements under the Pricing Order

The key provisions in the Pricing Order in regards to the estimation of a WACC for the port are Clauses 2.1, 4.1 and 4.3.

Clause 2.1

Prescribed Reference Tariffs must be set so as to allow the Port Licence Holder a reasonable opportunity to recover the efficient cost of providing all Prescribed Services determined by an application of an accrual building block methodology of the type described in clause 4 of the Pricing Order (clause 2.1.1(a)).

Clause 4.1

Sub-clause 4.1.1 requires that for determining its Annual Revenue Requirement, the Port Licence Holder must apply an accrual building block methodology that, amongst other things, includes an allowance to recover a return on its capital base that is commensurate with that which would be required by a benchmark efficient entity (BEE) providing services with a similar degree of risk as that which applies to the Port Licence Holder in respect of to the provision of Prescribed Services (clause 4.1.1(a)).

Clause 4.3

In determining a rate of return on capital allowance for the purposes of clause 4.1.1(a), the Port Licence Holder must use one or a combination of well accepted approaches that distinguish the cost of equity and debt, and so derive a weighted average cost of capital (clause 4.3.1).

The rate of return is to be calculated on a pre-tax nominal basis (clause 4.3.2).

3.2 Pricing Order provisions

The Pricing Order confers important discretions upon the Port Licence Holder in determining the WACC and return on capital allowance.

The key guidance provided in the Pricing Order relates to:

- the requirement that the return on PoM's capital base is to be commensurate with that which would be required by the BEE providing services with a similar degree of risk as that which applies to PoM in providing the Prescribed Services;
- the required use of one or a combination of well-accepted approaches that distinguish the cost of equity and debt to determine the WACC; and
- the requirement that the WACC is to be calculated on a pre-tax nominal basis.

Under the Pricing Order, it is up to the Port Licence Holder to demonstrate how it complies with the Pricing Order.

As such, the Pricing Order contrasts with the approach adopted in other regulated processes in Australia, whereby the relevant regulator ultimately holds deterministic responsibilities on the interpretation of the relevant requirements of the instrument and the assessment of the appropriate parameter values and rate of return for that determination.

Considering this guidance and the important discretions conferred upon the Port Licence Holder, PoM, in determining its WACC, this report presents and substantiates the estimation of a WACC having regard to relevant estimation methods, asset pricing models, market data and regulatory precedent, having regard to the requirements of the Pricing Order.

3.3 Overview of ESC commentary

Since PoM's first TCS submission for 2017-18, the ESC has published a number of commentary documents in relation to WACC. These include: Interim Commentaries (November 2017, October 2018 and December 2019) and the Statement of Regulatory Approach (SoRA) (version 1.0 of December 2017 and version 2.0 of April 2020).[7]

A key theme emerging from these documents is the definition of 'well accepted' in the context of the Port Licence Holder using 'one or a combination of well accepted approaches that distinguish the cost of equity and debt, and so derive a weighted average cost of capital.'[8]

PoM has argued that any well accepted approach must have regard to the terms and context of the Pricing Order, including to allow PoM a 'reasonable opportunity to

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7 The ESC's latest interim commentary of December 2019 is addressed later in this report.

8 *Port Management Act 1995* (Vic) Pricing Order, Clause 4.3.1.

recover the efficient cost of providing all Prescribed Services', as well as the objectives of the regulatory regime set out in section 48 of the Port Management Act.[9]

The ESC's view on what constitutes a well accepted approach has evolved. Initially, as set out in SoRA version 1.0, the ESC focussed narrowly on approaches used by economic regulators determining inputs into an accrual building block methodology.

More recently, the ESC's revised SoRA (version 2.0), outlines that the focus is on approaches that are being used, or recognised as appropriate for use, in the context of an economic regulatory regime which has objects such as efficiency and which recognises that the service provider should be provided with a return commensurate with a BEE facing a similar degree of risk. Additionally, the revised SoRA recognises that the views and practices of regulators and other professionals engaged in the practice of economic regulation in regimes similar to that applying to PoM may be relevant.[10]

PoM considers that the ESC has broadened its interpretation of well accepted; for instance, to not be limited to acceptance by economic regulators and to no longer specify that an approach should be used by at least one economic regulator. However, PoM's concern is that ESC's revised guidance could exclude approaches that are well accepted in relevant spheres outside of economic regulatory applications. The overarching matters that are relevant to assessing the well accepted-ness of an approach are those expressed in the objectives of the PMA. This in turn requires that appropriate weight should be placed on approaches such as those used by finance practitioners engaged in deriving a return on capital.[11]

3.4 ESC 3-step process for assessing rate of return clauses

The ESC indicated in its SoRA (versions 1.0 and 2.0) that it will adopt a three-step compliance assessment framework to assess whether PoM has complied with the requirements of the Pricing Order and the broader objectives of the Port Management Act.

The ESC's 2019 Interim Commentary noted that PoM considers that its WACC estimate satisfies the well-accepted and overall reasonableness stages of the ESC's compliance assessment framework as outlined by the three-stage process in the SoRA.[12] ESC further goes on to clarify that the SoRA is intended to provide guidance to PoM on how it may

9 Port of Melbourne (2018), 2018 - 2019 Tariff Compliance Statement, General Statement, Appendix I, May, pp 5-6

10 ESC (2020), Statement of Regulatory Approach — version 2.0, Port of Melbourne pricing order, 28 April, p 21.

11 Port of Melbourne (2020), 2020 - 2021 Tariff Compliance Statement, General Statement, May, section 9.2.3.2

12 ESC (2019), Interim commentary - Port of Melbourne tariff compliance statement 2019-20, December, p 6

demonstrate compliance with the Pricing Order, including through information provided in its TCS.

We have sought to apply the ESC's steps, noting the ESC's commentary is in some cases expressed in general rather than specific terms. Whilst we seek to apply the ESC's steps, our view is that in some cases the ESC commentary presents positions on the interpretation of the Pricing Order that are at odds with our understanding of the proper interpretation of the instrument. We set out our main areas of disagreement in the following sections.

3.4.1 Step 1: Well accepted test

The first step, "the well accepted test," relates to clause 4.3.1 and assesses whether the approach or combination of approaches used by PoM to determine the allowed rate of return is or are "well accepted."

Step 1 as outlined by the ESC in its SoRA version 2.0 focusses on approaches in the context of an economic regulatory regime, and the ESC intends for this to be a qualitative assessment only, with quantitative evaluation to occur in later steps of the process.

However, there are aspects of the revised SoRA that are too narrow. Specifically, the use of the phrases 'in the context of an economic regulatory regime' and 'engaged in the practice of economic regulation' could be read as excluding approaches that are well accepted outside of economic regulatory applications but which are nevertheless relevant to a consideration of enabling the PoM to attract capital for investment that is in the long term interests of users and Victorian consumers. This is consistent with the PoM's General Statement.[13]

In our view, the ESC's guidance operates as a constraint on the plain wording of the Pricing Order and is not required by, or is necessarily consistent with, advancing any of the regulatory objectives underpinning the Pricing Order.

As we detail in the following sections, our view is that the Pricing Order permits consideration of approaches that are well accepted by regulators, by financial practitioners and, in some cases, by academics.[14]

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[13] Port of Melbourne (2020), 2020 - 2021 Tariff Compliance Statement, General Statement, May, section 9.2.3.2

[14] This has been recognised by the ESC in its SoRA, version 2.0, p 21, although it is not necessary that these parties be engaged in the practice of economic regulation for an approach to be relevant to the rate of return required of a benchmark efficient entity under the Pricing Order; in our view, the key point is whether or not it is relevant to inform the statutory objective.

3.4.2 Step 2: Benchmark efficient entity test

The second step, "the benchmark efficient entity test", relates to clause 4.1.1 of the Pricing Order. Accordingly, this step aims to verify whether the return on capital outcome determined by PoM is commensurate with the required rate of return for the BEE providing services with a similar degree of risk as that which applies to PoM in respect of the Prescribed Services.

We expect this assessment will be quantitative with an emphasis on the quantum of the WACC estimate and its reasonableness. To this end we envisage this step would likely entail two components.

First, high level cross-checks will be required in order to assess if the overall return is likely to be commensurate with the returns that would be required by the BEE.

The ESC's SoRA version 2.0 identifies a number of examples of the cross-checks that it may use including regulatory decisions for industries with similar risk characteristics, practitioners' surveys, reports by valuation experts, brokers and analysts, comparing systematic risk of the BEE with that of the average firm in the market, and comparing PoM's cost of debt with the cost of equity.[15] Whilst we agree that these examples provide cross-checks, we do not agree that their role is so limited in informing PoM's compliance with the Pricing Order.

Such cross-checks may involve an appraisal of relevant regulatory decisions, surveys, valuation and broker reports, and other reference points, such as assessed rates of return of unregulated comparator entities.

In our view, comparator entities that are adopted must be "efficient" in the relevant market and be exposed to sufficiently similar risks to the PoM for them to usefully inform PoM's rate of return requirement.

Whilst regulatory precedent is clearly relevant, the BEE is not necessarily a regulated entity.[16] Moreover, relying upon regulatory decisions as benchmarks to assess PoM's compliance under the Pricing Order can be problematic.

Regulators are afforded different discretions under different statutory schemes. Consider, for example, a situation where a regulator is empowered to impose its own view of a WACC value or approach on a regulated business in preference to an alternative position put forward by the regulated business that was also consistent with

[15] ESC (2020), p 29.

[16] See Australian Energy Regulator v Australian Competition Tribunal (No 2) [2017] FCAFC 79 at [537]; See also SoRA version 2, p 22.

the relevant statutory tests. The fact that the position put forward by the regulated business could be accepted will not be relevant to the regulatory outcome in such a case if the regulator decided to impose a different value or approach. So long as the regulator's use of discretion is authorised by the statute that decision will be validly made. However, it does not necessarily invalidate any position put by the regulated business.[17]

Conversely, the Pricing Order confers upon PoM the opportunity to put forward a position which, if compliant, will not be subject to the regulator imposing an alternative compliant position. As such, the differing tests become a relevant consideration to the benchmarking process itself. Regulators assess rates of return under varying legislative instruments that confer differing degrees of regulatory discretion. A WACC outcome under a regime that gives the regulator significant regulatory discretion should not set a cap for PoM under a different regime (such as the Pricing Order) that limits the regulator's discretion.

As such, consideration of regulatory benchmarks alone cannot determine PoM's compliance with the Pricing Order. Moreover, the WACCs of unregulated businesses can also be relevant.

Relevantly, the ESC's view in the SoRA is that "the benchmark efficient entity need not be defined as being either a regulated or unregulated entity. Rather, the appropriate benchmark is an entity that is 'efficient'. This efficiency should be that expected in a workably competitive market".[18]

At this stage, we consider PoM would be considered in compliance with the Pricing Order if these cross-checks confirm that the submitted rate of return is consistent with that required by a BEE providing services with a similar degree of risk as that which applies to PoM in respect of the Prescribed Services (and the rate of return has been determined using one or a combination of well accepted approaches). In that respect, the relevant workably competitive market is the relevant equity and debt market from which capital is efficiently sourced for the PoM.

However, if the cross-checks suggest the return on capital is not commensurate with that required by the BEE, then we expect the ESC would seek to identify which specific components of the WACC are of concern, for further investigation. This could involve a

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17 See, for example, the Australian Competition Tribunal, Application by DBNGP (WA) Transmission Pty Ltd [2018] ACompT1, July 2018, esp 286-292. Similarly, the recent agreement reached between Aurizon and its coal customers (as well as other made by coal companies and ARTC in the Hunter Valley) involving a higher cost of capital highlights that regulatory decisions do not reflect the only acceptable value for a rate of return assessment.

18 ESC (2017), p 21; ESC (2020), p 22.

closer examination of individual parameter estimates, or the way in which individual estimates have been combined to calculate the overall WACC. This is the focus of Step 3, discussed further below.

3.4.3 Step 3: Further investigation

We expect Step 3 will involve a more detailed, focussed analysis to assess whether the approach is consistent with the Pricing Order and the objectives of the regulatory regime. The ESC has indicated in its response to feedback on the SoRA that this could involve:[19]

- A review of the assumptions and data underpinning PoM's chosen estimation models or methodologies.
- Sensitivity testing of empirical analysis relied upon by PoM.
- First principles analysis of PoM's risk profile, comparing these risks to the listed comparator sample to determine whether such risks are higher or lower.
- Empirical implementation of other well accepted approaches that may lead to different rate of return outcomes.
- Establishment of confidence bands or plausible ranges for the overall WACC, as well as individual parameters.

Synergies' approach to the estimation of each WACC parameter for the 2017-18, 2018-19, 2019-20 and 2020-21 TCS is compliant with the above guiding principles, as we consider that these naturally form part of a robust WACC estimation process.

As such, our interpretation of the Pricing Order is that while the three steps identified by the ESC are relevant to the assessment of PoM's compliance with Pricing Order, they need not be applied as a sequential test. This is because the Pricing Order does not establish any such prescription in the WACC estimation process. To this end, throughout our report, we demonstrate how our proposed WACC estimate satisfies the ESC's assessment framework. However, we note that the three-step sequential assessment framework is necessarily binding on PoM in the context of the Pricing Order.

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19 ESC (2017), Feedback on consultation and other matters: Statement of Regulatory Approach version 1.0, December, pp 46-47, cited in the SoRA, version 2, p 23.

In this regard, we note the ESC's 2018 Interim Commentary recognised the view of PoM and Synergies that the three tests should be applied simultaneously not sequentially as suggested by the SoRA.[20]

3.5 The relevant context

As noted above, the ESC has proposed in the SoRA version 2.0 that for an approach to be well accepted it should be used, or be recognised as appropriate for use, in the context of an economic regulatory regime which has objects such as efficiency and which recognises that the service provider should be provided with a return commensurate with a BEE facing a similar degree of risk.[21]

However, as noted above there are aspects of the revised SoRA that are too narrow. Specifically, the use of the phrases 'in the context of an economic regulatory regime' and 'engaged in the practice of economic regulation' could be read as excluding acceptance by practitioners other than economic regulators, and/or excluding approaches that are well accepted outside of economic regulatory applications; the overarching concerns are those expressed in the objectives of the PMA.

The ESC has also posited that the application of academic and financial market approaches may disregard the regulatory context in which the allowable rate of return is being set. This is possible but can be addressed by applying criteria used by regulators to ensure approaches are compatible with a regulatory environment. For approaches that can be compatible with a regulatory environment, the key issue relates to PoM's compliance with the Pricing Order and, in turn, the relevant statutory objectives. This in turn requires that appropriate weight should be placed on approaches used by finance practitioners engaged in deriving a return on capital, or to put it another way, attracting capital for entities in competitive finance markets that are relevant to informing the rate of return required to attract investment funds to the PoM.

We set out in the following sections what we consider to be relevant context regarding interpretation of a well accepted approach.

3.5.1 Port Management Act 1995 objectives

We consider the ESC's view regarding the basis upon which an approach can be considered well accepted in the context of an economic regulatory regime, operates as a

20 ESC (2018), Interim commentary, p 14

21 ESC (2020), SoRA, p 21

constraint on the plain wording of the Pricing Order and is not required by the language of, or any of the regulatory objectives underpinning, the Pricing Order.

The Pricing Order is a regulatory instrument made under section 49A of the *Port Management Act 1995* (the PMA).

Part 3 of the PMA establishes the framework for the regulation of port services, including the objectives to guide interpretation of the Pricing Order. The objectives of most relevance to the estimation of PoM's cost of capital are the following:

- to promote efficient use of, and investment in, the provision of prescribed services for the long-term interests of users and Victorian consumers (s48(1)(a));
- to protect the interests of users of prescribed services by ensuring that prescribed prices are fair and reasonable whilst having regard to the level of competition in, and efficiency of, the regulated industry (s48(1)(b)); and
- to allow a provider of Prescribed Services a reasonable opportunity to recover the efficient costs of providing Prescribed Services, including a return commensurate with the risks involved (s48(1)(c)).

Further, the Pricing Order provides for the Port Licence Holder to be allowed a reasonable opportunity to recover the efficient cost of providing all Prescribed Services determined by application of an accrual building block methodology (clause 2.1.1(a)).

These objectives reflect the intention of all Australian economic regulatory regimes to ensure that efficient outcomes consistent with those found in a workably competitive market are achieved. As noted by PoM in its General Statement, the Pricing Order as a whole provides for a regulatory regime of a kind which is "a surrogate for the rewards and disciplines normally provided by a competitive market."[22] In applying the Pricing Order, the ESC must have regard to its objectives in the *Essential Service Commission Act* to promote the long-term interests of Victorian consumers. In performing its functions and exercising its powers, the ESC must also have regard to the price, quality and reliability of essential services. In seeking to achieve the objective, it must also have regard to, amongst other things, efficiency in the relevant industry, incentives for long term investment and the benefits and costs of regulation for consumers and regulated entities.[23] The following discussion is relevant to the application of the PMA and ESC Act objectives.

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22 *East Australian Pipeline v Australian Competition and Consumer Commission* (2007) 233 CLR 229, para. 81, quoted in Port of Melbourne (2020), 2020 - 2021 Tariff Compliance Statement, General Statement, May, section 9.2.3.2

23 *Essential Services Commission Act* 2001 (Vic), sections 8 ad 8A

The inherent imprecision of the process for estimating the cost of equity (particularly) has been well documented. Unlike, for example, the cost of debt, where there are observable benchmarks, the cost of equity can only be inferred. Not only is there controversy over the most appropriate model to apply to infer the cost of equity, there is also controversy over parameter values in respect of each model. This lack of observability means that the estimation of the cost of equity is imprecise. This creates a challenge for regulatory processes, where estimating the cost of capital is a key parameter in an accrual building block model.

These considerations inform the Pricing Order. It is for the Port Licence Holder to present a position to the ESC and to demonstrate compliance with the Pricing Order. This "compliance" approach in the Pricing Order represents an important means of minimising perceived regulatory risk. The regulatory risk associated with the inherent imprecision of the WACC is ameliorated in a compliance framework, as compared to a determination framework.

This in turn can be expected to enhance the Port Licence Holder's confidence in the regulatory arrangements and provide a vehicle for greater stability in returns and in so doing, advance the interests of Victorian consumers. This is an important consideration for the Port Licence Holder and Victorian consumers alike, largely because of the asymmetric consequences of regulatory error as it affects establishing cost of capital estimates.

Asymmetric consequences of regulatory error

Regulatory processes that ascribe an unrealistic degree of precision to the calculation of the rate of return, particularly in estimating the return on equity (which is unobservable), create a heightened risk of regulatory error.

We consider that the Pricing Order's requirements regarding the use of one or a combination of well-accepted approaches that distinguish the cost of equity and debt is directed to mitigating the potential for regulatory error in estimation of the cost of capital, given it will be the primary driver of PoM's ongoing incentive to invest over the lease term.

In a general sense, the application of economic regulation affects a very high proportion of a regulated service provider's cash flows in relation to the regulated services given the generally large fixed capital nature of regulated service provision. This is true for PoM and its provision of Prescribed Services. Accordingly, it could reasonably be expected that the ESC's decisions on PoM's cost of capital on its existing capital base will exert a considerable influence on PoM's future investment plans.

In contrast, even though users of Prescribed Services are more numerous, they are considerably less exposed to the ESC's decisions under the Pricing Order, particularly in the short term. For example, it is atypical for any customer of a regulated entity to have more than 10 per cent of its costs affected by a regulated service.

Hence, from an economic perspective, the adverse impact of prices of regulated service being marginally higher than the economic regulator believes is optimal (allocative inefficiency) in the short term are generally not large relative to the long-term costs associated with under-pricing of infrastructure assets and the consequential under-investment in those assets over time (dynamic inefficiency). Understanding this asymmetry is important in resolving the tension that arises from the inherent imprecision of regulatory parameters, including the cost of capital.

The Productivity Commission has characterised the issue of asymmetric consequences of regulatory error as follows:[24]

> …. the Commission does not subscribe to the view that, in a regulated environment, the community faces a choice between incurring the allocative efficiency costs of over-compensation and (more serious) dynamic costs of under-compensation. Both types of error are likely to influence investment outcomes and therefore have dynamic efficiency implications.
>
> Nonetheless, the Commission accepts that there is a potential asymmetry in effects:
>
> - Over-compensation may sometimes result in inefficiencies in the timing of new investment in essential infrastructure (with flow-ons to investment in related markets), and occasionally lead to inefficient investment to by-pass parts of a network. However, it will never preclude socially worthwhile investments from proceeding.
> - On the other hand, if the truncation of balancing upside profits is expected to be substantial, major investments of considerable benefit to the community could be forgone, again with flow-on effects for investment in related markets.
>
> In the Commission's view, the latter is likely to be a worse outcome. Accordingly, it concurs with the argument that access regulators should be circumspect in their attempts to remove monopoly rents perceived to attach to successful infrastructure projects.

24 Productivity Commission (2001). Review of the National Access Regime, Report No. 17, AusInfo, Canberra, p.83.

In practice, the full effects of regulatory errors associated with under-compensation for regulated infrastructure investments are not realised until the long term, because it is in the long-term that the effects of under-investment and the high costs associated with remedying this outcome are understood. Potentially adverse consequences of PoM's cost of capital being set too low include:

- future investment in the port to increase capacity being adversely affected (stifled, delayed, distorted)
- inefficient use of Prescribed Services, including rationing of constrained available capacity or users being forced to utilise surrounding ports that impose additional transport costs and may not be as efficient;
- adverse consequence on efficiency of the transport supply chain servicing PoM because required port infrastructure is not built in timely manner or at all; and
- more generally, the adverse flow-on economic impacts for the Victorian and national economies given the economic value generated by the PoM supply chain.

Balancing long-term and short-term consumer interests

Recognising the importance of investment incentives in a regulatory context is not to say that excessive compensation of an infrastructure owner (relative to the outcomes of a workably competitive market) is benign – such an outcome will tend to harm consumers in the short run (through higher than necessary charges) and in the long run (through incentivising gold plating).[25]

In this regard, the impact of the Tariff Adjustment Limit (TAL) (which constrains PoM's price increases to a level below efficient cost recovery) means that even if the WACC were to exceed the 'true' cost of capital, PoM faces strong incentives to only invest in infrastructure with clear outcomes in terms of productivity and growth, and to do so at the least cost possible. Moreover, it is difficult to conceive of an incentive the Port Licence Holder could have to over-invest whilst the TAL remains in place.

The legislation enacted to provide for the 50 year lease includes a provision that compensation may be payable to the port licence holder if handling of international containers occurs at another Victorian port within 15 years of the lease commencement. Relevantly, if PoM materially expands the port's container handling capacity in the first 15 years of the lease, and seeks to have the capacity expansion costs included in a compensation calculation, it will need to obtain either approval from the Ports Minister,

[25] Clause 4.2.1(c) of the Pricing Order requires capital expenditure be undertaken prudently and efficiently.

or certification from the ESC. This approval/certification process would mitigate any incentives for gold plating. However, in the longer term the concerns remain relevant.

The Australian Energy Market Commission has characterised the balancing of short and long-term considerations as it affects investors in regulated energy infrastructure and users of the services of that infrastructure as follows:[26]

> The concept of the 'long-term' recognises that there is an inherent trade-off between consumers today, and consumers in the future. Changes that may be in consumers' short-term interests may not be in their long-term interests if those changes undermine incentives to make efficient investments and operational decisions over time. Generally, making changes specifically to provide customers with short-term price decreases at the expense of enabling investors to recover a return of and return on efficient investment will not be in the long-term interests of consumers.

Similarly, the Productivity Commission has commented on balancing short-term and long-term efficiency considerations in determining the cost of capital under the Australian electricity regulatory framework:[27]

> ... while the allocative inefficiency effects of small price increases are modest in the short term, they still matter in other respects, and the transfers to producers from setting the WACC too high would potentially not be consistent with the National Electricity Objective. On the other hand, while setting the regulatory WACC [weighted average cost of capital] too low would lower prices to end users in the short run, it might make it difficult for firms to recover their efficient costs in the long term. This would contravene the revenue and pricing principles of the National Electricity Law, and in any case would not be in the long-term interest of consumers.

The key issue is that any quest for unrealistic precision in the application of models to estimate the WACC, including through a narrow interpretation of any such models that are well-accepted, will not be in the long term interests of Victorian consumers if it ultimately discourages future investment at the port such that Prescribed Service provision is compromised. The potential for this situation to arise is exacerbated by the cost of capital outcomes in recent Australian regulatory decisions.

Port charges represent a very small proportion of the total supply chain cost of any product that is handled through the port (eg generally significantly less than 10% of the cost of importing a container). The long term interests of Victorian consumers are likely to be advanced by ensuring they secure the benefit of an efficient port that promotes

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[26] AEMC (2016), Applying the energy objectives, A guide for stakeholders, December, p 6

[27] Productivity Commission (2013), Electricity Network Regulatory Frameworks, Volume 1, April, p 206

efficient supply chains at a sustainable price rather than through potentially undermining investment incentives through commercially unsustainable WACC outcomes that do not make due allowance for the imprecision of WACC parameters. The risk of commercially unsustainable WACC outcomes that do not make due allowance for the imprecision of parameters can be seen in recent regulatory decisions.

Impact of recent Australian WACC decisions

In recent years, infrastructure owners have seen their returns allowed by Australian economic regulators drop significantly. First, and not unexpectedly, from lower risk-free rates. Second, and more of concern, through a series of regulatory decisions where parameter values have been varied to reduce the equity returns of regulated infrastructure owners.

This in turn highlights the need to ensure that the rate of return is sufficient for the BEE to be able to attract capital for its investment. Additionally and significantly, the discretions afforded to the PoM under the Pricing Order highlight that regulatory risk matters to that investment climate. The prospect of a regulatory environment that determines unreasonably low rates of return, increases not only the risk of investment distortions, but also, all else being the same, increases the rate of return required to incentivise investment, on account of perceived regulatory risk. Such an outcome is not in the long run interests of Victorian consumers, yet the recent history of regulatory determinations in Australia highlight this risk.

These regulatory decisions have coincided with unprecedented political controversy over the cost of living pressures associated with regulated infrastructure, particularly in the energy sector. As an example, the effect of this political pressure has been reflected quite starkly in the allowed return on equity for electricity transmission businesses since 2000.[28] Normalising the large reduction in the risk-free rate since the early 2000s,

Table 4 shows that the pre-tax return on equity margins above the risk free rate (whether pre or post tax) have halved over the period (the pre-tax return on equity margin falling from 9.48% in 2000 to 4.31% as at March 2020).

[28] For illustrative purposes prior to the introduction of the National Electricity Rules and establishment of the AER, we have used ACCC decisions in 2000 and 2005 for the NSW electricity transmission entity, TransGrid.

Table 4 Electricity transmission return on equity allowances (2000-present)

	ACCC 2000 TransGrid decision	ACCC 2005 TransGrid Decision	AER 2009 TNSP and DNSP decision	AER 2013 Rate of Return Guideline	AER 2018 Rate of Return Instrument	AER 2018 Rate of Return Instrument (updated to March 2020)
Risk-free rate	6.81%	5.98%	5.68%	4.17%	2.70%	0.90%
Equity beta	1.0	1.0	0.8	0.7	0.6	0.6
MRP	6.00%	6.00%	6.50%	6.50%	6.10%	6.10%
Gamma	0.5	0.5	0.65	0.5	0.585	0.585
Post-tax return on equity	13.85%[a]	11.98%	10.88%	8.72%	6.36%	4.56%
Margin above risk-free rate	*7.04%*	*6.00%*	*5.20%*	*4.55%*	*3.66%*	*3.66%*
Pre-tax return on equity	16.29%	14.09%	12.16%	10.26%	7.26%	5.21%
Margin above risk-free rate	*9.48%*	*8.11%*	*6.48%*	*6.09%*	*4.56%*	*4.31%*
Total market return (post-tax)	12.81%	11.98%	12.18%	10.67%	8.80%	7.00%

[a] The 2000 return on equity was selected using discretion from a range of 11.50%-14.45%.

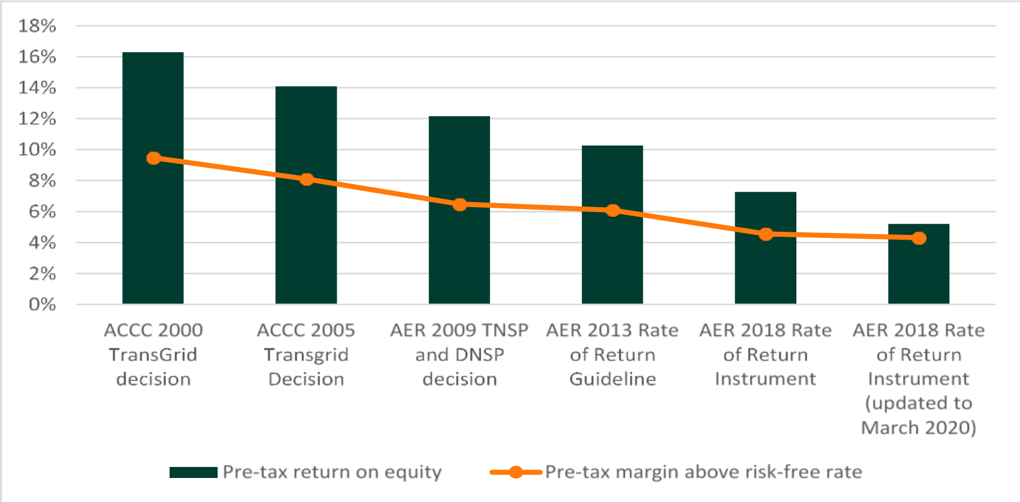
Source: Synergies analysis of AER and ACCC decisions

In our view, this fall in the margin above the risk free rate over 20 years is unrelated to the market risks facing investors in the Australian electricity transmission sector, nor has this fall been substantiated by the AER on the basis of any such de-risking over time (indeed, systematic risk for the sector is likely to have increased due, amongst other things, to increased systematic regulatory and stranding risk). Rather, it appears that the AER is now taking lower bound positions on all cost of equity parameters that, in aggregate, have resulted in a sharply lower estimate of the margin above the risk-free rate in 2018.

Moreover, for the reasons we explain in Chapter 6, finance practitioners, as well as regulators (particularly in Europe) do not accept that the dramatic falls in recent years in the risk-free rate translate directly into equivalent reductions in the cost of capital.

The decline in the pre-tax return on equity and the pre-tax return on equity margin over the risk free rate over time for Australian electricity transmission decisions is illustrated in Figure 1. It shows that the pre-tax return on equity is now less than one third of its value 20 years ago. However, the evidence outlined in Chapter 6 makes it clear that finance practitioners do not subscribe to there being such dramatic falls in the cost of equity over this period.

Figure 1 Pre-tax return on equity and pre-tax return on equity margin above the risk-free rate in ACCC and AER electricity transmission decisions



Data source: Synergies analysis based on AER decisions

Further, the impact of these regulatory WACC decisions has not been confined to energy network businesses. Most recently, the WA Economic Regulation Authority's decision to reduce the MRP by 1.3% alone reduced the pre-tax nominal return of the Pilbara railways by approximately 160 basis points (and by approximately 200 basis points when combined with the impact of an increase in the value of gamma).

In our view, these changes have undermined the stability of WACC frameworks and, as a consequence, reduced confidence in regulatory regimes amongst infrastructure owners. This affects both the cost of debt[29] and equity[30].

As previously discussed, whilst lower prices can be to customers' benefit in the short term, in the longer term their interests are best served by stable regulatory regimes that instil confidence that efficient infrastructure owners can earn a return commensurate with risk and thereby encourage efficient investment. This is because a regulatory environment which minimises the perceived risk of investing in regulated infrastructure, in turn, encourages efficient investment in that infrastructure at lower long-term cost to the consumer.

29 Ratings agencies consider the stability and predictability of an entity's regulatory environment in their ratings assessments.

30 Antoniou, A., Pescotto, G. (1997). 'The effect of regulatory announcements on the cost of capital of British Telecom', *Journal of Business, Finance & Accounting* 24(1), 1-25.

The long term impact of recent lower WACC decisions by regulators remains to be seen, although it is entirely conceivable that they may increase the returns equity holders demand to invest in infrastructure relative to an environment in which the regulated rates of return is accepted as stable and sufficient for efficient infrastructure investment.

Implications for interpretation of the Pricing Order - balancing and reconciling objectives

Balancing the competing legislative objectives requires interpreting the Pricing Order holistically. A key objective that arises when considering the rate of return is promoting efficient use of, and investment in, the provision of Prescribed Services for the long-term interests of users and Victorian consumers. The Pricing Order further provides for an allowance to recover a return on PoM's capital base which is commensurate with that required by a BEE providing services with a similar degree of risk as that which applies to the Port Licence Holder in respect of the provision of the Prescribed Services.

In practice, we consider that this means avoiding a rigid and narrow interpretation of the Pricing Order that undermines the longer-term stability of the WACC, particularly in the context of the inherent imprecision involved in estimating the cost of capital. Further, adopting such an approach will create a stable and consistent investment environment for PoM in the long-term, which we consider is in accordance with the intent of the Pricing Order and the achievement of the relevant statutory objectives. That is, to provide confidence to PoM that compliant proposed positions on its estimated cost of capital will not be rejected.

In contrast, pursuit of unattainable precision in setting the cost of capital is likely to adversely affect PoM's incentives to undertake efficient investment, which would be contrary to the long-term interests of Victorian consumers. In this regard, the design of the Pricing Order, including the discretions it confers upon the Port Licence Holder regarding its application of well-accepted approaches to estimating its cost of capital, recognises and seeks to assuage the risks associated with regulatory decision making.

Appropriateness of constraints on well accepted approaches

In our view, it is not inconsistent with the Pricing Order or the PMA objectives to permit a consideration of "well accepted" approaches that includes the approaches accepted by regulators (both Australian and international), as well as those approaches adopted by the financial and academic communities.

Each of these communities ultimately seeks to estimate or analyse efficient returns on capital of entities from the perspective of a workably competitive market consistent with the efficiency assumption of the BEE and the efficiency objectives of the PMA (both of which are intended to reflect the out-workings of a workably competitive market in remunerating and attracting capital investment on an efficient basis). It is therefore inappropriate to limit the meaning of "well accepted" to only those approaches adopted by regulators or the more limited subset of Australian regulators.

Further, an economic regulator making decisions and exercising discretions under a different regulatory framework to the Pricing Order should not have particular standing or persuasive force in the context of PoM's compliance with the Pricing Order. It also highlights the risks of benchmarking cost of capital estimates developed under different regulatory frameworks, particularly in the context of sharply declining allowed rates of return by economic regulators as discussed above, and the reality that the approaches adopted by economic regulators depart from the practices of finance practitioners.

However, this is not to say that our proposed WACC methodology is inconsistent with regulatory precedent.

Table 5 outlines the evidence from economic regulators in support of the approaches that we have used.

Table 5 Regulatory precedent for WACC proposal

WACC component	Proposed approach	Use by economic regulators
Risk-free rate	20-day average on 10-year Commonwealth Government bonds	Used by numerous Australian and international regulators
Capital structure	Gearing based on median and average from sample of comparable listed and unlisted entities.	Gearing based on median or average of relevant comparator sample.
Return on equity models	SL CAPM forms the basis of our WACC approach and is given 100% weight in our point estimate	SL CAPM is widely used by regulators. It is also widely used by financial practitioners, albeit in conjunction with adjustments, as demonstrated by the evidence we have gathered.
	While not given weight in our point estimate, we continue to construct a WACC estimate with some weighting to the Black CAPM (5%), and will monitor its application going forward.	The AER has endorsed the Black CAPM in its Rate of Return Guideline and uses it indirectly to inform the asset beta component of its cost of equity estimate. Also used in US and Canadian regulatory decisions.
	While not given weight in our point estimate, we continue to construct a WACC estimate with some weighting to the Fama-French Model (FFM) (5%), and will monitor its application going forward.	IPART has announced that it will monitor the FFM over the next 5 years. Endorsement of FFM by NZ Commerce Commission, as well as regulatory use in the UK and US.
Beta	Asset beta based on median and average from sample of comparable listed domestic and international transport entities from multiple sectors	Regulatory decisions have used companies from other transport sectors to inform beta estimates or ranges (e.g. ERA's use of port comparators for rail WACC determinations). Regulators also rely on overseas comparators if insufficient domestic comparators are available.
Market risk premium	Ibbotson MRP approach (70% weighting in our point estimate); Wright approach (15% weighting in our point estimate); and DDM (15% weighting in our point estimate).	Ibbotson MRP is in use by various Australian regulators. The QCA, NZ Commerce Commission (NZCC) and European regulators use the Wright MRP. QCA, IPART,

WACC component	Proposed approach	Use by economic regulators
		ERA, NZCC and various overseas regulators utilise forms of the DDM.
Return on debt	Transition to trailing average as return on debt history is established.	On-the-day approach in use by the ACCC and QCA; trailing average now in use by AER, IPART and ERA. Trailing average also adopted by Ofgem and NZCC.
Gamma	Based on gamma values derived from finance practice and regulatory precedent (primarily the equity ownership approach).	Typically based on regulatory precedent, equity ownership approach and/or market valuation studies.

Source: Synergies analysis, various regulatory decisions

3.5.2 Regulatory adoption of a range of approaches

Regulators have adopted models developed in academia; indeed, the SL CAPM was conceived by academics, as have models used by financial practitioners.

In its WACC methodology review released in February 2018, IPART addressed four principles for the determination of an appropriate rate of return. They are as follows:[31]

- WACC methods should produce estimates of the cost of capital that are as reasonably accurate as possible. This will ensure that customers do not pay more than necessary and that the regulated firms will be financially viable and have the incentive to invest in the efficient level of productive assets.
- WACC methods should be relatively stable over time to give stakeholders certainty.
- WACC methods should be predictable and replicable by stakeholders to provide transparency and reduce resources required in each review.
- Incremental improvements should be made where there is sufficient evidence that they increase the accuracy of the cost of capital faced by a benchmark efficient firm.

Similarly, in its December 2013 *Better Regulation – Rate of Return Guideline*, the AER considered that rate of return decisions should use “estimation methods, financial models, market data and other evidence that are, where applicable, reflective of economic and finance principles and market information.”[32] Furthermore, such approaches should be “informed by sound empirical analysis and robust data” and should be “sufficiently flexible as to allow changing market conditions and new information to be reflected in regulatory outcomes as appropriate.”

We consider a relevant WACC assessment approach should adhere closely to the regulatory principles identified above (i.e. accuracy, stability, predictability,

[31] IPART (2018a). Review of our WACC method. February, p.14.

[32] AER (2013a). Better regulation – rate of return guideline, December, p.6.

replicability, transparency) rather than simply reducing to an assessment of whether an aggregate WACC estimate or component parameter estimate is accepted by one or more regulators. This is particularly the case due to the specific circumstances relevant to PoM and the regulatory framework that is being applied to it, which differs in important respects from the regulatory frameworks from which other regulatory decisions are drawn. Consideration of whether a particular approach is well accepted is not confined to regulatory precedent. Moreover, approaches that may not meet the well accepted threshold may still perform a useful role in informing the cost of capital in the context of informing a range of likely values or as a cross-check.

Table 6 shows how we have applied these criteria to the various elements of our WACC estimation approach.

Table 6 Application of IPART and AER criteria to WACC parameters

Parameter	Accuracy	Stability and predictability	Transparency and replicability	Reflective of economic/financial principles	Flexibility with changing market conditions	Robust data
Risk-free rate	20-day average avoids one-off anomalies whilst capturing recent market conditions	Risk-free rate will change with market conditions, but 20-day average will be a stable estimator of current underlying conditions	RBA dataset is publicly available	10-year government bond corresponds to PoM's long-term investment horizon	20-day average will incorporate changes in market conditions promptly	RBA is acknowledged as a reliable data source and is frequently used by regulators
Capital structure	Observed gearing of listed firms is the best proxy for unobservable BEE, supplemented by privatisation evidence	5 and 10-year comparator averages less susceptible to short-term fluctuations	Gearing data from Bloomberg is publicly available	Firms with similar risk profiles to PoM will maintain similar capital structures	Changes in gearing will be incorporated into averages over time.	Bloomberg is a globally-recognised data source. Other relevant data sources verified.
SL CAPM	Empirical shortcomings in SL CAPM imply that it may underestimate the return on equity, particularly for entities with equity betas less than 1	SL CAPM remains stable provided estimates of risk-free rate and MRP are responsive to changes in market conditions	Formula is easy to apply	SL CAPM empirical performance is poor	Changes in return on equity will be driven by changes in risk-free rate, beta and MRP	SL CAPM is a function of the risk-free rate, beta and MRP, all of which are based on robust data
Black CAPM	Use of zero beta premium corrects for low-beta bias of SL CAPM	Relationship between SL CAPM and Black CAPM is well-defined	We have updated the zero-beta premium estimate to be 4.56%	Low-beta bias is empirically observed	Changes in return on equity will be driven by changes in risk-free rate, beta and MRP	Zero beta premium can be derived from market data
Fama-French Model	FFM accounts for factors not captured by CAPM.	Averaging across all firms in the comparator set reduces the impact of outliers	We have provided an extensive description of our approach	Listed entity size and value premiums have been consistently observed around the world	FFM results in a more rigorous estimate of the return on equity	Professor French's dataset is globally recognised
Beta	Our use of different sectors establishes a reasonable range for PoM's asset beta	Large number of comparator companies and 5/10-year averages/medians reduces impact of outliers	All beta estimates can be replicated via Bloomberg, and we have detailed our de-levering process	Companies with similar risk profiles will tend to share similar exposure to systematic risk	Long-term averages will gradually incorporate changes in companies' exposure to systematic risk	Data on beta is based on observed security returns from Bloomberg, a globally recognised data source
Market risk premium (Ibbotson MRP)	Historical averages based on observed market returns.	Historical averages fluctuate less than forward-looking	We have detailed our approach to calculating the	Ibbotson MRP captures the stability of the MRP under conventional market	Ibbotson MRP does not adjust in response to risk-free rate – hence	Bloomberg is a globally recognised data source, and

Parameter	Accuracy	Stability and predictability	Transparency and replicability	Reflective of economic/financial principles	Flexibility with changing market conditions	Robust data
		estimates. However, from a total market return perspective it is less stable than the Wright and DDM methodologies	Ibbotson MRP using publicly available data	conditions, but may be misrepresentative if the risk-free rate deviates from the same long-term average used for the market return calculation (i.e. the sum of the RFR and MRP do not equal the long-term Market Return)	our reliance on a combination of approaches incorporating the Wright MRP and DDM methodologies respectively	NERA MRP data is well recognised in Australia
Market risk premium (Wright MRP)	Historical averages based on observed market returns.	The historical average of total market return fluctuates less than forward-looking estimates i.e. whilst Wright can fluctuate due to changes in RFR, when combined with prevailing RFR it is relatively stable	We have detailed our approach to calculating the Wright MRP using publicly available data	Wright MRP reflects empirical tendency for return on equity to remain relatively stable over time	Wright MRP adjusts in response to risk-free rate	Bloomberg is a globally recognised data source, and NERA MRP data is well recognised in Australia
Dividend Discount Model (MRP)	Forward-looking estimate based on current dividend yields and assumed long-term dividend growth rate, but sensitive to these assumptions	Fluctuations in DDM estimates arise from changes in reported dividend yields reflecting changing market conditions. However, similar to Wright, since dividend yields are strongly correlated with changes in RFR, when observed from a total market return perspective, DDM is relatively stable	We have detailed our approach to calculating the MRP using publicly available data and five DDM models, allowing replicability of results.	DDM estimates are based on prevailing stock prices and dividend yields, so are more likely to provide a true forward-looking estimate than historical averages	By design, DDM adjusts in response to changing dividend yields reflecting prevailing market conditions	Bloomberg is a globally recognised data source, reported stock prices and dividends are reliable
Return on debt	Short term averages from RBA and Bloomberg will reliably estimate the current return on debt, although the actual return on debt will vary over time with market conditions. A trailing average approach will more	Trailing average may offer more stability over the long run	RBA and Bloomberg data is publicly available, and we have detailed the adjustments we have made to the raw estimates	Trailing average may better reflect efficient debt management practices once return on debt history is established	Return on debt methodology will reflect changes in the risk premium attributable to a BBB credit rating over time. Trailing average may be more representative of actual	Historical evidence suggests that neither RBA nor Bloomberg approach has been systematically higher than the other

Parameter	Accuracy	Stability and predictability	Transparency and replicability	Reflective of economic/financial principles	Flexibility with changing market conditions	Robust data
	accurately reflect the efficient cost of debt under the corresponding debt management strategy				debt management practices	
Gamma	Combination of well-accepted approaches avoids reliance on a single method that may promote over or underestimation of the parameter	Finance practitioners consistently ascribed no value to imputation credits in valuations, implying zero gamma value. Regulatory precedent provides support for the equity ownership approach.	Evidence on gamma is well-documented in financial practice, regulatory decisions and academic journals	Evidence on gamma as applied in financial practice is consistent with economic principles	The estimate of gamma is less likely to vary than other parameters over time assuming investors' required post-tax return on equity is stable	Strong support for zero gamma from finance practitioners. Parameters underpinning utilisation approach remain contentious

Source: Criteria are derived from IPART WACC Methodology (2018) and AER Better regulation – rate of return guideline (2013)

Similar principles may also be found in financial or academic sectors. Like regulators, financial practitioners have adopted and adapted models developed in academia, including the SL CAPM. Similarly, in the regulatory sphere we have seen the development of adaptations or new approaches for specific WACC input parameters for use in the accrual building block methodology, including the recent introduction of the trailing average cost of debt. This suggests that regulators themselves are borrowing knowledge and learnings from these other communities to apply to the specific needs of a regulatory framework.

A failure to consider these broader models may result in an estimate of required returns that do not meet the requirements of clause 4.1.1(a) of the Pricing Order and fail to achieve the objectives of the Port Management Act.

3.5.3 Inappropriate to unduly limit the discretion of PoM

In the Consultation Paper, the ESC describes the Pricing Order as a price compliance regime, which it distinguishes as being lighter handed than a price determination regime. The ESC describes the Pricing Order as:[33]

> a unique form of regulation best described as a price compliance regime. It represents a more heavy-handed form of regulation than a typical price monitoring regime, but is lighter handed than a price determination regime.

As a "price compliance regime," the Pricing Order establishes a set of processes for PoM to follow in setting prices for its Prescribed Services that must provide it with a reasonable opportunity to recover efficient costs. This includes placing a CPI-based cap on prescribed service tariff increases for the first 20 years of the lease term. It is an important feature of the regime that it is for PoM to apply the Pricing Order, not for the ESC to determine an outcome and impose it on PoM.

The PMA provides that, should PoM be unable to demonstrate compliance with the Pricing Order and that non-compliance is properly found to be in a significant and sustained manner, the form of regulation can change with a heavier-handed approach implemented in place of the Pricing Order framework.

In our view, these features of the regulatory regime reflect the fact that the Victorian Parliament intended there to be greater discretion afforded to PoM in applying the Pricing Order when compared to the more constrained role it would have under a conventional price determination regime. Indeed, it is likely that current prices for

[33] ESC (2017a). Regulatory approach to the Pricing Order – a consultation paper, May, p.3.

Prescribed Services would be significantly higher under a conventional price determination regime given PoM's current deferral of recovery of depreciation under the TAL.

That is, PoM is conferred an important discretion in the first instance when establishing the parameters of the building block model for the purposes of complying with the Pricing Order. That discretion is not constrained by the issue of whether or not an approach is well accepted by reference only to regulators.

The inevitable imprecision in estimating the cost of equity means that considerable judgement is necessarily applied – not only in relation to a particular model or models to apply, but also to the parameter values that are adopted in the application of any model.

The discretion afforded to the Port Licence Holder must be considered in this context. It is a discretion to utilise models that meet the threshold test of well accepted in the context of the Pricing Order. It is not limited by approaches that have been adopted in regulatory regimes that themselves involve significantly different tests and confer different discretions on regulators and the businesses compared to the Pricing Order.

Interpreting well accepted approaches broadly gives the regulatory regime the flexibility necessary to quickly adjust to developments in knowledge and learning by academia and adopted by the financial industry in relation to the weighted average cost of capital.

There is no reason to suggest that a methodology or parameter value, widely accepted by the financial community, should not be considered well accepted for the purposes of the Pricing Order simply because other regulators (operating with very different tests and legislative approaches to those contained in the Pricing Order) are yet to adopt it. Similarly, there is no reason to suggest that a methodology or parameter value, widely accepted in academia, cannot similarly inform an estimate of the cost of capital, including as a cross-check. This can also be seen in the language of the Pricing Order.[34]

3.5.4 The Pricing Order is drafted in an open way

The language of the Pricing Order does not limit the meaning of the phrase "well accepted" other than that it should be interpreted in a manner consistent with its purpose relating to clause 4.1.1(a). Accordingly, the phrase should be given its natural

[34] See also SoRA, p.21, which accepts that the views of academics, economists and finance practitioners may be informative.

meaning. In this respect, we have adopted PoM's interpretation set out in its 2020-21 TCS General Statement.[35]

As such, we accept that the well accepted approaches that we have identified as being relevant must be appropriate for use in the context of the Pricing Order, which is able to encompass a wider range of approaches than those currently in use by Australian regulators.

This may encompass an approach well-accepted by regulators in overseas jurisdictions governed by legislative instruments with similar objectives to the PMA as well as other relevant spheres, including the financial community or, in some cases, by academia.

The broad language incorporated into the Pricing Order, including the express reference to "a combination of well-accepted approaches," reflects recognition in other regulatory regimes that a range of approaches can be used to inform an assessment of the parameters for the weighted average cost of capital. For example, the AER and ERA were directed to a broader consideration when determining the return on equity and the return on debt for electricity networks and regulated gas pipelines in 2012 following a rule change made by the AEMC. Similarly, the Pricing Order has been drafted to acknowledge a range of approaches may inform the cost of capital.

However, the Pricing Order is different from the instruments governing the AER and ERA processes in the sense that it confers the discretion on the Port Licence Holder so long as the Port Licence Holder adopts one or a combination of well-accepted approaches and otherwise demonstrates compliance with the Pricing Order. It is therefore submitted that the ESC's assessment of the Port Licence Holder's compliance with the Pricing Order should be applied in this context.

3.6 Determining one or a combination of approaches

In considering the component parts of PoM's weighted average cost of capital, including its cost of equity, cost of debt and individual WACC parameters, we have canvassed what we believe to be well accepted approaches. The Pricing Order is silent in terms of how PoM should apply a combination of well accepted approaches, other than that the resulting rate of return must satisfy clause 4.1.1(a).

Each approach that is adopted for the assessment of the cost of capital reflects a model. A model, is, by definition, an abstraction of reality. It would be surprising if a single model was so superior to any other that it, and it alone, would be appropriate. As such, a range of models, and the values that emerge from their application, can properly

35 Port of Melbourne (2020), 2020 - 2021 Tariff Compliance Statement, General Statement, May, section 9.2.3.2

inform the assessment of the cost of capital under the Pricing Order. This is acknowledged by the Pricing Order itself.

In some cases, where we acknowledge concerns raised about particular approaches, we have adjusted weightings relative to those used in previous years. In so doing, alternative combinations of well accepted approaches may be applied by the Port Licence Holder and be compliant with the Pricing Order.

This reflects the fact that all well accepted approaches have strengths and weaknesses, such that exclusive reliance on a single well accepted approach may not provide the most reliable estimate of the cost of capital nor provide the only means of complying with the Pricing Order. It is also the case that compliance with the Pricing Order can be helpfully informed by considering a wider range of approaches as cross checks.

Our intent has been to provide a transparent, unbiased weighted average cost of capital, which is stable over time and is reflective of economic and finance principles and market information. Each subsequent period, PoM will need to reassess this approach and the fundamental pros and cons of well accepted estimation methods to substantiate the weights applied based on the evidence available at the time. For example, as data improves (deteriorates) for an estimation method, the weight assigned to that method approaches might increase (decrease), or new estimation might become well-accepted for the purposes of clause 4.3.1.

As such, PoM may make further changes to the combination of well accepted approaches it adopts in future in a manner which complies with the Pricing Order.

It is also important to highlight that the 'well accepted' stipulation is used in reference to the approaches used by PoM, whether alone or in combination, and not to the chosen combination itself. In other words, PoM is required to adopt a 'combination of well accepted approaches' but not a 'well accepted combination of well-accepted approaches.' In determining a WACC estimate for PoM, where there is a lack of regulatory or other practitioner guidance on the appropriate weighting for combinations, we have substantiated our judgement in the weighting of these approaches.

3.6.1 All approaches have practical difficulties

There is merit in the ESC's observation that:[36]

[36] ESC (2017a), p.41.

> Some approaches used in academia or by finance practitioners are not well-accepted in Australian regulatory practice and their application can be difficult in practice due to data quality and availability issues or methodological choices.

However, the ESC fails to recognise that data quality and availability, or methodological choices, present challenges in the application of all approaches, particularly cost of equity models, including those that are well-accepted in Australian regulatory practice. Furthermore, the cost of equity approaches commonly used in Australian regulatory practice have often been contentious in application, particularly following the Global Financial Crisis. This has been reflected in contentious debate across Australian regulated energy and transport sectors, including before the Australian Competition Tribunal.

In the context of the highly contested area of cost of equity estimation under the national energy regulatory framework, the Australian Competition Tribunal in its Public Interest Advocacy Centre/Ausgrid appeal decision made what we consider to be important comments regarding the availability and use of cost of equity models:[37]

> 650. It is apparent also that the AEMC [Australian Energy Market Commission] did not consider the rate of return estimates should be driven by a single financial model, whether the SL CAPM or another model, or by one estimation method. The available relevant evidence should be considered. As the DNSPs [Distribution Network Service Providers]and JGN [Jemena Gas Networks] pointed out, the AEMC recognised that, in any event, other models may be useful as all have weaknesses to some degree, including that they are all based on certain theoretical assumptions, so that no one model can be said to provide the right answer.
>
> 651. Indeed, it is commonly accepted that the AEMC's view (see the AEMC's 2012, *Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services*, *Draft Rule Determinations*, 23 August 2012, at p 48) that "estimates are more robust and reliable if they are based on a range of estimation methods, financial models, market data and other evidence" is a sensible one.

Further to the Tribunal's commentary, we consider there may be a model that is superior in terms of simplicity and theoretical appeal. However, to the extent that the theoretical assumptions are inappropriate or the model abstracts from financial reality too heavily, the accuracy of the model will suffer. Other, less theoretically elegant models, which perform empirically better, in the sense that they more accurately predict the return necessary to compensate PoM for the risks involved in providing Prescribed Services,

37 Australian Competition tribunal, Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1

may therefore also be relevant to meeting the statutory objectives. In this regard, for the reasons expressed above, accuracy is an important consideration for the choice of model.

More specifically, we consider several well-accepted cost of equity models differ in theoretical appeal, as well as empirical 'fit' with observed data, the latter issue being directly relevant to the issue of reliability in informing the rate of return necessary to compensate PoM for the provision of Prescribed Services having regard to the relevant risks. For example, we acknowledge the theoretical attractiveness of the SL CAPM, which has led to its widespread use. However, in practice, the theoretical attractiveness of the SL CAPM is to some extent compromised by its poor empirical performance. It is this compromised empirical performance that led to other approaches emerging, such as the Black CAPM and FFM. While the Black CAPM and FFM also have their limitations as theoretical cost of equity models, this in itself does not invalidate their use, particularly in the context of informing the range of WACC outcomes or as cross checks for a point estimate WACC outcome, provided any such use is consistent with the open wording of clause 4.3.1 of the Pricing Order, as well as the Port Management Act objectives. We discuss alternative cost of equity models in detail in Chapter 5 of our report.

Hence, it does not follow based on available theoretical and empirical evidence that *only* the approaches used by Australian regulators can be applied by PoM when determining the weighted average cost of capital. Approaches may be well accepted in academia or by financial practitioners even though they are not well accepted in Australian regulatory practice. Similarly, data quality issues do not provide a justification for limiting the meaning of the phrase "well accepted" approaches to only those approaches accepted by Australian regulators (recognising a lesser weight might be appropriate in light of data quality). Nevertheless, we acknowledge these issues may affect the weight that is placed on particular approaches or the context of the reliance that is placed on them (for example, as informing a range of outcomes or as a cross check rather than reliance to determine a central estimate).

Finally, we consider that the practical difficulties in applying some of the approaches used by the financial community and academia to determine the weighted average cost of capital should not result in the exclusion of all approaches used by the financial community and academia to informing a compliant WACC under the Pricing Order. Rather, PoM's use of any of these approaches should have regard to their limitations (e.g. through the extent to which reliance is placed upon them, including as cross-checks) while recognising that the models used by Australian regulators also have important limitations (particularly regarding accuracy). This confirms that a well-accepted approach to determining the weighted average cost of capital cannot reasonably be constrained to Australian regulatory practice having regard to the range of approaches that could be adopted by PoM and that comply with the Pricing Order.

4 Benchmark efficient entity (BEE)

Chapter overview
We have retained our classification of the BEE as a private sector entity that need not be domiciled in Australia, because public sector entities typically lack the market data required to facilitate WACC analysis and an Australian-domiciled BEE assumption unreasonably constrains the size of the comparator set required for robust asset beta estimation. We have revisited the issue of a market capitalisation threshold for the BEE. We consider that it is very unlikely that a relatively small entity could perform activities that are comparable to a BEE reflecting the largest container port in Australasia. We have therefore adopted the threshold that companies with a market capitalisation below $US200 million cannot helpfully inform the cost of capital for the BEE.

4.1 Identifying a BEE

Clause 4.1.1(a) of the Pricing Order requires that the Port Licence Holder be able to recover an allowance to recover a return on its capital base that is commensurate with that which would be required by a benchmark efficient entity (BEE) providing services with a similar degree of risk as that which applies to the Port Licence Holder in respect of the provision of the Prescribed Services.

For current purposes, a BEE is a hypothetical efficient entity that provides the Prescribed Services. Under incentive-based economic regulation, the WACC is set having regard to a BEE with comparable risks to the regulated entity in providing the relevant services and that is reflective of prevailing conditions in equity and debt markets. We have adopted this framework in this report, including in the context of identifying comparator firms used to estimate the return on capital for the Port Licence Holder. We have sought to ensure that comparator firms are sufficiently comparable to the BEE, and where differences arise, acknowledged and adjusted for those differences when determining the return on capital.

4.1.1 Pricing Order requirements

The Pricing Order is consistent with this approach by requiring that the rate of return allowance be calculated commensurate with that which would be required by a 'benchmark efficient entity' providing services with a similar degree of risk to PoM in its provision of Prescribed Services (which excludes property-related services). In other words, the WACC estimate should not be based on PoM's actual cost of capital (assuming it were able to be directly observed).

There is no formal definition of the BEE in the Pricing Order. Consequently, there is a need to identify the key characteristics of such an entity, including the services it provides. This involves establishing a conceptual definition of the characteristics of the BEE relevant to the WACC estimation. Once defined, it is necessary to gather evidence from actual 'comparator' entities which best resemble the conceptual entity, as a means to inform the benchmark parameters for the cost of equity and the cost of debt.

In its Consultation Paper, the ESC provided its view on the risk profile of PoM and the factors that could be used to identify appropriate comparator entities which best resemble the conceptual BEE.[38]

In terms of risk profile, the ESC notes the relevant risk characteristics of the services provided by PoM include that the Prescribed Services:

- relate primarily to the provision of wharfage and channel access services;
- are provided by a port that predominantly derives revenue from services relating to container cargo, with a smaller share of bulk and non-bulk cargoes; and
- are provided by a port in Australia.

In regards to comparator entities, the ESC recognises there are no publicly-listed ports in Australia. Accordingly, it suggested the following methodology:[39]

> Consequently, the port will have to determine a comparator set by considering other characteristics of the port's prescribed services, and by making trade-offs between elements of comparability. For example, by including other firms (not ports) that provide similarly risky services or to include overseas ports in the comparator set. Whichever approach is adopted, it is important that a systematic approach to comparator selection be used to avoid 'cherry picking' comparators in each regulatory period.

4.1.2 Australian regulatory precedent

In terms of the conceptual efficient benchmark definition, the Western Australia Economic Regulation Authority (ERA) has provided guidance on its regulatory interpretation as follows:[40]

> It is desirable that the benchmark not be hypothetical. This means that the benchmark must, as far as possible, reflect achievable financing practices, which reflect the practices of efficient firms exposed to a similar degree of risk as the regulated firm. Importantly, by reflecting achievable efficient financing practices, the benchmark will allow the service provider 'reasonable opportunity' to achieve the efficient parameters determined for the benchmark entity.

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38 ESC (2017a).

39 ESC (2017a), p.40.

40 ERA (2015a). Review of the method for estimating the Weighted Average Cost of Capital for the Regulated Railway Networks, Final decision, 18 September, p.20.

Whilst the Pricing Order applies to only one entity (as opposed to a range of regulated businesses as was the case for the ERA), the ERA's approach is consistent with the Pricing Order requirement that the Port Licence Holder be given a reasonable opportunity to recover the efficient cost of providing all Prescribed Services.

The ERA's review also provided useful guidance on the reliance on international comparators in informing the assessment of the risk profile of a BEE, including the degree to which:[41]

- foreign investors seek to invest equity in Australian firms, augmenting domestically-sourced investment (in the case of Port of Melbourne, the Lonsdale Consortium involves a number of foreign investors);
- Australian firms raise capital for their Australian investments on overseas capital markets, to supplement capital raisings in Australia; and
- there is arbitrage between Australia's financial markets and those overseas.

This reflects the broader issue of whether estimation of the BEE's cost of capital should be based solely on domestic parameter values or can also incorporate international parameter values. The ERA has previously commented on this issue as follows:[42]

> Overall, the Authority considers that not strictly adhering to the internal consistency of the estimation method – by basing some estimates on a mix of domestic and international estimates – is reasonable in the circumstances in order to enhance the robustness of the parameter estimates.
>
> In this context, the Authority considers that some parameters are likely to be more independent of jurisdiction than other parameters. For instance, gearing, credit rating and equity beta (notwithstanding differences in, for example, tax treatment) are likely to be more independent of jurisdiction than are the risk-free rate and market risk premium, which will be closely related to country conditions.

Both the ERA and ACCC have used international comparators to ensure the estimation of robust efficient benchmark beta and gearing parameter values for regulated Australian transport entities. Synergies concurs with this approach.

[41] ERA (2015a), p.22.

[42] ERA (2015a), p.24.

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This view has been reflected by the Full Federal Court in its recent judgment in *Australian Energy Regulator v Australian Competition Tribunal (No 2)* where it comments in relation to the BEE:[43]

> …The allowed rate of return objective confers on the benchmark its particular, necessary and defining characteristics: it must be efficient and it must face "a similar degree of risk" as that which applies to the particular service provider in question in relation to the provision of standard control services. But the attribution of the relevant "efficiency" (i.e., in respect of financing costs) is to be gauged by the disciplines of a workably competitive market (i.e., an unregulated market).

That is, the Full Federal Court has found that the BEE must face risks similar to the business it is intended to replicate, and the efficiencies possessed by that BEE are those determined by a workably competitive market. As the ESC has noted[44], the BEE need not be defined as either regulated or unregulated. The appropriate benchmark is an entity that is efficient. The efficiency should be that expected in a workably competitive market. If the relevant workably competitive market is an international market, then international comparators should be used.

4.2 ESC definition of BEE

The ESC in its 2018 interim commentary did not formally respond to all contrasting positions between itself and Synergies on the definition of the BEE. However, it did respond to Synergies' proposed "freight-focused" characteristic of the BEE and the relevance of competition to the asset beta assessment.

In its earlier SoRA, the ESC reinforced its view from earlier commentary on the characteristics of the BEE, as discussed in the previous section. However, the ESC acknowledged the challenges in identifying a sufficiently large set of comparators in Australia that closely reflect the risk characteristics of the BEE.[45] In practice, a significant factor driving the differences between the ESC's commentary and our approach is the

43 *Australian Energy Regulator v Australian Competition Tribunal (No 2)* [2017] FCAFC 79, para. 537.

44 Statement of Regulatory Approach, December 2017, page 21; SoRA, version 2, p 22

45 It could be interpreted that ESC is focussed on services provided by the BEE, whereas Synergies is focussed on the physical characteristics of the BEE. However, in practice, in our view, the difference is not material reflecting instead our practical emphasis in identifying benchmark entities. We consider an entity-focus is essential in the first instance to identify listed comparator entities that provide comparable services with a comparable risk profile to PoM's provision of Prescribed Services. This is because the BEE (as defined by services) is not observable in the market, rather proxy entities with a comparable risk profile must be identified that effectively establish the efficient benchmark for PoM. It is comparable entities that are identified, but they are identified because they provide comparable services involving a similar degree of risk to the PoM.

desire to be able to draw upon a sufficiently large set of comparators to inform a robust assessment of the BEE.

The key differences between our previous (May 2018) report and the ESC on the definition of the BEE are summarised in Table 7.

Table 7 Contrasting positions of Synergies and the ESC on the BEE

Synergies	ESC
Supplies services equivalent to PoM's Prescribed Services Freight-focused Not necessarily domiciled in Australia Private sector provider Market cap > $US100m Not vertically integrated in relevant supply chain Some contestability between ports	Primarily supplies wharfage and channel access services Predominantly derives revenue from container cargo, smaller share of bulk and non-bulk cargoes Domiciled in Australia Not necessarily private/public ownership, but efficient Unlikely to face significant competition in short to medium term.

Several points of difference can be drawn from this comparison:

- the ESC has questioned the need for a $US100m threshold for market capitalisation of comparator entities. We consider that it is very unlikely that a relatively small entity could perform activities that are comparable to a BEE reflecting the largest container port in Australasia;
- we accept that public sector entities could well form part of the sample of the BEE as suggested by the ESC, but they would fail any filtering process for the purposes of estimating the cost of capital because they are not traded and so cannot sensibly inform the estimate of the asset beta (or capital structure) for the BEE;
- our earlier report identified a "freight-focused" entity, whereas the ESC's characterisation is arguably narrower in that it refers to an entity that derives revenue primarily from container cargo and a smaller share of bulk and non-bulk cargoes;
- we assume the BEE could face some contestability with other ports, in contrast the ESC considers the BEE is unlikely to face significant competition in the short to medium term; and
- our earlier report assumed the BEE is not necessarily domiciled in Australia, whereas the ESC favours an Australia-domiciled BEE.

Each of these points of difference is discussed in the following sections of this chapter.

Market capitalisation threshold

In our 2017 report, we placed a market capitalisation threshold on the size of the BEE, at $US100 million, in recognition that asset intensity is a relevant consideration for assessing comparability with PoM. The ESC responded that "it is not obvious that size should define the risk characteristics of the BEE."[46]

As a matter of principle, the key question is whether the comparator entity reasonably reflects the risk profile of the BEE providing services with a similar degree of risk as that which applies to PoM in providing the Prescribed Services.

In the past we have acknowledged that it is an open question whether it is possible for an entity that is substantially smaller in scale compared to PoM to reasonably reflect the risk profile of the BEE.

We have previously stated that size and asset intensity are highly relevant considerations in the classification of PoM's BEE.[47] These characteristics are critical to the BEE, including, for example, because of the operating leverage inherent in a capital intensive and significant freight focused business activity.[48]

Having further considered this issue, and having regard to the well accepted practice of applying capitalisation thresholds for comparators, we consider that it is very unlikely that a relatively small entity could perform activities that are comparable to a BEE reflecting the largest container port in Australasia. We have therefore adopted the threshold that companies with a market capitalisation below $US200 million cannot helpfully inform the cost of capital for the BEE.[49]

Public or private sector status of the BEE

Another point of difference between the two BEE definitions relates to the public and private sector delineation.

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46 ESC (2017b). Feedback on consultation and other matters: Statement of Regulatory Approach version 1.0., December, p.43.

47 Synergies Economic Consulting (2018), Determining a WACC estimate for Port of Melbourne, p 24. In that report, we stated that asset intensity was a relevant consideration for the BEE. We acknowledged that it was an open question whether a small entity could inform the BEE. This report reflects our further consideration of this issue.

48 Additionally, we note that firms with small market capitalisations are generally more prone to missing data and tend to statistically insignificant beta estimates (likely in part because these companies also tend to be illiquid). We tend to view these considerations as being less relevant to whether they can usefully inform the risk profile of the BEE and that it is more appropriate to assess these considerations through statistical criteria in the subsequent asset beta filtering process.

49 We have been shown a report by Incenta entitled *Estimating the Port of Melbourne's equity beta*. We acknowledge that Incenta have reached a similar conclusion on this issue.

The ESC stated that "Synergies did not explain why the BEE should be a private sector provider."[50] Instead, the ESC held that the BEE could be private or public, provided it was 'efficient.'[51] In theory, we agree with the ESC. However, our view is very much driven by a practical consideration regarding the purpose of the investigation. In our view, public sector entities may well be relevant comparators if the investigation concerned, for example, assessments of operating cost.

As such, in principle, Synergies does not object to a definition of the BEE that encompasses both private and public sector owned entities. However, there are significant practical limitations using public-sector entities to inform the cost of capital because of the absence of relevant market data. For example, publicly owned entities, even if they are very similar to PoM, cannot inform the assessment of beta.[52]

Even in the case of capital structure, concerns arise regarding the wider Government considerations that can influence the capital structures of publicly owned entities as well as the incentives faced by these entities, which can significantly differ from the BEE.

As such, at least for the purposes of assessing the cost of capital, we maintain that only private sector entities can, in practice, be considered in the context of the BEE for current purposes.

General freight-focussed BEE

In practice, we do not perceive material issues in the composition of the trade of comparator ports for the purposes of identifying the BEE beyond the key matter that the BEE should broadly reflect PoM's general freight exposure. Importantly, this freight exposure is relatively broadly based, including exposures to containers, motor vehicles, export and general cargo trades with overall trade levels being significantly driven by domestic economic activity (as opposed to a narrow freight exposure, which would typically be the case for a single bulk export commodity port or transport service provider).

For example, dedicated coal-related entities are not considered relevant to PoM's BEE. Entities such as Aurizon Network, Dalrymple Bay Coal Terminal and the ARTC Hunter Valley rail network will have different risk profiles due to their narrow exposure to international thermal and coking coal markets, as well as the prevalence of take-or-pay contracts regarding the provision of transport infrastructure services in this sector.

50 ESC (2017b), p.38.

51 ESC (2017b), p.43.

52 It is possible that the view of the owner Government about how the cost of capital is determined could be relevant although it would not be an outcome that is necessarily market tested.

Moreover, they operate in a materially different regulatory environment to PoM. Accordingly, considerably less weight should be placed on these entities for comparison purposes.

In the SoRA, in identifying the BEE's characteristics, the ESC implied using a relatively granular assumption regarding the nature of services provided by PoM and its associated revenues. However, we consider the ESC's proposed service granularity to be impractical in terms of identifying an appropriate comparator set from publicly listed Australian and international entities for gearing and beta. Hence, we favour a broad assumption about the freight-related services provided by the BEE.

Further, our reference to freight-focussed is, in our view, a necessary broadening of terms to allow a large enough comparator sample to be identified to determine a robust asset beta estimate.

In this regard, the ESC has noted, and we agree, that there is a need for trade-offs when sourcing comparators from other sectors (such as rail).

Extent of competition

The extent of competition constraining the BEE, including the prospect of competition from a second container port, also received attention from the ESC in the SoRA. The ESC's view is that the BEE would be unlikely to face significant competition in the provision of services similar to those of the Prescribed Services.

We argued that it should be assumed that PoM's BEE should be exposed to some contestability between ports. Moreover, and unusually, the BEE should recognise that PoM is subject to the prospect of a second container port being developed in the Melbourne region within its 50-year lease term, to which we now turn.[53]

The ESC considered that, at the present time, it is "highly uncertain whether a second port will be developed in the Melbourne region."[54] We contend that the likelihood of the development of a second Melbourne port is at the very least a significant possibility and as such considerably more likely than has been characterised by the ESC, although the timing of such a development is uncertain.

The ESC then goes on to state that even if the development of a second port were a reasonable likelihood, the specified timeframe for the second port is nearly 40 years away and is therefore unlikely to exert competitive pressures.

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[53] Further details on the second Melbourne port are presented in Attachment D.

[54] ESC (2017b), p.43.

However, in May 2017, Infrastructure Victoria reported to the Victorian Government that a new container report would be required in Melbourne by 2055. The Victorian Government is yet to formerly endorse this timeline, and it has been contended that the construction of the port could be brought forward.

Whilst clearly not imminent, the prospect of the development of a new port has material implications for PoM with respect to its return on future investments. PoM must make investment decisions across long-term horizons, and any change in demand for services will affect these investment decisions. The prospect of a second port potentially weakens PoM's bargaining power in commercial negotiations, reducing its market power.

Furthermore, PoM is only entitled to compensation for the construction of a second port if it takes place within the next 15 years.[55] From that point onwards, a significant barrier to the second port's construction is removed.

The impact of the Tariff Adjustment Limit (TAL), by deferring a large proportion of PoM's capital recovery to the second half of its lease term, further exacerbates the risk to PoM of a second port being constructed.

Moreover, PoM faces pressure from several competing facilities. PoM's liquid bulk, dry bulk and break bulk trades (which account for approximately 13% of total revenue tonnes) are all subject to some form of competition from other ports.

Container traffic is also subject to competition from a variety of Australian ports (Adelaide and Botany for imports, Botany, Geelong and Adelaide for exports, and Station Pier (and Geelong in the future), Port Botany (via Bell Bay) and direct calls for the Tasmanian trade).

These existing competitive pressures are not mitigated by any element of PoM's regulatory regime.

The impact of competition on our beta estimation is covered in further detail in the first principles analysis in Section 7.4.3 and in Attachment D of our report.

Domicile of BEE

The ESC has maintained its view that, for the purposes of defining the BEE, the Prescribed Services are provided by a port in Australia. In principle, the assumption of an Australian-domiciled BEE is reasonable given PoM is a Melbourne-based entity with no operations or revenue streams outside of Australia.

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55 *Delivering Victorian Infrastructure (Port of Melbourne Lease Transaction) Act 2016*, Clause 65(2)(a)(ii).

However, when deriving a WACC estimate for an Australian entity, the practical reality is that there are generally insufficient Australian listed entities to derive robust asset beta and gearing estimates. Our assumption that the BEE is not necessarily domiciled in Australia reflects this practical reality.

The ESC's 2018 Interim Commentary noted that while understanding Synergies' reasons for using international comparators to derive asset beta and gearing estimates, it had identified several drawbacks in our approach to using beta estimates for international firms. We address the ESC's comments in Attachment G and Chapter 7 (asset beta estimation) of our report.

There is a trade-off between the size of the comparator sample and the extent of filtering that is undertaken to refine it. We accept that being an international comparator may be a legitimate filter to be applied in certain circumstances. Here, however, there is not a sufficient number of Australian based listed entities to inform a risk assessment (including a beta assessment) of PoM. There is no realistic option but to draw on international comparators. We have minimised the risk of incorporating less comparable international comparators by filtering on the basis of the quality of the relevant capital market where such entities are listed.

4.3 Defining the BEE for PoM

Having regard to the commentary provided by the ESC, we consider that the competing concepts of the BEE are not irreconcilable. The main challenge we (and the ESC) face is that there are relevant practical considerations, such as data limitations and the lack of suitable comparator entities, which need to be recognised, particularly in asset beta estimation.

As such, we propose to substantively retain our position on the BEE definition from the 2019-20 TCS submission, with the addition of a $US200 million market capitalisation threshold. This position is driven in part by what we believe to be the true BEE for PoM but is primarily based on the practical issue of identifying an appropriate sample of entities to inform WACC estimation.

In response to the ESC's commentary, we have provided additional justification of our asset beta comparator filtering procedure, and the implications that this has for the resulting sample of comparable firms. These are examined in detail in Chapter 7.

Given the above considerations, we are of the view that PoM's BEE, for the purposes of the Pricing Order, is a freight focused private sector provider services broadly equivalent to the Prescribed Services with a market capitalisation of at least $US200 million.

Further, the BEE is not vertically integrated upstream or downstream from the provision of port services consistent with the narrow definition of Prescribed Services. Moreover, for the purposes of the Pricing Order, the BEE would not earn revenue from sources other than Prescribed Services, which excludes property-related assets and activities.

Ideally, the BEE would have reference to landlord port businesses in Australia and internationally that provide a similar range of services to the Prescribed Services and hence face comparable risks. However, in practice, there are no listed port businesses operating in Australia providing services that are comparable to PoM's Prescribed Services and hence that have comparable risks to the BEE required under the Pricing Order. Hence, this has required us to identify transport entities outside of the Australian and international port sector with a comparable risk profile to PoM's Prescribed Services.

The systematic approach we have taken in determining WACC parameter values for the BEE with comparable risks to PoM are discussed in more detail in Chapter 7 (beta) and Chapter 8 (capital structure) of our report. The following section provides an overview of the sectors that we have investigated to source comparable companies for the BEE.[56]

4.3.1 Comparable Marine Ports and Services

Port-related businesses are categorised as "Marine Ports and Services" under the Global Industry Classification Standard (GICS) classification.

Whilst terminal operators and PoM have similar market exposures, many of the entities in the Marine Ports and Services category operate primarily as terminal operators or stevedores and do not provide the core infrastructure service that PoM provides. This is reflected in terminal operators generally having lower fixed capital costs and higher variable costs within their total cost base than a landlord port, such as PoM. This means that these terminal operators' earnings will be less sensitive to sales volumes than PoM.

Consequently, whilst PoM's risk profile is not identical to several of these businesses, we consider there is a sufficiently strong overlap in market exposure and demand drivers between the entities comprising the Marine Ports and Services classification and PoM to warrant their inclusion in our comparable companies set.

4.3.2 Comparable Railroads

We have also included freight railroad companies in our sample as there are a number of publicly listed firms in this sector with similar infrastructure characteristics and

[56] Whilst we do not agree with the entirety of Incenta's comparator set, there is broad agreement that the following sectors are the most relevant to inform the systematic risk of the BEE.

demand drivers to ports. In particular, freight railroad companies have high fixed capital costs and significant volume exposure driven by economy-wide economic conditions. US Class I railroads also typically possess significant market power in many of the markets that they serve.

Whilst in previous reports we have included major city airports in our comparator set, we have removed them partly in response to the concerns expressed by the ESC. This is discussed in more detail in Chapter 7.

4.3.3 Comparable List Application

Having selected the relevant industry sectors for inclusion in our comparable companies set, we reviewed the business description for each listed company in each relevant sector and eliminated companies that were of limited relevance to PoM's Prescribed Services because they are unlikely to face comparable risks.

Using Bloomberg, and having regard to FTSE (Financial Times Stock Exchange) country classifications, we have extracted gearing and other relevant data from companies in the following GICS categories:

- Marine Ports and Services
- Railroads.

This filtering process results in a comparator set of 13 firms (7 marine ports and services firms and 6 railroads) from 7 countries from FTSE Developed country classification.

Regarding possible adjustments to empirical beta estimates, the ESC's commentary sought explanation about how specific adjustments to our empirical beta estimates (and to a lesser extent gearing) should be made where the nature of the comparators and their risk characteristics are not strictly equivalent to the BEE used to establish PoM's WACC.

In our view, caution should always be applied in determining asset beta estimates to avoid applying 'false precision,' especially at an individual entity level. This includes applying purportedly precise quantitative adjustments to beta estimates derived from the comparator set. Instead, the approach that we have taken is to consider the characteristics of the two industry sectors that comprise our comparator set, with this set establishing a reasonable asset beta range from which a point estimate can be selected and substantiated through qualitative analysis of differential risk factors.

5 Assessing alternative return on equity approaches

Chapter overview
We now place 100% weighting on the SL CAPM.
Implementation of the Fama-French model for the comparators available to PoM is constrained by limited country-specific size and value factors. For the Black CAPM, we have generated an updated estimate of the zero-beta premium, but it remains statistically insignificant at conventional levels. These deficiencies do not invalidate the Black CAPM or the FFM to inform the cost of equity for the BEE – all well accepted approaches have limitations. In this instance, we use the Black CAPM and the FFM as cross-checks, and will continue to assess their appropriateness for use in future TCS processes.

The cost of equity is not observable ex ante. This means that the only way to estimate the cost of equity for the purposes of assessing the rate of return is through the use of predictive tools or models. This chapter addresses the alternative approaches for estimating the cost of equity. We begin by considering the factors that are relevant to a consideration of the efficacy of alternative models for estimating the cost of equity for regulatory purposes. We then consider the most widely used models for estimating the cost of equity, these being the SL CAPM, the Black CAPM, the Fama French three factor model and Dividend Discount Model. Finally, we assess the extent to which the models are well accepted and consider combinations of well accepted models.

5.1 Introduction

5.1.1 Motivation for considering different models

All models, including models to estimate the cost of equity, are an abstraction of reality. Each return on equity model makes differing assumptions about the real-world markets to which it is applied. The need for abstraction arises because there may be factors that are unobservable, or whose magnitude is at least uncertain. This gives rise to inherent and unavoidable imprecision in the estimation of parameters to inform a cost of equity estimate as well as the resulting cost of equity estimate itself.

Consequently, each model will have its strengths and weaknesses, especially under varying market conditions. As such, it may be difficult for one model to outperform all others all the time. Where one model is unable to capture all of the complexities of actual market phenomena, it is possible the regulatory objectives (efficient outcomes consistent with a workably competitive market; efficient investment; fair and reasonable prices; and recovery of efficient costs) are better achieved through the use of multiple models.

5.1.2 Criteria for relevant models

In Section 3.5.2, we introduced an array of criteria that Australian economic regulatory bodies have employed to evaluate the merits of competing WACC methodologies. These criteria are pertinent to any component of the WACC, whether they be individual parameters or entire models. These well accepted criteria are:

- Accuracy
- Stability and predictability
- Transparency and replicability
- Reflection of economic and financial principles
- Flexibility with changing market conditions
- Robust data.

There is benefit in examining multiple return on equity approaches where no single approach is clearly superior when measured against these criteria - each model differs in its:

- level of theoretical appeal
- empirical fit with observed data (i.e. reliability to inform the return necessary to compensate a provider of prescribed services having regard to the risks involved in providing prescribed services); and
- 'fitness-for-purpose' in the context of a regulatory process for determining a return on equity allowance.

For example, there may be a well accepted model that is superior in terms of simplicity and theoretical appeal. However, to the extent that the theoretical assumptions are inappropriate or the model abstracts from financial reality too heavily, it will misestimate the true cost of equity for a firm. In turn, despite its theoretical appeal, such a model could be ranked behind other well accepted models for the purpose of determining the return necessary to compensate a provider of prescribed services commensurate with the risks involved in providing prescribed services. In other words, other well accepted models, which are less theoretically elegant, but perform empirically better, in the sense that they more accurately predict the return necessary to compensate a provider of prescribed services for the risks involved in providing prescribed services, may better meet the statutory objectives.

The consequences of this in a regulatory setting depend on the direction of the error. If the WACC is under-estimated relative to the cost of efficient financing, such an outcome may establish low prices for users and consumers (with fair and reasonable prices being one objective of the regulatory regime) but it will jeopardise the opportunity to earn a return commensurate with the risks involved and, in turn, undermine the promotion of efficient investment (both of which are also objectives of the regulatory regime).[57] Likewise, a return on equity (and, by extension, WACC) that is too high may lead to excessive prices, foster inefficient investment and over-compensate the provider of Prescribed Services for the risks borne (although none of these outcomes is likely during the TAL period for the Port Licence Holder). In Chapter 3, we discuss the asymmetric consequences of error, which suggests that in an environment of uncertainty about the true WACC (and in particular the cost of equity) of the BEE, which is inevitable given the inherent and unavoidable imprecision of its estimation, the adverse social consequences of this uncertainty are minimised by erring on the side of not understating the WACC in a regulatory setting.

5.1.3 Candidate cost of equity approaches

Given that it is unlikely that one model could meet all of the above criteria, it is prudent to consider different models that can jointly meet all of these requirements. Four return on equity approaches are described below that we consider could support an estimate of the return on equity commensurate with the requirements of the BEE and the Pricing Order:

- Sharpe-Lintner Capital Asset Pricing Model (SL CAPM) – the SL CAPM expresses the return on equity as the premium required in regards to the undiversifiable risk of holding a portfolio of assets relative to overall market risk (reflected in a beta estimate). The SL CAPM predicts that the variations in mean returns of this portfolio of assets should be entirely explained by variations in the beta estimate.
- Black CAPM – this model is a more broadly based form of CAPM, which adds the excess returns of a zero-beta portfolio to the return earned on the risk-free rate in the SL CAPM formula. If the excess returns of the zero-beta portfolio are estimated to be zero, the Black CAPM reduces to the same formula as the SL CAPM. As per the SL CAPM, the Black CAPM predicts that variations in mean returns should be entirely explained by variations in the beta estimates.
- Fama-French three factor model (FFM) – this model can be considered an extension of the SL CAPM by including two additional explanatory factors: small capitalisation stocks; and high book-to-market value stocks (in addition to the sensitivity of the returns of the asset compared to the overall market return as captured under the SL CAPM).

[57] See Section 3.5.1 of this report for an overview of the relevant objectives.

- Dividend Discount Model (DDM) – this model estimates a return on equity based on a company's stock price and future expected dividend payments. It states that the required return on an asset is dependent on the expected future growth rate in dividends.

These return on equity models are not intended to be an exhaustive list. Rather, we consider that each one is capable of satisfying the well accepted threshold established by the Pricing Order. The next section of our report summarises the strengths and weaknesses of each of these models. Further detail on these methodologies is provided in Attachment A.

5.2 Sharpe-Lintner CAPM

5.2.1 SL CAPM formulation

The SL CAPM is expressed as follows:

$$Re = R_f + \beta_e * [E(R_m) - R_f]$$

Where:

Rf = the risk-free rate of return

E(Rm) = the expected return on the market

[E(Rm) – Rf] = the market risk premium

βe = equity beta (measures systematic risk)

The equity beta measures systematic business risk, as well as the financial risk of a company. This can be contrasted with the asset beta, which reflects only the business risk of a company and can be calculated by de-levering the observed equity beta.

5.2.2 Strengths

The SL CAPM was the original prescription of the CAPM and is the model from which other CAPM-oriented models have evolved. One strength of the SL CAPM is its relative simplicity and intuitive appeal, specifically its underlying theoretical basis regarding the relationship between expected returns and risk in an asset portfolio context.

Systematic risk is a useful way to think about risks incorporated into market prices.

Its intuitive appeal has resulted in the use of the SL CAPM in both financial market and regulatory contexts. However, its use in financial market contexts has often involved practitioners making adjustments to individual parameter values, specifically the risk-free rate or market risk premium. We explore this phenomenon further in Section 5.2.6.

5.2.3 Weaknesses

The main weakness of the SL CAPM is that it generates values of expected returns that have limited correspondence to actual returns (i.e. the method produces a poor fit to the observed data).

Empirical studies published in academic journals demonstrate that the model presents a downwardly biased estimate of the rate of return for low-beta entities.

The frequency of use of SL CAPM in a regulatory context in Australia has revealed further limitations of the model when applied in a prescriptive, formulaic way, as has been the practice of most Australian regulators over the past decade. These concerns have become more pronounced since the Global Financial Crisis (GFC), when risk-free rates fell to historical lows, resulting in low return on equity outcomes when the low risk-free rate is combined with a 'static' long-run average market risk premium (MRP) of 6%, which, at least until the GFC, was the most commonly applied value for the MRP. These concerns were particularly evident when debt margins increased considerably following the GFC at the same time as regulatory allowances for the return on equity reduced because of falling risk-free rates. To our knowledge no logical reason has ever been advanced as to why debt and equity margins returns would move in different directions.

The underlying assumptions for the model are also problematic, including that investors can borrow or lend freely at the risk-free rate (which they clearly cannot) and investors share the same beliefs about distribution of returns (which they do not - investors will have diverse views about the distribution of returns).

5.2.4 Application of SL CAPM by regulators

The SL CAPM model is acknowledged by the ESC as meeting the criterion of being well accepted and we agree with this assessment. However, when applied in practice, the model does encounter significant empirical limitations. The SL CAPM is used extensively by regulators in Australia and other jurisdictions.

This is also the case in the finance community. Graham and Harvey (2001) surveyed nearly 400 chief financial officers of large US corporations to establish, among other things, what approaches these businesses applied in valuing capital.[58] Brounen, de Jong and Koedijk (2004) broadened this work by extending the survey to businesses in the UK, Netherlands, Germany and France.[59] In all, these researchers confirmed the widespread use of the CAPM in companies in the US and several European countries (around 60 per cent).

Relevantly for our assessment of acceptance of other approaches besides the SL CAPM, survey research has found that a significant minority of corporations (skewed towards larger companies) modified the SL CAPM by including additional risk factors. In other words, many companies regarded the SL CAPM (as it is generally applied in regulatory processes) as insufficient to be used as the sole measure of the cost of equity. This also reflects the application of the SL CAPM by financial practitioners in Australia.

A number of studies have also provided evidence in support of using the SL CAPM. The results from Moyer, McGuigan and Kretlow (2001) and Campbell, Lo and Mackinlay (1997), for instance, suggest that the SL CAPM is appropriate for examining the pricing of capital assets, evaluation of investment portfolios and event studies of efficient markets.[60] Davis (2011), Handley (2014) as well as McKenzie and Partington (2014) supported the use of the SL CAPM in reports to the Australian Energy Regulator (AER).[61]

5.2.5 Application of SL CAPM in academia

The logic of the CAPM is that an investment should earn at least the risk-free rate (otherwise there would be no reason to invest in risky assets). The CAPM stipulates that a security's excess return above the risk-free rate depends only on the correlation of its returns with those of the market as a whole. The strength of this relationship is measured by beta. Despite its widespread application, its empirical performance has been impugned in numerous studies.

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58 Graham, J. and Harvey, C. (2001). The theory and practice of corporate finance: Evidence from the field. Journal of Financial Economics, 60, pp.187-243.

59 Brounen, D., de Jong, A. and Koedijk, C.G. (2004). Corporate finance in Europe: Confronting theory with practice. 2004 Maastricht Meetings Paper No. 2769. Also published in Financial Management.

60 Moyer, R.C., J.R. McGuigan, and W.J. Kretlow. Contemporary Financial Management, 8th Edition. South-Western College Publishing, Cincinnati, OH, 2001; Campbell, J.Y., Lo A.W. and MacKinlay, A.C., 1997, The Econometrics of Financial Markets, Princeton University Press.

61 Davis, K., January 2011, Cost of equity issues: A report for the AER; Handley, JC, October 2014, Advice on the Return on Equity, report prepared for the AER; Mckenzie, M. and Partington, G., October 2014, Part A: Return on Equity, Report to the AER.

Two of the earliest and most significant contributions were Black et al. (1972)[62] and Fama and Macbeth (1973).[63] To investigate the association between beta estimates and average stock returns, Black et al. (1972) used monthly statistics relating to price, dividend, adjusted price and dividend information for all common stocks traded on the New York Stock Exchange for the period between January 1926 and March 1966. Similarly, Fama and Macbeth (1973) used monthly percentage returns for the same data from January 1926 to June 1968. The results from these two studies highlighted that the SL CAPM generated values of expected returns that had a small or zero association with actual returns. Specifically, the findings from these studies suggested that the SL CAPM produced a poor fit to the observed data.

In addition to the study by Black et al. (1972), a 2004 review of the literature concerning the CAPM by Fama and French (2004) highlighted that the SL CAPM presented a downwardly biased estimate of the rate of return for low-beta firms.[64] This provided an indication that the linear relation between average returns and beta is flat compared to SL CAPM predictions, i.e., a shortcoming in the SL CAPM identified as the low beta bias. The authors (Fama and French) concluded that:

> The attraction of the CAPM is that it offers powerful and intuitively pleasing predictions about how to measure risk and the relation between expected return and risk. Unfortunately, the empirical record of the model is poor – poor enough to invalidate the way it is used in applications. The CAPM's empirical problems may reflect theoretical failings, the result of many simplifying assumptions. But they may also be caused by difficulties in implementing valid tests of the model.
>
> In the end, we argue that whether the model's problems reflect weaknesses in the theory or in its empirical implementation, the failure of the CAPM in empirical tests implies that most applications of the model are invalid.

Acknowledging that the true market portfolio is unobservable, Shanken (1987) reported empirical evidence that the SL CAPM was invalid by generating a multivariate proxy for the true market portfolio.[65] Burmeister and McElroy (1988) employed the S&P 500

[62] Black, F., Jensen, M.C., and Scholes, M. (1972). The capital asset pricing model: Some empirical tests, in Studies in the Theory of Capital Markets. Michael C. Jensen, ed. New York: Praeger, pp.79-121.

[63] Fama, E. F. and Macbeth, J. (1973). Risk, return and equilibrium: Empirical tests. Journal of Political Economy, 81(3), pp. 607–636.

[64] Fama, E.F. and French, R.K. (2004). The capital asset pricing model: Theory and evidence. Journal of Economic Perspectives, 18(3), pp. 25–46.

[65] Shanken, J. (1987). Multivariate proxies and asset pricing relations. Journal of Financial Economics, 18, pp.91-110.

Index as a proxy for the market and also rejected the hypothesis of the SL CAPM.[66] Findings from a number of recent studies are also found to be in line with the findings of these earlier empirical works. Mehrling (2005), for instance, revealed that:[67]

> One important consequence of the BJS (a 1972 paper of Fischer Black, Michael Jensen, and Myron Scholes titled The Capital Asset Pricing Model: Some Empirical Tests) was to confirm earlier suggestions that low-beta stocks tend to have higher returns and high-beta stocks tend to have lower returns than the theory predicts.

Campbell and Vuolteenaho (2004) revealed that: [68]

> It is well known that the CAPM fails to describe average realized stock returns since the early 1960s, if a value-weighted equity index is used as a proxy for the market portfolio. In particular, small stocks and value stocks have delivered higher average returns than their betas can justify. Adding insult to injury, stocks with high past betas have had average returns no higher than stocks of the same size with low past betas.

Da, Guo and Jagannathan (2012) revealed that:[69]

> A variety of managed portfolios constructed using various firm characteristics earn very different returns on average from those predicted by the CAPM. Fama and French make a convincing case that the CAPM fails to describe the cross section of stock returns.

Lewellen and Nagel (2006) examined whether the unconditional SL CAPM failed due to time-variation in risk and expected returns. This would imply a role for a conditional SL CAPM, which allows for beta to vary over time. However, the authors demonstrated that the conditional SL CAPM performed nearly as poorly as the unconditional SL CAPM, and that time-variation in betas and the equity premium would have to be implausibly large to explain the value premium.[70]

A brief summary of other contributions to SL CAPM academic literature is presented in Table 8. Of the 38 papers in Table 8 (which are in addition to the papers introduced

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[66] Burmeister, E. and McElroy, M.B. (1988). Joint estimation of factor sensitivities and risk premia for the Arbitrage Pricing Theory. Journal of Finance, 43, pp.721-33.

[67] Mehrling, P. (2005). Fischer Black and the revolutionary idea of finance, Wiley, pp.104–105.

[68] Campbell, Y. J and Vuolteenaho, T. (2004). Bad beta, good beta. The American Economic Review, 94(5), p.1249.

[69] Da, Z. Guo, R.J. and Jagannathan, R. (2012). CAPM for estimating the cost of equity capital: Interpreting the empirical evidence. Journal of Financial Economics, 103(1), pp.204–206.

[70] Lewellen, J. and Nagel, D. (2006). The Conditional CAPM does not explain asset-pricing anomalies. Journal of Financial Economics, 82, pp.289-314.

above), 25 present evidence that rejects the SL CAPM; 5 uncover evidence that supports the SL CAPM; and 8 make neutral findings. Of the 18 papers published since 2000, 13 reject the SL CAPM (72%), while the remaining 5 papers (28%) reach a neutral or supportive conclusion. Although some authors find insufficient evidence to reject the SL CAPM on statistical grounds, the majority of the literature finds that the SL CAPM is empirically inadequate for explaining observed returns.

Table 8 Additional SL CAPM literature

Author	Year	Study Name	Summary	CAPM - Support / Neutral / Reject
Douglas	1969	Risk in the equity markets; an empirical appraisal of market efficiency	In annual and quarterly return data, it was found that there seemed to be measures of risk, in addition to beta, that contribute systematically to observed average returns. These results are inconsistent with the hypothesis that investors attempt to hold efficient portfolios.	Reject
Miller and Scholes	1972	Rates of return in relation to risk: a re-examination of some recent findings	By using individual securities' returns in testing the validity of the CAPM, they found that the intercept has values much larger than the risk-free rate of return while the coefficient of beta statistically has a lower value.	Reject
Basu	1977	Investment performance of common stocks in relation to their price earnings ratios: a test of efficient market hypothesis	Basu finds that when stocks are sorted on earnings-price ratios, those with high E/P have higher expected future returns than is predicted by the CAPM which suggests there are other factors that contribute to asset returns.	Reject
Roll	1977	A critique of the asset pricing theory's tests - part 1: on past and potential testability of the theory	Raised doubts testing the CAPM. Regression tests are probably of quite low power, and grouping may lower the power further. As long as proxies are used for the market portfolio, the Sharpe-Lintner theory is not being tested.	Neutral
Roll	1978	Ambiguity when performance is measured by the securities market line		Neutral
Lakonishok and Shapiro	1984	Stock returns, beta, variance and size: an empirical analysis	Found an insignificant relationship between beta and returns and a significant relationship between market capitalisation and returns.	Reject
Lakonishok and Shapiro	1986	Systematic risk, total risk and size as determinants of stock market returns	Concludes that neither the traditional measure of risk (beta) nor alternative measures (such as variance or residual standard deviation) can significantly explain the cross-sectional variation in returns. Instead, only size appears to be of relevance.	Reject
Tinic and West	1984	Risk and return, January vs the rest of the year	Conducted similar study to Fama and MacBeth (1973), which has previously been cited in our report, but concluded opposite results. They found that residual risk has no effect on asset returns. However, their intercept is greater than the risk-free rate, and their results indicate that the CAPM might not hold.	Reject
Bhandari	1988	Debt/equity ratio and expected common stock	Bhandari finds that expected common stock returns are positively related to the ratio of debt to equity, controlling for beta and firm	Reject

Author	Year	Study Name	Summary	CAPM - Support / Neutral / Reject
		returns: empirical evidence	size. Shows that single factor CAPM does not hold and other factors also contribute to asset returns.	
Chan et al	1991	Fundamentals and stock returns in Japan	Research on a sample of Japanese firms found that differences in returns were related to four variables: earnings yield; size; book to market ratio; and cash flow yield. Their findings "reveal a significant relationship between these variables and expected returns in the Japanese market."	Reject
Amihud et al	1992	Further Evidence on the Risk-Return Relationship	Argue that data is too noisy to invalidate the CAPM. Show that when a more efficient statistical method is used, the estimated relationship between average return and beta is positive and significant.	Support
Black	1993	Beta and return	Posits that it is too premature to declare the "death" of beta. Argues that rational investors who can borrow freely, whether individuals or firms, should continue to use the CAPM and beta to value investments and to choose portfolio strategies.	Support
Davis	1994	The cross-section of realized stock returns: the pre-compustat evidence	Using a database that is free of survivorship bias, it finds that book-to-market equity, earnings yield and cash flow yield have significant explanatory power. This goes against the theory of the SL CAPM, which posits that only systematic risk exposure is relevant.	Reject
He and Ng	1994	Economic forces, fundamental variables and equity returns	Finds that book-to-market exhibits the most explanatory power of average returns, contrary to the theory of the SL CAPM. Meanwhile, size is found to play a weaker role.	Reject
Lakonishok et al	1994	Contrarian investment, extrapolation, and risk	Argue that the size and price to book value (P/B) effects are due to investor overreaction rather than compensation for risk bearing. As a result, investors systemically overreact to corporate news, unrealistically extrapolating high or low growth into the future. This leads to under-pricing of 'value' (small capitalisation, high P/B stocks) and overpricing of 'growth' (large capitalisation, low P/B stocks).	Neutral
Fama and French	1995	Size and book-to-market factors in earnings and returns	Predicts that the return on the portfolio of small stocks is higher than the return on the portfolio of large stocks (the so-called size effect) and also that the return on stocks with high B/M ratios is higher than the return on stocks with low B/M ratios. Follow-up paper to earlier seminal work	Reject
Kothari et al	1995	Another look at the cross-section of expected stock returns	Notes that using historical betas estimated from annual rather than monthly returns produces a stronger relation between return and beta. Also, that the relation between P/B and return is exaggerated by survivor bias in many samples used.	Neutral
Pettengill et al	1995	The conditional relation between beta and returns	Finds that a consistent and highly significant relationship between beta and cross-sectional portfolio returns and beta predicted by CAPM	Neutral

Author	Year	Study Name	Summary	CAPM - Support / Neutral / Reject
			is based on expected rather than realized returns.	
Miles and Timmermann	1996	Variation in expected stock returns: evidence on the pricing of equities from a cross-section of UK companies	Provide weak empirical evidence on the single-factor CAPM and rather find that book to market value, and to a lesser extent company size and liquidity, are the only company attributes that appear to contain information about variation in expected returns.	Reject
Kothari and Shanken	1999	Beta and book-to-market: is the glass half full or half empty?	Counters Fama and French (1992) emphasising that the evidence ignored positive evidence on historical betas and overemphasised the importance of P/B. Although size is statistically significant, the incremental benefit of size, given the beta, is surprisingly small. Also claim that P/B is a weak determinant of the cross-sectional variation in average returns among large firms and fails to account for return differences related to momentum and trading volume.	Neutral
Elsas et al	2000	Beta and returns revisited: evidence from the German stock market	Find a positive and statistically significant relationship between beta and return in their sample period, 1960 - 1995, as well as in all sub-periods they analyse for the German market. They maintain that the empirical results provide justification for the use of betas estimated from historical return data by portfolio managers.	Support
Bartholdy and Pearl	2001	The relative efficiency of beta estimates	Argue that five years of monthly data and an equal-weighted index provide the most efficient estimates of historical beta. However, they find that the ability of historical betas to explain differences in returns in subsequent periods ranges from a low of 0.01% to a high of 11.73% across years. With these results, they conclude that it may well be appropriate to declare the beta dead.	Reject
Cremers	2001	Reviving beta? Bayesian tests of the CAPM when the market portfolio is unobservable	Claims that the data do not provide clear evidence against the CAPM. Poor performance of the CAPM often appears to be due to measurement problems with respect to the market portfolio and its beta. Thus, he concludes that the CAPM may still be valid.	Neutral
Avramov	2002	Stock return predictability and model uncertainty	Shows that small-cap value stocks appear to be more predictable than large-cap growth stocks and that model uncertainty is more important than estimation risk: investors who discard model uncertainty face large utility losses.	Reject
Griffin	2002	Are the Fama and French factors global or country specific?	Concludes that country-specific three-factor models are more useful in explaining stock returns than world and international versions	Reject
Koutmos and Knif	2002	Estimating systematic risk using time varying distributions	Propose a dynamic vector GARCH model for estimation of time-varying betas. They find that in 50% of cases, betas are higher during market declines (the opposite is true for the remaining 50%). They claim that the static market model overstates unsystematic risk by more than 10% and that dynamic betas follow stationary, mean reverting processes.	Reject

Author	Year	Study Name	Summary	CAPM - Support / Neutral / Reject
Shalit and Yitzhaki	2002	Estimating beta	Argue that the OLS regression estimator is not appropriate for estimating betas. Suggest alternatives: eliminate the highest and lowest four market returns and show that the betas of 75% of the firms change by more than one standard error.	Reject
Thompson et al	2006	Nobels for nonsense	Presents three important pieces of evidence against the CAPM: 1) the correlation between the return and the volatility of the Ibbotson Index from 1926 to 2000 was negative (-0.32) 2) 65% of the portfolios randomly chosen had a higher return than the CAPM could predict 3) an 'equal weight index', from 1970 to 2002, had an annualised return 4.8% higher than the S&P 500.	Reject
Aktas and McDaniel	2009	Pragmatic problems in using beta for managerial finance applications	Present cases in which CAPM-generated costs of equity are less than zero, less than the risk-free rate and less than the company's marginal cost of debt. They calculate betas using 60 and 120 monthly returns. They reference a Compustat database with 8,361 companies with listed betas: 925 of these are negative.	Reject
Brennan and Lo	2010	Impossible frontiers	Define 'impossible' as when every efficient portfolio has at least one negative weight. They prove that the probability of an impossible frontier approaches 1 as the number of assets increases with sample parameters.	Neutral
Levy and Roll	2010	The market portfolio may be mean/variance efficient after all	Affirm that many conventional market proxies could be perfectly consistent with the CAPM and useful for estimating expected returns.	Support
Levy	2011	The capital asset pricing model in the 21st century	Although behavioural economics contradicts aspects of expected utility theory, CAPM and M-V remain intact in both expected utility theory and cumulative prospect theory frameworks. Furthermore, the paper finds that there is no evidence to reject CAPM empirically when ex-ante parameters are employed.	Support
Dempsey	2013	The capital asset pricing model (CAPM): the history of a failed revolutionary idea in finance?	Concludes that available empirical evidence does not support the CAPM.	Reject
Giannakopoulos	2013	A deep dive into the mean/variance efficiency of the market portfolio	Counter to Levy and Roll (2010). Results are highly sensitive to the choice of the portfolio used, the market returns and the standard deviation as well as to the choice of the risk-free rate. They conclude that the performance of these models, with their real market values, is not sufficiently robust to justify global acceptance.	Reject
Antoniou et al	2014	Investor Sentiment, Beta and the Cost of Equity Capital	Argue that the security market line accords with the CAPM by taking an upward slope in pessimistic periods but a downward slope in optimistic periods. In particular, high beta stocks become over-priced in optimistic periods. For this reason, CFOs can use the	Reject

Author	Year	Study Name	Summary	CAPM - Support / Neutral / Reject
			CAPM for capital budgeting decisions in pessimistic periods but not optimistic ones.	
Carelli et al	2014	Which is the right 'market beta'?	Calculated the betas of 1,385 US companies on March 31, 2014 and showed 147 betas for each company, using monthly, weekly and daily returns over different intervals. The median of the difference [maximum beta - minimum beta] was 1.03. Ranking the companies according to their betas, they find that the average of the maximum ranking - minimum ranking for the 1,385 companies is 786. In addition, it shows that for single data, calculated betas have an average range of 1.03.	Reject
Fernandez	2014	CAPM: an absurd model	Conclude that most papers that use calculated betas are irrelevant. It is clear that both the assumptions and the predictions/conclusions of the CAPM have no basis in the real world.	Reject
Gilbert et al	2014	Daily data is bad for beta: opacity and frequency-dependent betas	Report that beta varies across return frequencies. Using returns over the previous 60 months, they conclude that beta differences across frequencies occur even in large and liquid stocks and cannot be explained by microstructure and trading frictions.	Reject

5.2.6 Application of SL CAPM by financial practitioners

It is helpful to frame the model assessment in the context of how the financial community approaches WACC – in practice, this is the community of interest with the most direct connection with identifying a return that is necessary to compensate a provider of prescribed services for the risks involved in providing Prescribed Services.

As such, financial practitioners offer the clearest indication of how financial markets would determine the cost of capital for an entity such as PoM, which relates to the PMA's objective of allowing a provider of Prescribed Services a reasonable opportunity to recover the efficient costs of providing Prescribed Services, including a return commensurate with the risks involved. As we demonstrate, financial practice diverges from "textbook" return on equity models as applied by regulators in consistent and very important ways. We begin by interrogating market evidence on how financial practitioners actually calculate the WACC in independent expert reports.

Evidence from independent expert reports

This section outlines our insights from independent expert reports, both in Australia and in the United States. For Australian reports, we have analysed the Connect 4 database in relation to adjustments to the SL CAPM. The Connect 4 database (provided by Thomson Reuters) contains independent expert reports for companies listed on the ASX.

For the Australian sample, Synergies has investigated all 481 independent expert reports relating specifically to acquisitions, takeovers, divestments, demergers and merger schemes from 1 January 2013 to 31 December 2019.[71] Of these 481 reports, only 228 (47%) made explicit reference to the use of a WACC or discount rate, and of these only 179 (37%) provide a detailed description of their WACC methodology.

Our main findings are as follows:

- The common practice of IE reports that explicitly consider the cost of capital is to adopt risk-free rates well in excess of contemporaneous risk-free rates, consistent with the higher intercept implied by the principles of the Black CAPM (see Section 5.3).[72]
- Of the 179 reports with detailed WACC calculations, we have identified 68 IE reports that make ad hoc adjustments to the conventional SL CAPM formulation.[73] A number of these reports apply size and other premiums consistent with the principles of the FFM model. 19 out of 68 reports explicitly apply size premiums.

The remainder of this section elaborates on the varying treatment of the risk-free rate parameter, before discussing the nature of the risk premiums that we have identified.

Use of higher risk-free rates

Figure 2 shows the divergence between the risk-free rate adopted in each IE report and the prevailing risk-free rate published by the RBA at the time. On average, risk-free rates used by independent experts are 0.83% (83 basis points) higher, while the median risk-free rate is 0.70% (70 basis points) higher. This is a significant finding, because it shows that industry practice diverges from the regulatory practice of calculating the risk-free rate based on a short averaging period of long-term bond rates informed by contemporaneous data (see Chapter 6). In the current environment, this will inevitably result in higher WACC estimates than those arising from regulatory processes, although independent experts also achieve a similar effect through adjustments to the MRP and other parameters.

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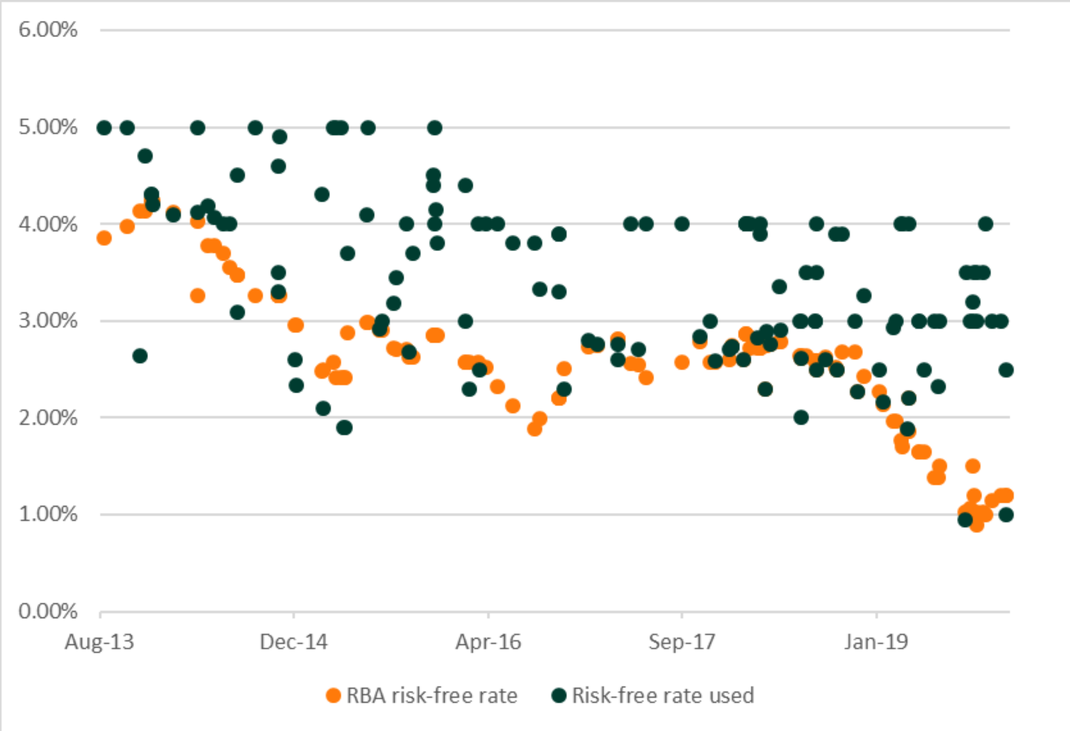
71 To facilitate an efficient interrogation of the database, we restricted our analysis to acquisitions with a deal size greater than AUD10 million.

72 Frontier Economics has made similar observations in regard to well-acceptance of the Black CAPM among finance practitioners (see p.6 of their report to the ESC).

73 We define an ad hoc adjustment as the inclusion of an additional parameter not included in the conventional SL CAPM formula as applied by Australian economic regulators. The ad hoc adjustments presented here do not incorporate reflect uplifts to the MRP, risk-free rate, or other standard WACC parameters, which may increase the overall WACC further relative to a standard regulatory approach.

Figure 2 Comparison of risk-free rates with prevailing RBA risk-free rate



Data source: RBA, Connect 4, Synergies calculations

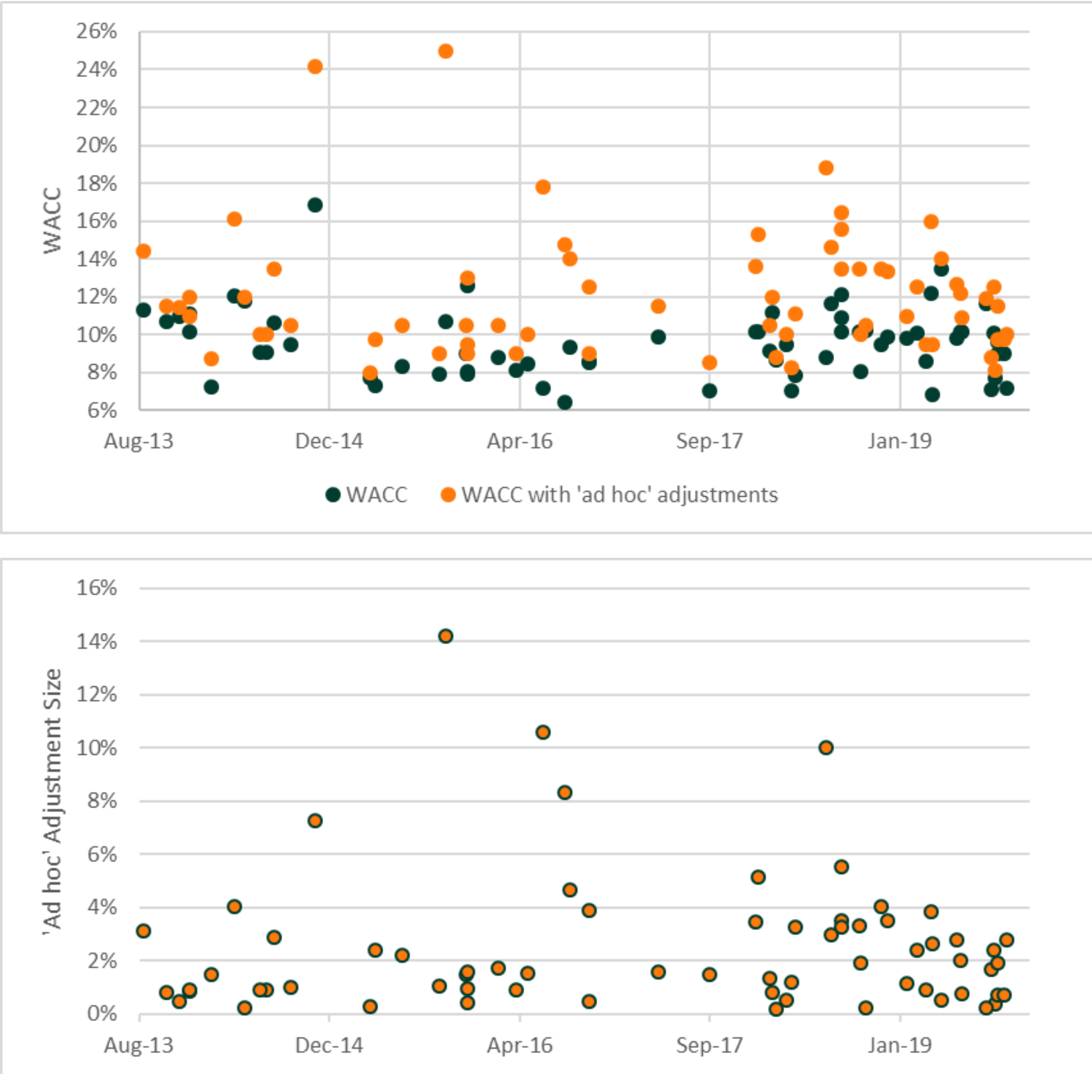
Figure 2 shows that risk-free rates used by practitioners are on average 0.83% higher than those that would be used in regulatory processes. This practice effectively adds almost 1% as an ad hoc premium to the risk-free rate. The most commonly applied risk-free rate in the IE reports over the sample period is 4%.

Application of risk premiums

In the 481 independent expert reports that we interrogated, it is clear that independent experts apply size and other premiums (such as for growth prospects, product execution risk and market-imposed hurdle rates).

In cases where size and other risk premiums are applied, the consequences for the resulting WACC are far from immaterial. Figure 3 illustrates the divergence between the actual WACC estimates used in independent expert reports and the WACC estimates in the absence of any ad hoc adjustments for risk premiums. In the upper panel, the orange points denote the WACC estimate after incorporating the ad hoc premium adjustments, while the dark green points denote the resulting WACC in the absence of any such adjustments. In the lower panel of Figure 3, we present the magnitude of the ad hoc adjustment, which is in effect the difference between the two lines in the upper panel.

Figure 3 Comparison of WACC estimates with and without ad hoc adjustments



Data source: Connect 4, Synergies calculations

Across the sample, the average adjustment was 2.49%, while the median was 1.60%. In proportional terms, this causes the ad hoc adjusted WACC estimates to be on average almost one-fifth larger than the unadjusted WACC estimates implied by the CAPM. This premium is on top of the average 0.83% risk-free rate increase applied by practitioners relative to those that would be used in regulatory processes that do not average risk free rates,[74] effectively adding almost another 1% to the ad hoc premium.

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74 IPART and OTTER are two regulators that apply long term averages of the 10-year bond rate to inform the risk free rate.

Conclusions on financial practitioner evidence

The evidence we have presented in this section shows that financial practitioners routinely depart from the conventional SL CAPM as it is applied by several (but by no means all) Australian economic regulators through the use of additional premia and higher risk-free rates.

Accordingly, this suggests that exclusive reliance on the SL CAPM (without adjustment) may not meet the statutory objective in terms of providing the return required by the BEE providing services with a similar degree of risk as that which applies to PoM in respect of the provision of Prescribed Services.

In turn, this suggests that the optimal return on equity framework for PoM may give some weight to the SL CAPM, but also have regard to other well accepted approaches that are capable of addressing the discord between the SL CAPM and actual financial practice and empirical observation. We examine such candidate models in the rest of this chapter.

5.2.7 Application of guiding principles for well accepted approaches

The evidence presented in the preceding subsections enables us to ascertain how the SL CAPM performs in relation to the guiding principles we introduced in Chapter 3. An overview of these criteria as they apply to the SL CAPM is presented in Table 9.

Table 9 Application of IPART/AER criteria to SL CAPM

Criteria	Applicability to SL CAPM
Accuracy	SL CAPM has been proven across multiple studies to provide poor empirical fit. Any persistent mis-estimation of the return on equity will not contribute to the achievement of the regulatory objectives.
Stability and predictability	SL CAPM is relatively stable and predictable, as it relies on only three parameters (although the risk-free rate and MRP may change with market conditions).
Transparency and replicability	SL CAPM is easy to implement and replicate.
Reflection of economic/financial principles	SL CAPM has strong theoretical appeal, although its assumption of investors being able to borrow and lend at the risk-free rate is not consistent with financial practice.
Flexibility with changing market conditions	SL CAPM will adjust in line with changes in the risk-free rate, MRP and/or beta, but will not capture any other factors that affect the return on equity.
Robust data	Data for SL CAPM is readily available and directly observable – the issue instead is what the model fails to capture.

5.2.8 Conclusion on SL CAPM

In summary, the SL CAPM's theoretical foundations are attractive but its empirical performance is poor. Accordingly, we consider exclusive reliance upon the SL CAPM in the way that it has been applied by many regulators has a high risk of understating the cost of capital for a subject entity.

All models are abstractions of reality and it is not therefore surprising that each has strengths and weaknesses. The theoretical foundations of the SL CAPM do not offset the poor explanatory power of that model in terms of predicting actual returns. In this respect, other models, such as the Black CAPM and the FFM, have demonstrated better performance than the SL CAPM.

5.3 Black CAPM

The purpose of this section is to explain the evolution of the Black CAPM (1972) and its application.[75] The Black CAPM augments the SL CAPM by adding what is known as a zero-beta portfolio to the risk-free rate to take into account the observed tendency of the SL CAPM to understate asset returns for companies with betas less than one. We have applied the Black CAPM as a cross-check for the return on equity for the BEE.

A key motivation for modifying the SL CAPM is the empirical observation of low beta bias, evidence of which is well documented in academic literature.

5.3.1 Black CAPM formulation

The Black CAPM is expressed as follows:

$$Re = Rz + \beta_e * [E(R_m) - Rz]$$

Where:

Rz = the rate of return on the zero-beta portfolio (equal to risk-free rate plus zero beta premium)

E(Rm) = the expected return on the market

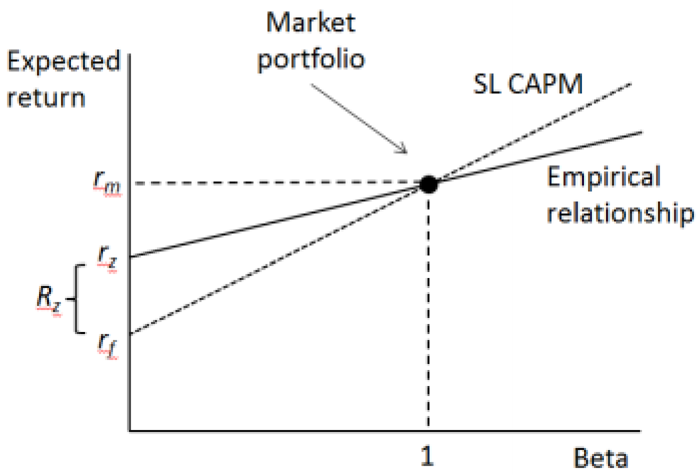
[E(Rm) – Rz] = the zero-beta adjusted market risk premium

βe = equity beta (measures systematic risk)

75 Black, F. (1972). Capital market equilibrium with restricted borrowing. Journal of Business, 28(1), pp.444-454.

The relationship between the SL CAPM and Black CAPM is indicated in Figure 4.[76] The SL CAPM uses a theoretical lower bound for the intercept (i.e., the intercept cannot possibly be lower than the risk-free rate). In contrast the Black CAPM provides an empirical estimate of the risk-free rate, the zero-beta portfolio. This is reflected in a higher intercept point on the Y-axis, reflecting the zero-beta premium.

Figure 4 Relationship between SL CAPM and Black CAPM



Source: SFG Consulting (2014)

5.3.2 Black CAPM strengths

By construction, the Black CAPM removes the tendency of the SL CAPM to under-estimate the returns to low beta assets and over-estimate the returns to high beta assets.[77] It has less restrictive assumptions than the SL CAPM, with its central prediction being that market betas suffice to explain expected returns and the risk premium for beta is positive (in contrast the SL CAPM assumes the premium per unit of beta is strictly the expected market return minus the risk-free interest rate).

It has been applied in rate of return regulation cases in other jurisdictions, for example in the United States and Canada, where it is sometimes known as the empirical CAPM (ECAPM) or the zero-beta CAPM.[78]

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76 SFG Consulting (2014c). The required return on equity for regulated gas and electricity network businesses, 27 May, p.22.

77 Rossi, M. (2016) 'The capital asset pricing model: a critical literature review', Global Business and Economics Review, Vol. 18, No. 5, pp.604–617.

78 For example, the New York Public Service Commission, which accepts evidence from a range of models in estimating the cost of equity. Staff inputs into a 2015 decision made use of zero-beta CAPM estimates as well as standard CAPM estimates (1/3 weight) and dividend growth models (2/3 weight), New York Public Service Commission, Order

Black, Jensen and Scholes (1972), among others, discovered that the slope in CAPM regressions was flatter than would be implied by the SL CAPM. Specifically, the SL CAPM tended to understate asset returns for companies with betas less than one, and overstate asset returns for betas greater than one. One implication of this is that the intercept in these regressions was higher than expected. In the SL CAPM, the intercept takes the form of the risk-free rate. Therefore, the Black CAPM proposes adding the zero-beta premium to the risk-free rate.

A key difference between the SL CAPM and the Black CAPM is that the SL CAPM assumes that investors can borrow and lend at the risk-free rate, which presents difficulties in practice (as it is not generally possible). The Black CAPM does not require this assumption, but instead assumes that investors can short sell risky assets such as stocks. This assumption has its limitations too because investors may be able to short sell only to a certain extent. However, it is not considered to be as limiting an assumption. These differing assumptions thus explain the contrasting formulas for the two models. In the Black CAPM, expected return is equal to the return on a zero-beta asset (an asset with no systematic risk) plus a premium for bearing systematic risk (the SL CAPM equity beta).

5.3.3 Black CAPM weaknesses

While the Black CAPM is intended to address the low beta bias inherent in the SL CAPM, many studies have found that it too fails to produce a statistically significant association between beta estimates and stock returns. In addition, deriving a statistically significant estimate of the rate of return on the zero-beta portfolio has proven elusive in Australia.

5.3.4 Application of guiding principles for well accepted approaches

Attachment A sets out the precedent and academic literature in support of the use of the Black CAPM in regulatory settings in overseas jurisdictions, particularly the US. The widespread application of the model together with academic support provides evidence that it is a well-accepted approach.

We now turn to how the Black CAPM performs in relation to the guiding principles we introduced in Chapter 3. An overview of these criteria as they apply to the Black CAPM is presented in Table 10.

Approving Electric And Gas Rate Plans In Accord With Joint Proposal, June 15 2016; Public Service Commission of Maryland (2016), In the matter of the application of Baltimore gas and electric company for adjustments to its electric and gas base rates, order no. 87591, case no. 9406, June, p.153. Ontario Energy Board (2009), Report of the board on the cost of capital for Ontario's regulated utilities, EB-2009-0084, December.

Table 10 Application of IPART/AER criteria to Black CAPM

Criteria	Applicability to Black CAPM
Accuracy	The Black modifications to the SL CAPM have been proven to successfully achieve a better fit with observed data, namely that the security market line is flatter than predicted by the SL CAPM.
Stability and predictability	We have generated a revised estimate of the zero beta premium using updated data. Our updated estimate is 4.56%, which is higher than our 2019 estimate of 3.36%. The zero beta premium is the premium earned by a zero-beta portfolio in excess of the risk-free rate. As such, low risk-free rates could be responsible for the increase in this parameter.
Transparency and replicability	The Black CAPM is only marginally more complex to implement than the SL CAPM.
Reflection of economic/financial principles	As we have documented, there are theoretical underpinnings for the low-beta bias and the Black CAPM, which are likely to persist over time.
Flexibility with changing market conditions	Black CAPM will respond to market conditions by reflecting changes in estimated betas, the MRP and the risk-free rate over time.
Robust data	Zero beta premium can be derived from readily available market data. All other data is identical to SL CAPM.

5.3.5 Conclusion on the Black CAPM

In summary, the Black CAPM represents a theoretical (and generally an empirical) improvement to the SL CAPM. The model has been applied in the United States and Canada, and, to that extent, there is evidence of it being well accepted. However, as explored in the following section, its empirical performance is inferior to the Fama-French model.

However, despite its strengths, we acknowledge that the zero beta premium that we have determined is not statistically significant at conventional levels. This deficiency does not invalidate the use of the Black CAPM to inform the cost of equity for the BEE – all well accepted approaches have limitations. In this instance, we use the Black CAPM as a cross-check, and will continue to assess its appropriateness for use in future TCS processes.

5.4 Fama-French model

This section explains the evolution of the Fama and French (1993) model (FFM) and its application.[79] The FFM augments the SL CAPM by considering the impact of size and value premiums, in addition to the market risk premium, on stock returns.

We begin by discussing the motivation for the FFM and its strengths and weaknesses, before examining the support for the model in academic literature and regulatory practice. Furthermore, we provide evidence that financial practitioners make ad hoc size

[79] Fama, E.F. and French, K.R. (1993). Common risk factors in the returns on stocks and bonds. Journal of Financial Economics, 33(1), pp.3-56.

and other risk premium adjustments to the SL CAPM, implicitly adopting the rationale of the FFM. We also explore the FFM's acceptance in other spheres, including its presence in finance curriculum and the 2013 Nobel Prize awarded to Eugene Fama for the development of the model. All of these sources of evidence serve to solidify the well-accepted standing of the FFM.

5.4.1 Emergence and evolution of the FFM

The FFM emerged in response to the poor explanatory power of the SL CAPM. Fama and French observed that high stock returns were associated with smaller listed companies and listed companies that have a high book to market value ratio. Fama and French demonstrated that when these two additional variables were incorporated into an asset pricing model the explanatory power of the model increased significantly.

The FFM operates on excess returns to the market being assessed having regard to:

- The returns on the market as a whole
- HML (High Minus Low) is the average return on two value portfolios minus the average return on two growth portfolios.
- SMB (Small Minus Big) is the average return on three small portfolios minus the average return on three big portfolios

The FFM is expressed as follows:

$$Re = Rf + \beta j * [E(R_m) - R_f] + \beta k * [HML] + \beta l * [SMB]$$

Where:

Rf = the risk-free rate of return

E(Rm) = the expected return on the market

[E(Rm) – Rf] = the market risk premium

HML = expected high-minus-low risk premium

SMB = expected small-minus-big risk premium

βj = market excess returns beta

βk = high-minus-low factor beta

βl = small-minus-big factor beta

In contrast to the SL CAPM and the Black CAPM models, the FFM expresses the return on equity based on expected returns and two additional explanatory factors: a size factor (Small Minus Big); and a book-to-market equity factor (High Minus Low).

5.4.2 Strengths

The FFM retains systematic risk as an explanatory factor that explains stock returns consistent with the SL CAPM and Black CAPM.

However, the FFM better explains stock returns in comparison with either the SL CAPM or the Black CAPM. The model mostly and uniformly has statistically significant explanatory power and performs better than the SL and Black CAPM models in terms of goodness of fit (as measured by a higher R^2 value or by measures of forecast error).

For instance, Chiah et al. (2016) (see Attachment A) is the most recent Australian study to directly compare the FFM with the SL CAPM. Using their preferred measure of model fit, they find that the use of the three-factor FFM reduces the average mean absolute forecast error from 1.68 to 1.44 (a 14% reduction) over a 5-year forecast horizon relative to the SL CAPM (the Black CAPM was not evaluated in this particular study). In other words, the better empirical performance of the FFM is such that it is less likely to understate investors' required cost of equity by the incorporation of additional risk factors in the model that are evidently being priced by the market.

The FFM posits that multiple risks other than solely market risk are reflected in stock returns and that the high book-to-market and small-cap stock factors are the best available proxies for these risks.

In an Australian context, the size and value premiums in the model have been estimated using market data and delivered results consistent with US studies, particularly in relation to the value premium. This indicates that incorporating the FFM in the determination of the cost of equity estimate for the benchmark port entity, including with the SL and Black CAPMs, could provide a higher degree of confidence that the resulting estimate is robust and reflective of investor expectations.

5.4.3 Weaknesses

As for the SL CAPM, the FFM restricts the zero-beta rate to be the risk-free rate.

The model in the Australian market has sometimes yielded inconclusive results, particularly in respect of the high minus-low explanatory factor, although this may reflect data issues. However, Brailsford, Gaunt and O'Brien (2012) addressed these data issues and developed an Australian FFM that reconciled with US results.[80]

[80] Brailsford, T., Gaunt, C. and O'Brien, M (2012). The investment value of the value premium. Pacific-Basin Finance Journal, 20(3), pp.416-437.

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While the FFM is often employed in academic studies, it is less commonly employed in financial market and regulatory contexts, with practitioners citing challenges relating to data sourcing in some situations. However, as described earlier in this report, this reason alone should not preclude a particular approach from being well accepted.

5.4.4 Application of guiding principles for well accepted approaches

Evidence from financial markets, regulatory processes and academia is described further in Attachment A. The evidence highlights widespread support in academia for its use, including increasingly extensive Australian literature. This recognition includes Eugene Fama being awarded the 2013 Nobel Prize in Economics; the Economic Sciences Prize Committee said that Fama's extension of the CAPM "greatly improves the explanatory power relative to the single-factor CAPM model."[81]

We now turn to how the FFM performs in relation to the guiding principles we introduced in Chapter 3. An overview of these criteria as they apply to the FFM is presented in Table 11.

Table 11 Application of IPART/AER criteria to FFM

Criteria	Applicability to FFM
Accuracy	The three factor model has been shown to offer greater explanatory power in regard to observed returns than either the SL CAPM or the Black CAPM.
Stability and predictability	Our Fama-French methodology has delivered a stable return on equity estimate over time (accounting for changes in the risk-free rate), noting that this year's FFM estimate is not directly comparable with previous years due to refinements made to the underlying comparator set.
Transparency and replicability	The FFM provides a transparent framework for modelling the ad hoc premia that financial practitioners apply in their assessments.
Reflection of economic/financial principles	There is clear economic logic supporting the existence and persistence of the Fama-French factors. This ensures that the size and value premia are not transitory statistical anomalies.
Flexibility with changing market conditions	All model parameters are estimated based on market data, which will reflect and incorporate underlying market movements.
Robust data	The Australian Fama-French data has been derived according to a peer-reviewed academic methodology that takes into account country-specific considerations. The Ken French data for other countries is a globally recognised dataset. The lack of country-specific factors for all countries in PoM's comparator set has led us to place less weight on the FFM this year. We would consider increasing the weight if country-specific factors become available for a broader sample of countries. That being said, global data serves as a useful proxy in the absence of country-specific data, making it appropriate to still place some weight on the FFM.

81 Economic Sciences Prize Committee (2013). Scientific Background on the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2013: Understanding Asset Prices, p.3.

5.4.5 Conclusion on Fama-French model

The FFM has clearly demonstrated superior empirical performance in comparison to other asset pricing models. It has widespread acceptance in academia, as well as being used by finance practitioners and regulators in overseas jurisdictions. The particular strength of the FFM is better explanatory power than other asset pricing models, which highlights its importance as a relevant model in a regulatory setting, where the long-term interests of consumers are served by ensuring an infrastructure owner is adequately remunerated for its investment. Furthermore, the model has received favourable consideration from various economic regulators, including most recently by IPART.[82]

However, despite its empirical appeal and endorsements by regulators, we acknowledge that it is not possible to source country-specific factor estimates for all of the firms in PoM's comparator set. This deficiency does not invalidate the FFM to inform the cost of equity for the BEE – all well accepted approaches have limitations. In this instance, we use FFM as a cross-check, and will continue to assess its appropriateness for use in future TCS processes.

5.5 Dividend Discount Model

The DDM is a different construction from the three CAPM models in that it is underpinned by the assumption current stock prices reflect the present value of the expected future cash flows (dividends) that will be paid to investors. In so doing, its value reflects the current risk premium associated with holding the market portfolio.

The DDM is expressed as follows:

$$p = \sum_{t=1}^{\infty} d \frac{(1+g)^t}{(1+r)^t}$$

Where:

p = current stock price

d = dividend

g = expected dividend growth

r = discount rate/return on equity

The formula can be rearranged to express the return on equity (r) as a function of the stock price and future dividend growth.

[82] IPART (2018), Review of our WACC method, p 98.

5.5.1 Strengths

The DDM is a theoretically strong model because it does not require assumptions to be made regarding what explanatory factors drive expected returns, i.e., this model equates the present value of future dividend cash flows to the current stock price.

Findings from several empirical studies published in academic journals have found outcomes to be in line with the predictions of the model.

Reasonable specifications of the DDM produce estimates of the overall required return on equity that are more stable than the risk-free rate implying a risk premium that tends to partially offset changes in the risk-free rate, so that the estimate of the overall required return does not rise and fall one-for-one with changes in the risk-free rate. This characteristic means the DDM can also be used (and is or has been used by several regulators) to develop forward-looking estimates of the market risk premium.

5.5.2 Weaknesses

In commenting on the weaknesses of the DDM as a means of estimating the cost of equity for an individual stock, it is relevant to note that the weaknesses that arise in the application of the DDM to an individual stock do not apply or do not apply to the same extent in its use for assessing the MRP (which relies on the market as a whole).

For the purposes of assessing the cost of equity for an individual firm, the model is most applicable to mature, stable companies that have a proven track record of paying out dividends consistently. Immature growth stocks or stocks more generally without a track record of paying dividends are not captured in the model.

The DDM is built on the assumption that the only value of a stock is the return on investment it provides through dividends rather than expectations of capital growth, which in practice is unrealistic.

We have not pursued the DDM for informing the cost of equity for PoM (as opposed to the MRP) in the current case because of the limited sample of comparable Australian companies to underpin the application of the model.

In contrast to the other three cost of equity models that we have examined, the use of overseas comparators for the DDM for an individual company requires assumptions about key economic inputs (such as long-run growth rates). These may differ from the Australian context, making the estimates derived from the DDM less representative of the appropriate cost of equity. Previous applications of the DDM have relied heavily upon Australian (and New Zealand) comparators for this reason.

This does not undermine the application of the model for the purposes of estimating the MRP – indeed reliance on the DDM for the MRP is a well accepted approach amongst regulatory bodies; rather it limits the usefulness of international comparators for the purposes of using the model for assessing the cost of equity for an individual firm.

5.6 2019 ESC interim commentary on cost of equity approach

In the 2019 interim commentary, the ESC maintained its "cautious view on the port's use of the Black CAPM and Fama French models."[83] It reiterated its preliminary view formed in the 2018 interim commentary that neither the Black CAPM nor the FFM are well accepted by Australian regulators, which, according to the ESC, indicated that they would be unlikely to be considered well accepted.[84]

At the same time though, the ESC also acknowledged that PoM had placed significantly less weight on the Black CAPM and FFM relative to earlier WACC submissions, and the impact on the WACC of including these two models was only 0.10 per cent.[85] The ESC also sought advice from Frontier Economics on the level of acceptance of each model among economic regulators, financial practitioners and regulators.

In regard to acceptance by financial practitioners, Frontier's analysis reflected our previous submissions for PoM, namely that there is no clear evidence of explicit use by financial experts, but that these practitioners make adjustments that are consistent with the principles of these models.[86] Specifically, in the case of the Black CAPM, Frontier noted that finance professionals appear to use risk-free rates in excess of spot rates (such as a 20-day or other short-term average commonly used in Australian economic regulation), and this is consistent with the theory of the Black CAPM, which stipulates that the investors may not be able to borrow and lend at the risk-free rate. In regard to the FFM, Frontier identified traded index funds that use the FFM and reported that survey of finance practitioners exhibit use of the model by professionals.[87] Most commonly though, financial practitioners apply adjustments to risk premiums to reflect company size, although not explicitly within the FFM framework.

83 ESC (2019). Interim commentary – Port of Melbourne tariff compliance statement 2019-20, 16 December, p.7.

84 ESC (2019), p.10.

85 Corresponding to an impact of $4.6 million on the aggregate revenue requirement.

86 Frontier Economics (2019). Issues in cost of capital for the Port of Melbourne, 12 December, pp.6-7. (Reproduced by the ESC on pp.8-9 of the interim commentary).

87 Frontier Economics (2019), p.7.

In regard to regulatory precedent, Frontier Economics noted that the AER no longer gives weight to the Black CAPM, and there is no evidence of the Black CAPM being used in the UK or New Zealand. Frontier Economics recognised the use of the Black CAPM amongst US and Canadian regulators (where it is sometimes known as the ECAPM, an empirical application of the Black CAPM).[88] Frontier Economics observed that the FFM is not currently used by regulators in Australia, the UK or New Zealand. Use in Canada and the US is not widespread, although some Canadian regulators have expressed tentative support for the model in conjunction with other evidence to set the return on equity. Frontier Economics agreed that both the Black CAPM and FFM are well accepted by academics.[89]

The ESC then goes on cite evidence from past Australian regulatory decisions on the Black CAPM and FFM, especially by the AER and ERA.[90] These remarks closely resemble previous commentary provided by the ESC, and our responses to these issues are provided in Attachment A.

5.7 Choosing a well accepted cost of equity approach

5.7.1 Identifying well accepted models

Based on academic recognition, global regulatory and independent expert practice, we consider the following models are sufficiently well accepted to be capable of meeting the Pricing Order requirements and the PMA objectives in relation to the estimation of the rate of return:

- SL CAPM
- Black CAPM
- FFM.

Valuation techniques, asset pricing and regulatory practice evolve. Clearly, regulatory precedent in Australia supports the SL CAPM despite a range of known limitations. Given our assessment of strengths and weaknesses of each of the suitable cost of equity models, academic literature and the evidence of global regulatory and financial market practice, we consider it is appropriate to either:

88 Frontier Economics (2019), p.6.

89 Frontier Economics (2019), pp.6-7.

90 ESC (2019), pp. 10-12.

- use values generated from a combination of well accepted models to estimate the return on equity rather than solely relying on a single model given no single model is compelling in terms of its strengths compared to the other models;
- use values generated from the SL CAPM to inform a point estimate and rely on other well accepted models to inform an upper bound estimate, noting that the Black CAPM and FFM may be applied differently, or with greater weight, in the future; or
- use values generated from the SL CAPM to inform a point estimate and rely on other well accepted models as cross-checks.

5.7.2 Applying a multi-model approach

We have applied the SL CAPM to estimate the cost of equity for the BEE. The Black CAPM and FFM have been retained as cross-checks.

For this regulatory period submission, we have not included the DDM as a standalone well accepted cost of equity estimate due to the limited comparable set on the Australian Stock Exchange (ASX), which limits the statistical reliability of the results. However, we have utilised DDMs in our market risk premium estimate (which relies only on a whole of market analysis). DDMs contain potentially important (albeit volatile) forward-looking equity market information that can inform an appropriate MRP value and represent an approach that is well accepted by regulators for this purpose.

Chapter 6 of our report explains how we have estimated the return on the market as a whole. Chapter 7 explains how we have estimated beta for use in the SL CAPM model.

6 Total market return

Chapter overview		
2020-21 submission	**2019-20 submission**	**Comments**
8.47%	9.30%-9.73%	This chapter sets out our approach to estimating the total market return (calculated as the sum of the risk-free rate and the market risk premium (MRP)). The point estimate of 8.47% is based on a risk-free rate of 0.90% and an MRP of 7.57%. The MRP is based on a 70% weighting to the Ibbotson MRP, a 15% weighting to the Wright MRP, and a 15% weighting to dividend discount models (DDMs) used by Australian regulators.

Given the inherent volatility in the risk-free rate over time, it is informative to evaluate the expected value of the total market return (TMR) outcome (measured as the risk-free rate plus the MRP). As explained below, this ensures that the approach to PoM's return on equity is consistent with the pricing principles and capable of achieving the statutory objectives of ensuring efficient outcomes consistent with a workably competitive market; incentivising efficient investment; establishing prices that are fair and reasonable, and which recover efficient costs. Due to PoM's point estimate equity beta of 1.0, the TMR coincides with PoM's point estimate for the post-tax return on equity under the SL CAPM.

In this chapter we begin by outlining why the focus should be on TMR, having particular regard to evidence from financial practitioners on the relationship between the MRP, the risk-free rate and the TMR. We then summarise the various approaches to quantifying the risk-free rate and market risk premium adopted by regulators, before combining these into estimates of the TMR. We then review the estimated returns for the MRP for each approach to arrive at our estimate of the MRP and the TMR, to which we apply cross checks.

6.1 Why focus on the TMR?

The CAPM requires estimates of the risk-free rate and the MRP. The MRP is not directly observable – this has always presented a challenge for quantification. When seeking to quantify the TMR, we consider the focus should be on the TMR rather than examining the risk-free rate and the MRP in isolation. This is because beginning with the TMR focuses attention on a parameter that is observable over time; whereas the risk-free rate and the MRP (particularly) are not.

One of the principal means of estimating the MRP is by reference to historical returns. The historical MRP is a residual after the prevailing risk-free rate (proxied by the return on Government bonds) is deducted from the TMR. Thus, the MRP is defined by reference to a long-term average of the risk-free rate, which is proxied by the long-term Government bond rate.

The difficulty with this approach in the current environment is that current risk-free rates bear no correspondence to historical rates. This in turn calls into question exclusive reliance on combining a long term historical average MRP with a prevailing risk-free rate. Indeed, it appears Australian regulators who combine a long term historical average MRP with a prevailing risk free rate are unusual; few regulators internationally approach the task in this way (preferring a longer term historical average of the risk free rate and a MRP that reconciles that risk free rate with the observed TMR). Similarly, the well accepted approach amongst finance practitioners is to add a premium to the prevailing Government bond rate in order to estimate the TMR.[91]

This in turn suggests that a key issue for achieving the statutory objectives relates to ensuring the sufficiency of the TMR with respect to hurdle rates for new investment and in the valuation of companies.

At the heart of both of these considerations is the expected return from that investment; which is substantially informed by the TMR and therefore the interaction between the (implied) MRP and the underlying risk-free rate assumption. Indeed, the evidence from finance practitioners indicates that the required return on capital does not necessarily change one-for-one with observed government bond yields, especially when yields are low. If this were the case, unanticipated changes in long term interest rates would induce very large swings in company valuations, much larger than we see in practice.

6.1.1 Evidence on impact of risk-free rate changes in finance practice

In relation to hurdle rates for new investment, an article for the RBA bulletin, Lane and Rosewall (2015) is informative.[92] It investigated the practices of those who commit to investments in the context of the relationship between interest rates and investment decisions in Australia.[93] The authors, from the Economic Analysis Department of the RBA, employ evidence from the RBA's business liaison program, which conducts discussions with market contacts who are CEOs, CFOs or operations managers from primarily mid-sized and large-sized firms on an annual or semi-annual basis. These businesses are selected on the basis that they are more likely to reflect economy-wide trends rather than firm-specific factors.

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91 See NERA Economic Consulting (2020) Review of Regulators' Approaches to Determination of the Market Risk Premium (report at Appendix R of PoM's TCS submission).

92 We consider evidence from independent expert reports in Section 6.2 below.

93 Lane, K. & Rosewall, T. (2015). Firms' investment decisions and interest rates, RBA Bulletin, June quarter 2015. The precise number of practitioners interviewed is not disclosed, but the article states that the business liaison team conducts around 70–80 discussions with contacts on a monthly basis and that discussions with individual firms occur around every 6 to 12 months.

Their primary finding is that "the capital expenditure decisions of many Australian firms are not directly sensitive to changes in interest rates."[94] Instead, "Australian firms tend to require expected returns on capital expenditure to exceed high 'hurdle rates' of return that are often well above the cost of capital and do not change very often".[95] The authors also remark that this phenomenon is not confined to Australia, with other advanced economies exhibiting similar patterns of hurdle rates sometimes several percentage points above the contemporaneous WACC.

This tendency is also reflected in the evidence we have gathered from recent independent expert reports using the Connect 4 database. As elaborated in Section 6.2, although the range of TMR estimates adopted by financial practitioners has declined modestly since 2017, they have not fallen to the same extent as the risk-free rate. As such, those findings provide quantitative corroboration of the qualitative evidence that the RBA has uncovered from discussions with market practitioners about the lack of sensitivity of the cost of capital to changes in interest rates.

Recent international evidence also points to the persistence of hurdle rates. A 2017 Duke University / CFO Magazine Global Business Outlook Survey surveyed 750 senior finance executives on their assumed hurdle rates. The survey found that respondents had maintained high hurdle rates despite falling interest rates. The median hurdle rate for US companies was 12% and the mean hurdle rate was 13.6%. Specifically in regard to the WACC, the median assumption was 9.8% and the mean was 10.6%.[96]

Dobbs, Koller and Lund (2014) from McKinsey Inc. have also contributed to the debate about the MRP:[97]

> … a "rational expectations" investor who takes a longer-term view should regard today's ultra-low rates as temporary and therefore likely will not reduce the discount rate used to value future cash flows. Moreover, such investors may assign a higher risk premium in today's environment. Our conversations with management teams and corporate boards suggest that they take a similar approach when they consider investment hurdle rates. None of those with whom we spoke have lowered the hurdle rates they use to assess potential investment projects, reflecting their view that low rates will not persist indefinitely.

94 Lane, K. & Rosewall, T. (2015), p.1.

95 Lane, K. & Rosewall, T. (2015), p.1.

96 Hyatt, J. (2017). Getting over hurdle rates, 12 September, Accessed on 15 May 2020 from: https://www.cfo.com/budgeting/2017/09/getting-hurdle-rates/

97 Dobbs, R., Koller, T. and Lund, S. (2014). "What effect has quantitative easing had on your share price?" McKinsey on Finance, Winter (49), p.16.

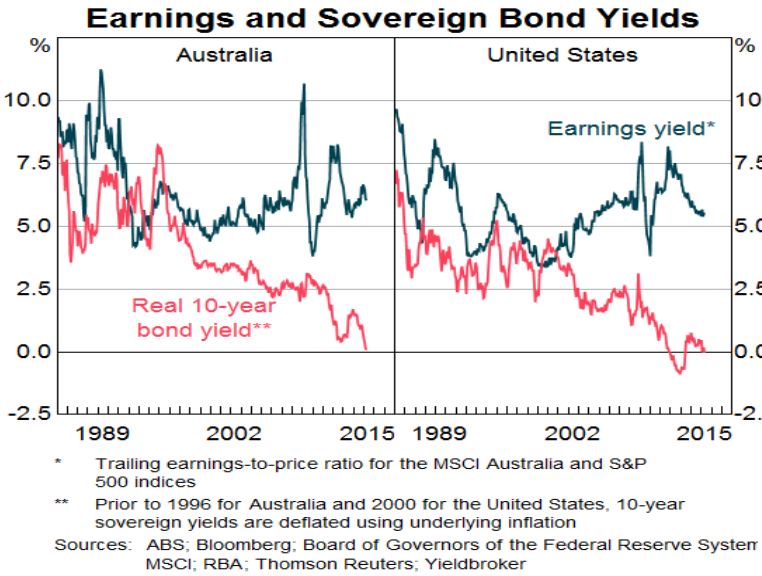
More broadly, post-GFC evidence supports the notion that the required return on equity is relatively stable over time. This point was implicitly made by Glenn Stevens, former Governor of the Reserve Bank of Australia, in a speech to the Australian American Association:[98]

> But another feature that catches one's eye is that, post-crisis, the earnings yield on listed companies seems to have remained where it has historically been for a long time, even as the return on safe assets has collapsed to be close to zero (Graph 2). This seems to imply that the equity risk premium observed *ex post* has risen even as the risk-free rate has fallen and by about an offsetting amount. Perhaps this is partly explained by more sense of risk attached to future earnings, and/or a lower expected *growth rate* of future earnings.
>
> Or it might be explained simply by stickiness in the sorts of 'hurdle rates' that decision makers expect investments to clear. I cannot speak about US corporates, but this would seem to be consistent with the observation that we tend to hear from Australian liaison contacts that the hurdle rates of return that boards of directors apply to investment propositions have not shifted, despite the exceptionally low returns available on low-risk assets.
>
> The possibility that, *de facto*, the risk premium being required by those who make decisions about real capital investment has risen by the same amount that the riskless rates affected by central banks have fallen may help to explain why we observe a pick-up in financial risk-taking, but considerably less effect, so far, on 'real economy' risk-taking.

The graph the Reserve Bank Governor referred to is reproduced in Figure 5.

98 Glenn Stevens, Address to The American Australian Association Luncheon, New York, USA – 21 April 2015.

Figure 5 Earnings and sovereign bond yields



Source: RBA

Figure 5 was constructed using data up to 2015. In order to verify whether the divergence between the earnings[99] and sovereign bond yields has persisted, we have updated this analysis using data to the end of February 2020.[100] Thus, Figure 6 compares earnings and sovereign bond yields for Australia and the US from 1995 onwards only. Nevertheless, new data since 2015 clearly illustrates that the spread between earnings and bond yield has not compressed over the last 5 years.

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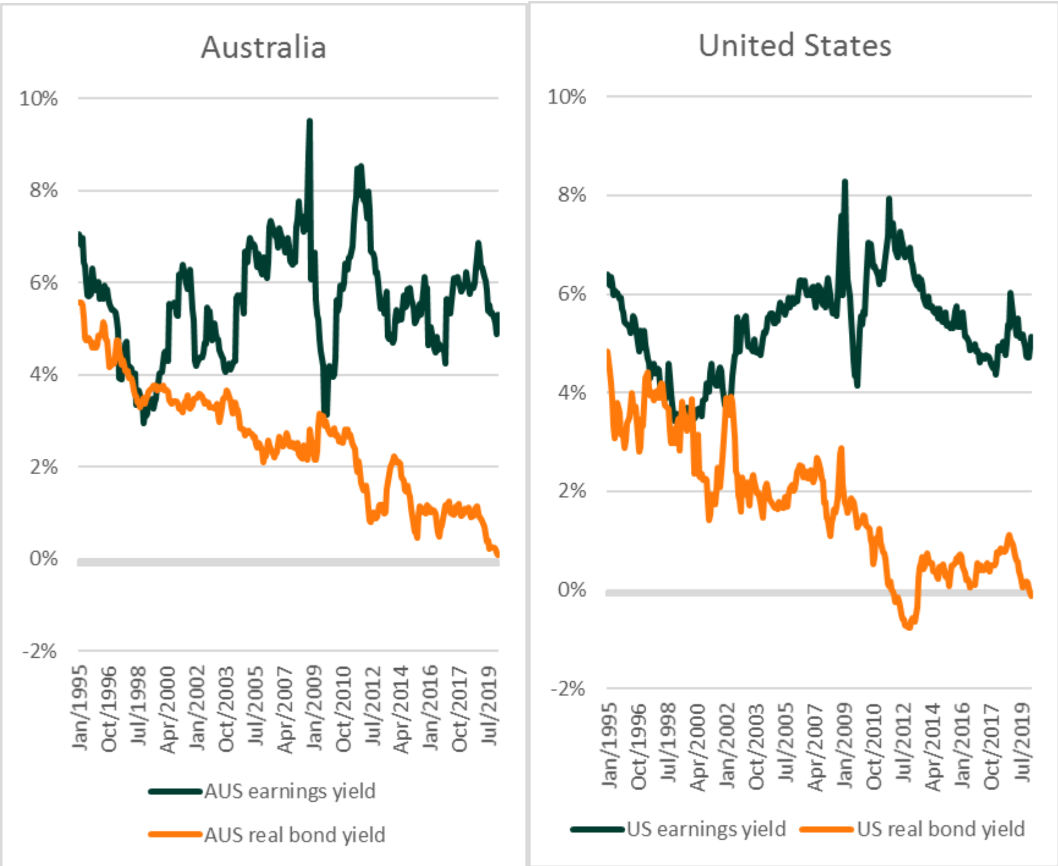
99 The earnings yield differs from the MRP as the latter when estimated using the Ibbotson and Wright approaches is based on "accumulation index" (dividend and capital gain).

100 Note that trailing earnings-to-price ratio data for the MSCI Australia prior to January 1995 was no longer available.

Figure 6 Updated earnings and sovereign bond yields, January 1995-present



Note: Trailing earnings-to-price ratio data for the MSCI Australia is no longer available on Bloomberg prior to January 1995.
Data source: Synergies analysis of Bloomberg, RBA and US Federal Reserve data

This evidence strongly points to the persistence of hurdle rates and the lack of sensitivity of the cost of equity to changes in interest rates. The market's assessment of the cost of equity does not adjust completely or automatically to changes in the risk-free rate. This in turn highlights that focusing on the risk-free rate or MRP in isolation of one another is misguided. This is particularly the case in the current environment, with the risk-free rate at all-time historical lows.

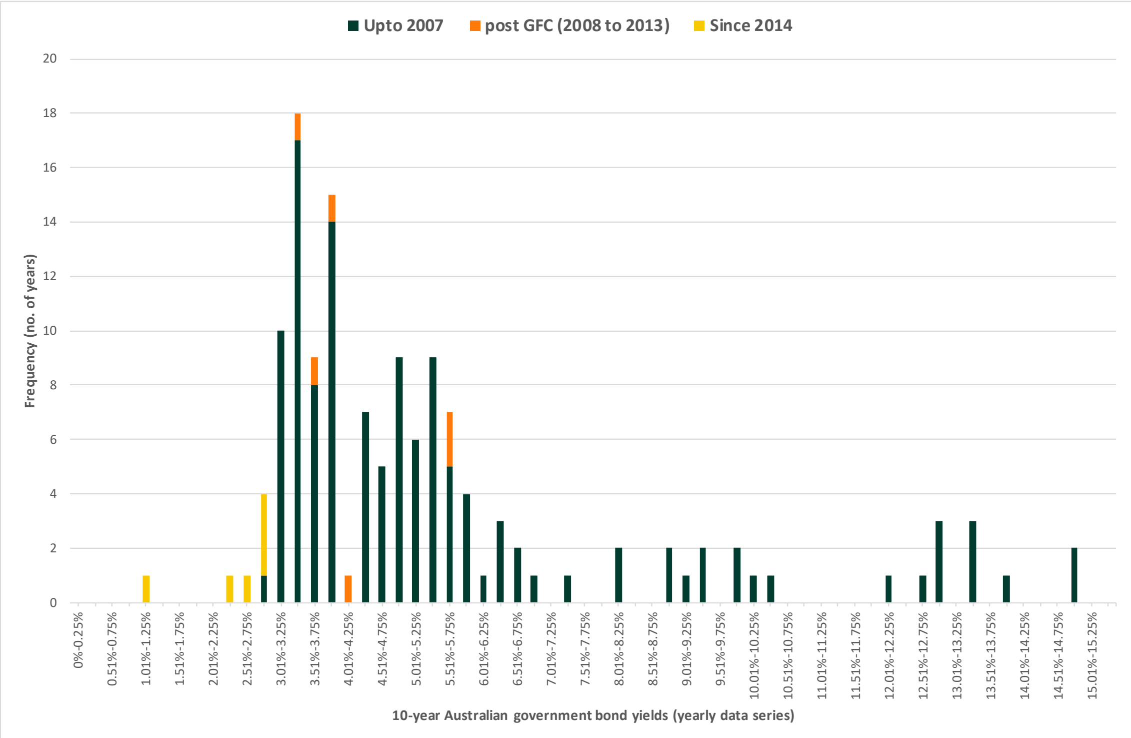
6.1.2 Current risk-free rate in an historical context

The prevailing risk-free rate is now even lower than it was at the time of these commentaries, which suggests that this persistent divergence of earnings yields and bond yields will be even more pronounced at the present time.

Figure 7 presents a frequency distribution of the 10-year Australian government bond yields (yearly data series) from 1883 to 2019, i.e. spanning 137 years. The data series has been split into three periods:

- up to 2007 denoted by the green bars to represent the period before the global financial crisis (GFC)
- 2008 to 2013 denoted by orange bars to represent the period during and post GFC; and
- Since 2014 denoted by yellow bars.

Figure 7 Frequency distribution of government bond yields from 1883 to 2019 (yearly data series)



Data source: Synergies analysis

Figure 7 shows that:

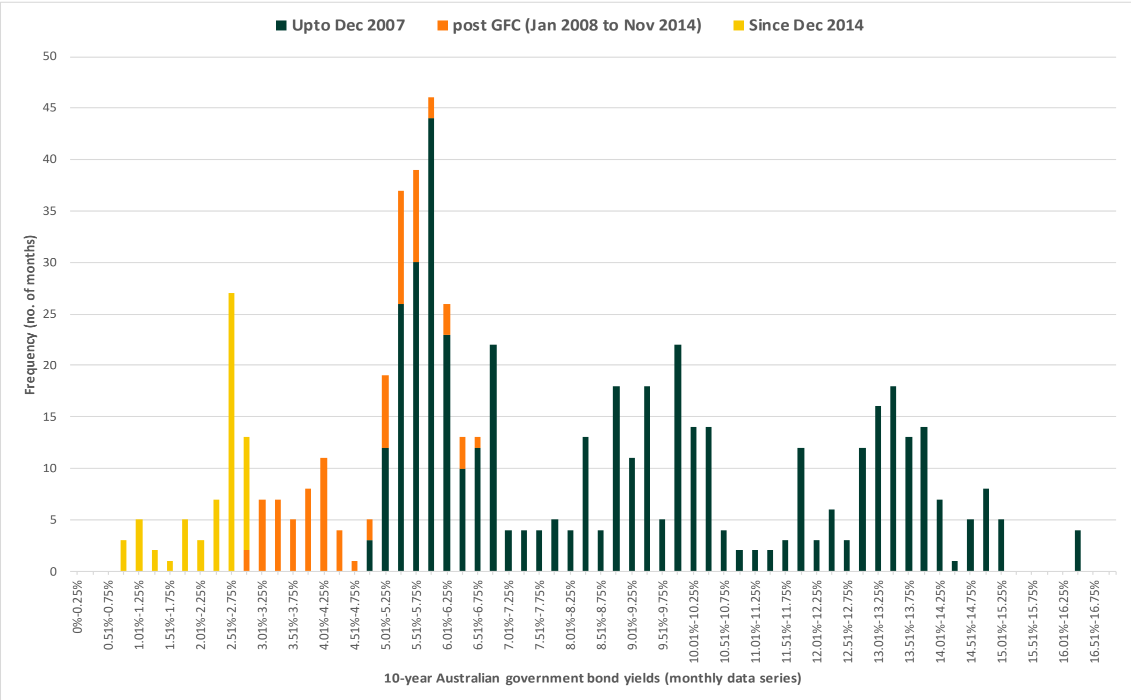
- There have been seven years in the past 137 years during which the average government bond yield was 3.0% or lower. These were 1897, and the six years from 2014 to 2019.
- The average yield in the very latest year in the dataset, 2019, was 1.20%, which is the minimum yield in the entire dataset. The average yield in 2019 is 427 basis points lower than the mean of the distribution (i.e. 5.47%) and 350 basis points lower than the median of the distribution (i.e. 4.70%).

Thus, these data show that prevailing government bond yields are abnormally low by historical standards.

Figure 8 presents a frequency distribution of the 10-year Australian government bond yields (monthly data series) from July 1969 (i.e. the period from when monthly data is available) to March 2020, split into three periods:

- Up to December 2007 (denoted by green bars)
- January 2008 to November 2014 (denoted by orange bars)
- Since December 2014 (denoted by yellow bars) when the government bond yield has consistently been below 3.0%.

Figure 8 Frequency distribution of government bond yields from July 1969 to March 2020 (monthly data series)



Data source: Synergies analysis

Figure 8 shows that:

- Since December 2014, the average government bond yield has consistently been below 3.0%.
- The average yield in the very latest month in the dataset, March 2020, was 0.90%. This is the minimum yield in the entire dataset. The average yield in March 2020 is 692 basis points lower than the mean of the distribution (i.e. 7.81%) and 584 basis points lower than the median of the distribution (i.e. 6.73%).

It is evident from these data that prevailing government bond yields are abnormally low by historical standards, and have consistently been so since December 2014. This is quite contrary to Partington and Satchell's claim that "the magnitude of current interest rates is not so dissimilar to the past".

The 10-year risk-free rate of 0.90% (as at 31 March 2020) is at an all-time record minimum during the period since July 1969.

One of the statutory objectives of the PMA is to protect the long-term interest of users, which cannot be achieved if regulated entities are not incentivised to engage in new investment which advances their consumers' long-term interests.

Based on this recent evidence, it is imperative to ensure that the TMR (being the sum of the risk-free rate and MRP) is compatible with achieving the statutory objectives. The efficient use of, and investment in, the provision of Prescribed Services for the long-term interests of port users and Victorian consumers is unlikely to be achieved if the MRP methodology is incapable of delivering an adequate return on equity under varying market conditions (as signalled by the level of government bond yields). This would preclude a provider of Prescribed Services from having a reasonable opportunity to recover the efficient costs of providing these services, in particular by preventing a return commensurate with the risks involved.

For these reasons, we have focussed on the TMR to make comparison between approaches across different regulators, regulatory regimes, finance practitioners and academics.

6.2 Evidence from financial practitioners

6.2.1 Independent expert reports

Further market evidence on the relationship between the MRP, the risk-free rate and the return on equity can be sourced from recent independent expert reports. These sources provide the clearest available indication of conditions in the workably competitive market for infrastructure finance. In an October 2018 independent expert report, KPMG highlighted that "market evidence indicates that bond yields and the market risk premium are strongly inversely correlated", and go on to stress that:[101]

> It is important that any assessment of the risk-free rate should be made with respect to the position adopted in deriving the market risk premium. As the market risk

[101] KPMG (2018a). Scottish Pacific Group Limited – Independent Expert report, 24 October, p.97. Available from: https://www.asx.com.au/asxpdf/20181026/pdf/43znynzr4xs52j.pdf [Accessed 25 May 2020].

> premium is based on a long-term view of the market, it is also important to do the same with the risk-free rate to ensure the combination of the risk free rate and market risk premium represents an appropriate return in the current investment environment.

This suggests to us that a comparison of TMR (i.e. risk-free rate plus the MRP, or the return on equity for a firm with an equity beta of 1) is relevant. This was the motivation for our previous comparisons with IPART's MRP (clarified below), which assumes a materially higher risk-free rate.

In an earlier January 2018 report, KPMG also stated that, "On balance, we consider adopting the spot Government Bond yield in isolation of a change in the MRP to be inappropriate and therefore have applied an adjusted risk-free rate."[102] With the 10-year Commonwealth Government bond rate still at near record low levels, this comment remains highly applicable to PoM's approach for setting its WACC.

Countering arguments that current interest rate conditions constitute a 'new normal', Grant Samuel argued in a separate 2018 report that they do not believe the current position is sustainable over the long term, and that "the risk is clearly towards a rise in bond yields."[103] Grant Samuel then went on to observe that some academics and valuation practitioners consider it to be inappropriate to add a "normal" market risk premium (e.g. 6%) to a temporarily depressed bond yield and therefore advocate that a "normalised" risk free rate should be used. They contend that this practice "has become increasingly common among broker analysts."[104] Grant Samuel has reproduced similar comments in more recent independent expert reports, such as for Bellamy's Organic in October 2019.[105]

The risk-free rate remains close to all-time lows, so the low interest rate phenomenon is an increasingly relevant consideration, which could foreseeably persist for some time. Although KPMG and Grant Samuel propose an adjustment to the return on equity via the risk-free rate rather than the MRP[106] both experts make clear that it is inappropriate

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[102] KPMG (2018b). Altona Mining Limited – Independent Expert's report, 9 January 2018, p.95. Available from: https://www.asx.com.au/asxpdf/20180219/pdf/43rnzgqt71q1vj.pdf [Accessed 25 May 2020].

[103] Grant Samuel (2018b). Billabong International Limited – Proposal from Boardriders, Inc., 13 February, p.51. Available from: https://www.asx.com.au/asxpdf/20180214/pdf/43rkvbcxd7jjw2.pdf [Accessed 25 May 2020].

[104] Grant Samuel (2018b), p.52.

[105] Grant Samuel (2019). Independent Expert's Report, Bellamy's Australia, 30 October, p.40. Available from: https://www.asx.com.au/asxpdf/20191031/pdf/44b3phn1xxth7f.pdf [Accessed 25 May 2020].

[106] Given the evidence of its implementation by both financial practitioners and regulators alike (both in Australia and overseas) we consider that this approach remains open to PoM.

to combine a long-term estimate of the MRP (as given by the Ibbotson approach) with a contemporaneous estimate of the risk-free rate (as given by the on-the-day approach).

In October 2019, Grant Thornton noted in an independent expert report for SeaLink Travel Group Limited that:[107]

> Global financial markets are currently witnessing significant volatility with several geopolitical factors, as mentioned above, adding to the fluctuation of bond rates. The RBA recently cut cash rates from 1.25% to 1.00% in July 2019 and further to 0.75% in October 2019. The current Australian spot rate is 0.95% as of September 2019. Although we note that the spot rate is currently 0.95%, given the significant volatility in global financial markets, we have placed more emphasis on the average risk-free rate observed over a longer period of time (e.g. 10 years).

This quote offers a useful overview of conditions in bond markets since PoM submitted its previous TCS in May 2019. Since Grant Thornton's commentary, the RBA has decreased its cash rate further to 0.25% as a result of the COVID-19 pandemic. It is too early to conclude how independent experts will respond to this major development, but it should be noted that the current risk-free rate of 0.90% (as at 31 March 2020) is very close to the spot rate of 0.95% that faced Grant Thornton in October 2019.

What this analysis further demonstrates though is that market conditions up until this point have not persuaded financial practitioners to decrease their cost of equity estimates by the same amount as the fall in the risk-free rate. Based on the position set out in their accompanying commentary for SeaLink Travel Group Limited, Grant Thornton ultimately adopted a risk-free rate of 3.5%, in conjunction with an MRP of 6.0%, resulting in a TMR of 9.5%.[108]

An October 2019 Lonergan Edwards & Associates report for Konekt Limited adopted a risk-free rate of 3%, reflecting its view of the average long-term risk-free rate, explaining that:[109]

> This exceeds the yield to maturity current prevailing on 10 and 20 year Australian Government bonds (of approximately 0.89% and 1.39% respectively as at 7 October

107 Grant Thornton (2019). SeaLink Travel Group Limited – Independent Expert's report and Financial Services Guide, 23 October, p.136. Available from: https://hotcopper.com.au/documentdownload?id=uOMxKKzFkiWRTLKhOROKAxjvSDYL4gm0yxj1v%2BR19LFiGug%3D. [Accessed 25 May 2020].

108 Grant Thornton (2019), pp.136-137.

109 Lonergan Edwards & Associates (2019). Independent Expert's Report for Konekt Limited, 11 October, p.39. https://www.konekt.com.au/images/investor-news/Confirmation-of-Release-KKT-ASIC-registration-of-Scheme-Booklet.pdf [Accessed 25 May 2020].

> 2019) as we believe current yields (notwithstanding their long-term nature) remain at unsustainably low levels. This is consistent with market practice when assessing the long-term rates of return required by investors.

Lonergan Edwards & Associates adopted an MRP assumption of 6.5%, (corresponding to a TMR of 9.5%), and explained its reasoning as follows:[110]

> Whilst, prima facie, recent lower interest rates globally have lowered the total equity return required by investors, based on our experience such investors have not reduced their required rates of return by the full extent of the fall in risk-free rates. Accordingly, in our opinion, it is appropriate to adopt an MRP of 6.5% (towards the upper end of the empirical studies) when used in conjunction with our risk-free rate of 3.0%.

Lonergan Edwards & Associates' rationale strongly supports the notion that while the required return on equity may partially move in line with changes in the risk-free rate, the relationship is far from one-for-one. Accordingly, if an MRP methodology seeks to replicate the outcomes of a workably competitive financial market, it appears reasonable to give at least partial weight to an approach that varies with the risk-free rate (such as the Wright approach). Moreover, the use of forward-looking methodologies, such as dividend discount models (DDMs), is also likely to be informative in revealing investors' expectations for the required return on equity. DDM MRP estimates are derived from market expectations about future dividend streams, and the implied return on equity that is needed to reconcile the discounted value of these anticipated cash flows with currently observed market prices. Consequently, DDMs indicate the relative responsiveness of the required return on equity in workably competitive financial markets to changes in the risk-free rate.

A key theme emerging from this market commentary is that a bottom-up compilation of WACC parameters needs to be supplemented by a wider consideration of a sufficient overall return on equity outcome to incentivise investment – it is the overall return on equity that ultimately provides (or does not provide) sufficient incentive for investment for statutory objectives to be fulfilled. When return on equity parameters such as the risk-free rate depart significantly from their long-term averages, it is imperative that this is at least partially accommodated in the TMR.

Our analysis of independent expert reports illustrates that this practice is widely accepted by financial practitioners, and the surveys we analyse in the following sections corroborate this approach at a whole-of-market level (noting that these surveys are

110 Lonergan Edwards & Associates (2019), p.39.

frequently cited by regulators and, in the context of the MRP, sometimes given explicit weighting, such as by the QCA).

However, the precise methodology for achieving these outcomes is not always explicit or replicable in a deterministic manner. Adjustments are made predominantly to the risk-free rate as opposed to the MRP, but the data (e.g. the length of the averaging period for long-run government bond yields) and general rationale underpinning the assumed risk-free rate are often subject to significant discretion. In a regulatory context, it is likely to be preferable to emulate these outcomes via a framework that can be applied with minimal discretion under changing market circumstances.

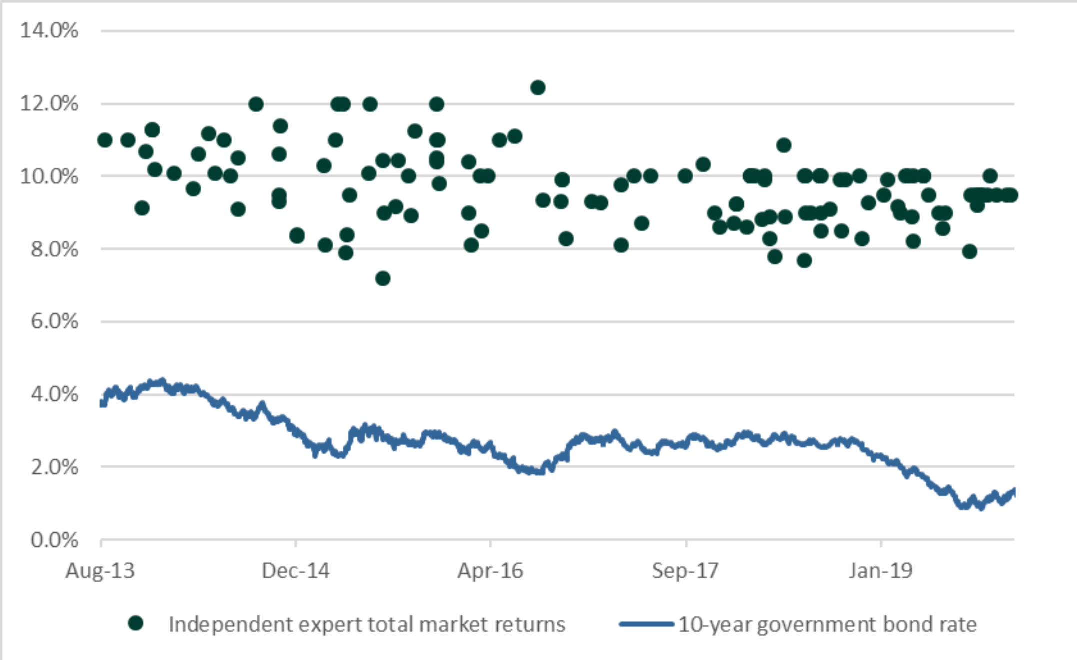
6.2.2 Connect 4 insights

Data on independent expert reports extracted from the Connect 4 database can also be used to generate estimates of the post-tax TMR, which is equivalent to the post-tax return on equity for an entity with an equity beta of 1.0. The median post-tax TMR across the sample period is 9.71% (with an average of 9.68%), as shown in Figure 9, with the prevailing 10-year government bond rate also shown for comparison.

This compares to the post-tax TMR of 8.47% that we currently estimate as at 31 March 2020 (based on 70% weighting to the Ibbotson MRP, 15% weighting to the Wright MRP and 15% weighting to DDMs, combined with an on-the-day estimate of the risk-free rate).[111] We do observe a modest decline in the TMR since 2017, with estimates used by independent experts clustering between 8% and 10%, but the TMR has not fallen to the same extent as the risk-free rate has over this same timeframe. Our TMR of 8.47% is towards the lower end of this range.

[111] 8.47% = risk-free rate (0.90%) + MRP (7.57%)

Figure 9 Post-tax TMRs implied by independent expert reports compared to 10-year government bond rate



Note: The TMRs in this chart are presented on a post-tax basis and do not include any ad hoc risk premia, which would further increase the post-tax return on equity for a firm with an equity beta of 1.

Data source: Connect 4, Synergies calculations

6.2.3 2019 KPMG Valuation Practices Survey

The 2019 KPMG Valuation Practices Survey provides critical insights into the TMR adopted by financial practitioners in Australia. The QCA uses the survey as part of its "Survey and independent expert" estimate, which the QCA assigns a weighting of 20%.[112] The survey is also relied upon by the AER and ACCC to inform a point estimate for the MRP (although these regulators do not specify an explicit weighting).[113]

Firstly, in regard to the risk-free rate, survey participants were asked about the risk-free rate that they adopt, and whether they have changed this risk-free rate over the preceding 12 months. Respondents were asked to provide estimates as at 30 June 2019. In doing so, they were asked to assume that the hypothetical valuation is being completed for a "perpetual life Australian asset". Given the long-lived nature of transportation infrastructure, we consider this to be a reasonable benchmark for the BEE. In considering the findings of the survey, it is worth noting that the 20-day average on

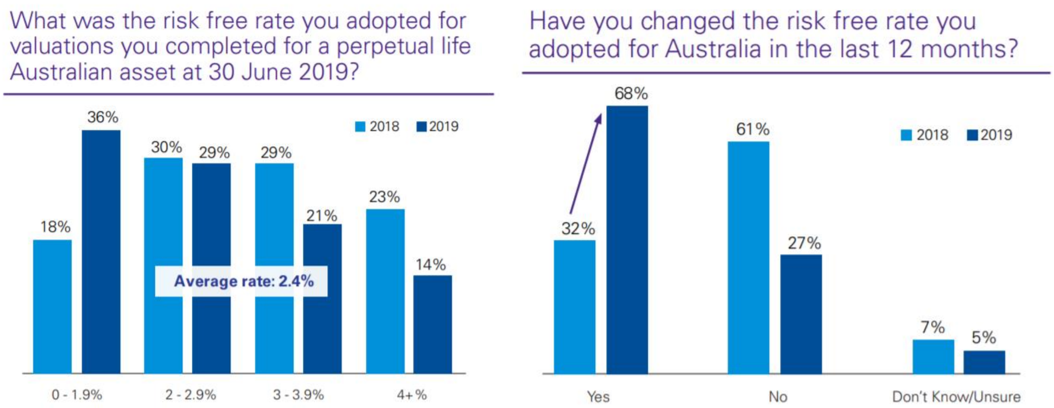
[112] QCA (2018). Aurizon Network's 2017 draft access undertaking – Appendices, December, p.57.

[113] AER (2018). Rate of return instrument – Explanatory statement, December, p.271; ACCC (2018). Australian Rail Track Corporation's 2018 Interstate Access Undertaking, 20 December, p.131-132.

10-year Commonwealth Government bonds at this time was 1.39% (effective annual rate).

As shown in Figure 10, the average risk-free rate used by practitioners as at 30 June 2019 was 2.4% (left panel) - 100 basis points above the contemporaneous risk-free rate. KPMG also reported that 64% of respondents adopted a risk-free rate of 2% or above. The right panel of Figure 10 illustrates that 68% of survey respondents changed their adopted risk-free rate in the 12 months to 30 June 2019. Separately, KPMG reported that, among those practitioners who changed their rate, the average adjustment was a decrease of 0.6%. This is a notable finding, because the 20-day average on 10-year government bonds as at 30 June 2018 (i.e. 12 months earlier) was 2.72%. That is, while the short-term risk-free rate decreased by more than 130 basis points (from 2.72% to 1.39%), the risk-free rate adopted by practitioners fell by less than half this amount.

Figure 10 Risk-free rates adopted by KPMG survey participants as at 30 June 2019

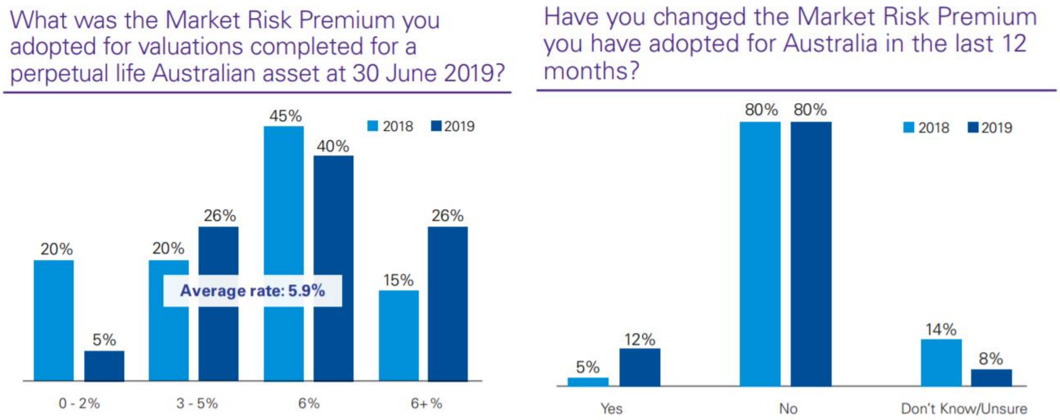


Note: The 20-day average of the 10-year risk-free rate was 1.39% as at 30 June 2019, compared to 2.72% a year earlier.
Data source: 2019 KPMG Valuation Practices Survey

Secondly, survey participants were asked about the MRP that they adopt, and whether they have changed this estimate over the preceding 12 months. Again, respondents were asked to provide estimates as at 30 June 2019. Figure 11 indicates that, although the average MRP was 5.9%, 66% of respondents adopted an MRP of 6% or higher. When combined with the average risk-free rate of 2.4% (which is 150 basis points higher than the current risk-free rate for PoM), the average MRP leads to an average TMR of 8.3%.[114] However, we also note below that when asked directly about the cost of equity for an equity beta of 1 (which is equivalent to the TMR), the average among survey participants was 8.8%.

114 Average total market return = average MRP + average risk-free rate = 5.9% + 2.4% = 8.3%.

Figure 11 MRP estimates adopted by KPMG survey participants as at 30 June 2019

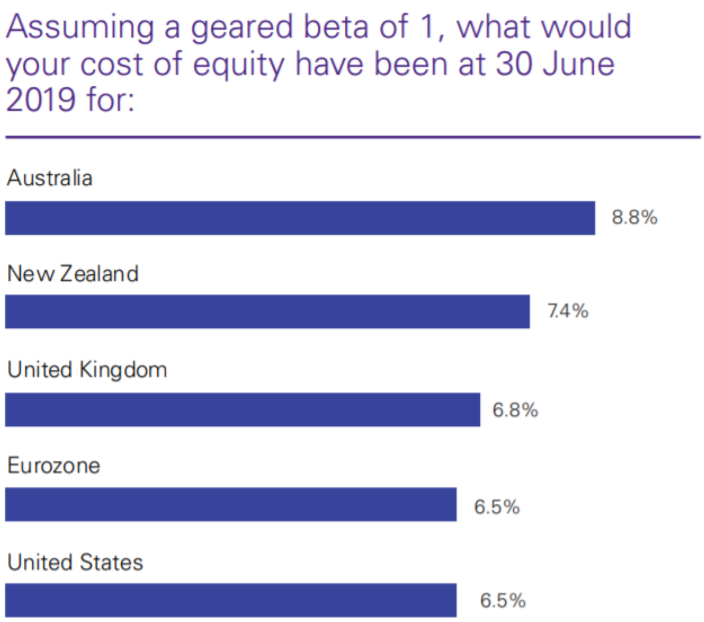


Data source: 2019 KPMG Valuation Practices Survey

Finally, survey participants were asked about the cost of equity they would assign to a firm with a geared (i.e. equity) beta of 1, which is equivalent to the TMR. As evidenced by Figure 12, the TMR for Australia of 8.8% was significantly higher than the TMRs applied for New Zealand, the UK, the US or the Eurozone. As mentioned above, the contemporaneous 20-day average of the risk-free rate was 1.39% as at 30 June 2019 (the date of the survey). If this risk-free rate were adopted (as would be the case in a regulatory process), the TMR used by financial practitioners could not be achieved unless an MRP of 7.41% is adopted.[115] Although practitioners reported using a value lower than 7.41% when directly asked about the MRP, they combined this lower MRP with a risk-free rate that was well above the 20-day average. This highlights the importance of considering the MRP and risk-free rate in conjunction with each other, rather than in isolation.

115 The total market return is the sum of the MRP and the risk-free rate, or alternatively, the MRP is the total market return less the risk-free rate. Accordingly, if the contemporaneous risk-free rate of 1.39% is subtracted from the stated total market return of 8.8%, an MRP of 7.41% results.

Figure 12 Total market return used by KPMG survey participants

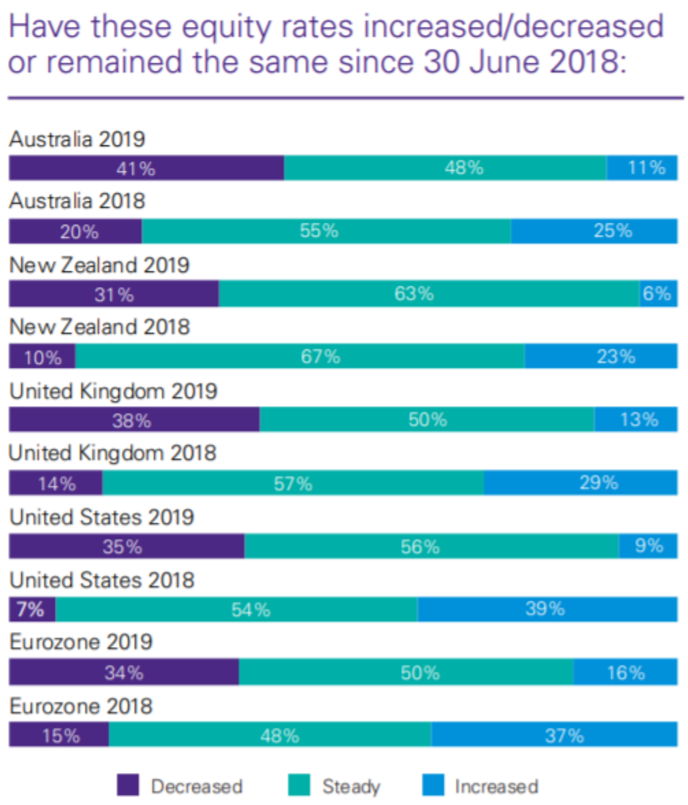


Note: Geared beta and equity beta are equivalent terminology.

Data source: 2019 KPMG Valuation Practices Survey

Respondents were also asked whether equity rates (which, in the context of KPMG's survey, are equivalent to the TMR) had changed or remained the same since the previous survey. Despite a falling risk-free rate, the majority of respondents considered that the TMR had either increased or remained the same. For the Australian market, 48% perceived equity rates to be steady, while 11% perceived that they had increased and 41% perceived that they had decreased (see Figure 13).

Figure 13 Perceived changes in TMRs by KPMG survey participants



Note: In the KPMG survey, equity rates and TMR are analogous.
Data source: 2019 KPMG Valuation Practices Survey

Insights from earlier KPMG surveys are summarised in Attachment B.

6.2.4 Fernandez et al. (2019) and (2020) Surveys

The international survey administered by Professor Pablo Fernandez has also been referred to by economic regulators.[116] As with the KPMG survey, the QCA uses the survey as part of its "Survey and independent expert" estimate, which the QCA assigns a weighting of 20%.[117] The survey is also relied upon by the AER and ACCC to inform a

[116] Fernandez, P., Martinez, M. & Fernandez Acin, I. (2019). Market risk premium and risk-free rate used for 69 countries in 2019: A survey; Fernandez, P., de Apellaniz, E. & Acin, J.F. (2020). Market risk premium and risk-free rate used for 81 countries in 2020, p.12. An overview of Fernandez surveys from previous years is provided in Attachment B.

[117] QCA (2018). Aurizon Network's 2017 draft access undertaking – Appendices, December, p.57.

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point estimate for the MRP (although these regulators do not specify an explicit weighting).[118]

In this section, we present the results from both the 2019 and 2020 surveys. This comparison is informative, because as Fernandez et al. (2020) observed in their latest paper:[119]

> More than fifty respondents provided answers at the beginning of March and later, considering the coronavirus. Most of them increased the MRP by 2%.

This suggests that the impact of coronavirus is already having an impact on financial practitioners' views on the required market return. The report is not specific about how many of these later respondents reside in Australia.

Survey respondents in 81 countries (69 countries in the 2019 survey) were asked about the risk-free rate, market risk premium and TMR[120] that they use. The data for Australia for 2019 and 2020 is displayed in Table 12.

Table 12 Market parameters for Australia in Fernandez et al. (2019) and (2020) surveys

	Number of responses		Average		Median		Minimum		Maximum	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
MRP	54	37	6.5%	7.9%	6.1%	6.2%	3.0%	2.8%	14.0%	20.4%
Risk-free rate	54	37	2.8%	2.4%	2.8%	2.4%	1.0%	0.8%	5.0%	4.2%
Total market return	54	37	9.2%	10.3%	8.7%	9.0%	5.0%	4.5%	18.0%	23.3%

Note: The 2019 survey asked respondents to report the parameters they used in 2019. Thus, no specific point in time is specified as in the KPMG survey. However, Fernandez et al. (2019) report that they initially sent out emails to survey participants in February 2019, and responses were collated by 22 March 2019. Similarly, the 2020 survey asks participants to report the parameters they used in 2020, again with no specific point in time specified, but responses were collated by 23 March 2020.

Source: Fernandez et al. (2019), Fernandez et al. (2020)

In 2020, Australian practitioners reported using an average TMR of 10.3% (median 9.0%), a substantial increase from the 2019 average TMR of 9.2% (median 8.7%), especially given that the reported average and median risk-free rates fell from 2.8% to 2.4%. This was offset by an increase in the average MRP from 6.5% to 7.9%, as well as an increase in the median MRP from 6.1% to 6.2%.

[118] AER (2018). Rate of return instrument – Explanatory statement, December, p.271; ACCC (2018). Australian Rail Track Corporation's 2018 Interstate Access Undertaking, 20 December, p.131-132.

[119] Fernandez et al (2020), p.1.

[120] Fernandez et al. (2019) refers to the total market return as the "required return to equity (market)," but makes clear that it is the sum of the risk-free rate and the MRP.

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Despite the average and median risk-free rate inputs used by Australian practitioners decreasing between 2019 and 2020, both the average and median TMRs increased since the previous survey. Not only does this imply a higher MRP, but it also indicates that practitioners' views of the required market return have not decreased as a result of falling risk-free rates. In any event, the 40 basis point decrease in the risk-free rate among surveyed practitioners (from 2.8% in 2019 to 2.4% in 2020) was less than the fall in the on-the day risk-free rate. The 20-day average as at 31 March 2019 was 1.96%, compared to 0.90% as at 31 March 2020. This decrease of more than 100 basis points is more than double the decline in the risk-free rate that was reported by survey practitioners.

6.2.5 Evidence of a well accepted approach

The evidence of the returns adopted by finance practitioners, corroborated by relevant survey evidence, confirms that it is a well accepted practice, when applying the SL CAPM, to determine the TMR by reference to factors additional to the prevailing risk free and the historical MRP (at least where the MRP is informed by reference to the Ibbotson approach).

This presents a challenge to a WACC assessment in a regulated environment given the desirability of adherence to the regulatory principles identified in Chapter 3 (i.e. accuracy, stability, predictability, replicability, transparency). This means that it is not appropriate to simply apply judgement to determine an increment to the risk-free rate. The judgement frequently applied by financial practitioners is not, in and of itself, an approach that lends itself immediately to regulatory application.

However, IPART's approach (i.e. taking the midpoint of a 10-year average of the risk-free rate and a short-term average of the risk-free rate) represents one way that adjustments can be made to the risk free rate to acknowledge the relevance of longer term averages of the risk free rate. OTTER's approach is broadly consistent with IPART's methodology.

Similarly, the Wright and the DDM approaches provide well accepted approaches of backward and forward looking methods to estimating the MRP that is consistent with financial practitioner views that the rate of return does not adjust precisely in line with movements in the risk free rate.

Additionally, regulators including the AER, QCA, ACCC, OTTER, and ESCOSA have frequently considered relevant survey evidence (including the survey evidence presented here) when assessing the market risk premium and, in turn, the TMR.

6.3 Regulatory approaches to the TMR

It is important to understand how the approach in financial markets differs from the practice of Australian economic regulators. This section begins with a brief overview of regulatory approaches to the risk-free rate and market risk premium, before combining these into estimates of TMRs.

6.3.1 Regulatory approach to the risk-free rate

Following the QCA draft decision for Queensland Rail released in April 2019 (and reaffirmed in the final decision), all Australian regulators assume a 10-year risk-free rate in their transport determinations.[121]

In regard to averaging periods, the most common regulatory practice is to average the rate over a short horizon, which typically ranges from between ten and forty days, noting that over such a short horizon the choice of averaging period is likely to be of little consequence. Relevantly, IPART and OTTER are two Australian regulators that take into consideration longer term averages, which they do in conjunction with short-term estimates.[122]

In this respect, IPART's and OTTER's approach reflects the practice of financial practitioners in looking beyond the spot rate on 10-year Commonwealth bonds to inform the risk free rate for the purposes of assessing the rate of return. In particular, IPART explicitly informs its MRP estimate by reference to a long term average of the 10-year Commonwealth bond rate. This closely resembles the approach observed in financial practitioner valuations.[123] It also reflects the practice of regulators in Europe to have regard to longer term averages of bond rates when setting the risk-free rate.[124]

Therefore, consideration of longer-term averages (over a decade) of the risk-free rate is a well accepted approach.

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121 The ERA continues to apply a term-matching rate for its electricity and gas decisions.

122 OTTER (2018). 2018 water and sewerage price determination investigation, p.166. OTTER determines the risk-free rate as follows. First, it calculates a 40-day average of 10-year Commonwealth Government Securities. Second, it calculates the daily average of the last one, two, three, four, five, six, seven, eight, and nine years of yields on 10-year government securities. Then, it calculates an average based on the 40-day average and each of the various annual historical averages. Finally, it determines the risk-free rate as the midpoint of this average (of averages) and the 40-day average. As at 31 March 2020, this approach results in a risk-free rate of 1.54%.

123 While we consider this approach remains open to PoM, we have sought to maintain consistency between the on-the-day risk-free rate used in the return on equity, and the same on-the-day risk-free rate used to calculate the annual on-the-day cost of debt (which is then used to update the trailing average).

124 See NERA Economic Consulting (2020) Review of Regulators' Approaches to Determination of the Market Risk Premium

Updated risk-free rate for PoM

We have updated our risk-free rate estimate for PoM based on 10-year Commonwealth Government bond yields and a 20-day averaging period to 31 March 2020. As the quoted rates are semi-annual, we have converted them to annual effective rates.[125] The resulting estimate is 0.90%.

6.3.2 Regulatory decisions on the MRP

Table 13 summarises the most recent MRP estimates derived by Australian economic regulators, which range from a low of 5.9% to a high of 7.4%.

Table 13 Most recent MRP estimates applied by Australian regulators

Regulator	Date	Sector	MRP (per cent)	Summary of approach
IPART	February 2020	Biannual WACC update	7.4% based on the February 2020 range of 6.0% - 8.8%. Increases to 9.25% once account is taken of uplift to risk-free rate	Based on long-run historical excess returns, and forward looking evidence, giving a 2/3 weight to DDM results and 1/3 weight to economic market indicators
QCA	February 2020	Rail	6.5%	Applies a weighted average of Ibbotson (25%), Cornell DDM (25%), Surveys (20%), Siegel (15%) and Wright (15%)
ERA	May 2019	Rail	5.9%	Applies Ibbotson and DDM estimation results, more weight on historical approach
ACCC	December 2018	Rail	6%	Considers historical estimates, surveys, and previous regulatory decisions with most weight put on historical estimates.
ESCOSA	March 2020	Water	6%	Applies Ibbotson based on the longest time series available (being 1833 – 2017). Uses surveys as a cross check.
ESC	July 2016	Water	6%	In its June 2016 Melbourne Water decision it applied an MRP of 6%, which was originally contained in a Guidance Paper. The reasoning behind this was not provided. It reflects a preference for relying on historical excess returns to estimate the MRP
AER	December 2018	Electricity and Gas	6.1%	MRP set using the Ibbotson method with regard had to DDM and surveys
OTTER	May 2018	Water	6.5%	Based on AER 2013 guidelines and judgement based on evidence from historic excess returns, survey evidence, DDM
ICRC	May 2018	Water	6.5%	Adopted the MRP used in the AER's 2013 Rate of Return Guidelines

Source: Synergies based on Australian regulatory determinations

125 Annual effective rate = (1+ semi-annual rate/2)^2 -1

The key point to note in terms of Australian regulators' recent determined MRPs is that a range of approaches are applied and it is common for regulators to combine several methodologies, having regard to:

- IPART derives its feasible MRP range based on long-run averages and current market data. The latter value is derived from with a weighting of two-thirds assigned to DDMs. IPART applies the mid-point of its MRP range. However, IPART's MRP estimate as a margin above the contemporary risk-free rate is greater than its reported value (7.4%) because of the higher risk-free rate assumed in its approach.[126]

- The QCA has continued to apply four main methods to estimate the MRP, being two forms of historical averaging (the Ibbotson and Siegel averaging methods), survey evidence (including independent expert reports), the Cornell DDM and the Wright MRP.[127]

- The AER relies primarily on the Ibbotson approach. It has diminished confidence in the Wright MRP and places no reliance on it. It also has diminished confidence in DDMs, but states that they can still inform the MRP, although the AER did not select an MRP towards the top of the observed range of historical excess returns (i.e. Ibbotson estimates) using this evidence as it had done previously. On the other hand, the AER does have regard to surveys to inform the MRP estimate.

- ESCOSA and ESC appear to rely solely on historical long-term averages based on the Ibbotson averaging approach.

Clarification on IPART's effective MRP

In the 2018 interim commentary, the ESC asked us to clarify why and how IPART's MRP should be converted into an 'effective' value, which in the 2019-20 report we estimated to be 8.49%. The ESC did not comment further on this issue in the 2019 interim commentary, but we have presented this analysis again in this year's report for completeness. IPART has since updated its MRP and risk-free rate estimates, so we use its most recent market update (published in February 2020) as an illustration.

IPART currently applies a risk-free rate of 2.75% in all of its decisions (185 basis points above the current risk-free rate of 0.90%). This is derived from the midpoint of a 'current' estimate, which provides a risk-free rate of 2.3% (as at 31 January 2020) and is used in

126 IPART (2020). WACC biannual update, February, p.2.

127 QCA (2020). Queensland Rail's 2020 draft access undertaking – Decision, February.

conjunction with its short-run MRP based on DDMs, and a 10-year estimate, which IPART calculates to be 3.2% (also as at 31 January 2020) and uses in conjunction with its long-run MRP assumption of 6%. IPART's use of a long-run average risk-free rate in conjunction with a long-run MRP estimate reflects the approach observed in financial practitioner valuations.[128]

The reason why this higher risk-free rate needs to be reflected in the MRP estimate becomes apparent when we consider the TMR allowed by IPART and other economic regulators. IPART's TMR is calculated as follows:

Total market return = risk-free rate + market risk premium

= 2.75% + 7.40%

= 10.15%

However, if we assume a risk-free rate of 0.90% for PoM (as at 31 March 2020), a TMR of 10.15% could only be achieved if a market risk premium of 9.25% were used. As a result of this, the market risk premium that is consistent with IPART's TMR is well in excess of 9%.

In a more recent April 2020 consultation paper, IPART published preliminary WACC parameter estimates for March 2020.[129] It reported a range for the MRP of between 6% (long-run MRP estimate) and 9.7% (short-run MRP estimate). The long-run risk-free rate was 3.10%, while the short-run risk-free rate was 0.90%, leading to a midpoint risk-free rate of 2%. Using the midpoint parameter estimates, this implies a TMR of 9.85% as at March 2020 (i.e. 2% + 7.85%). This remains well above our proposed TMR of 8.47%.

In addition, IPART noted that its uncertainty index has now moved more than one standard deviation from its long-term average. According to its WACC decision rule, if the uncertainty index is greater than one standard deviation from its long-term average, IPART may consider moving away from its midpoint WACC. In the April 2020 consultation paper, IPART stated that it "has the discretion to modify weights given to current and long-term average market observations."[130] However, it also stressed that it has not yet made a decision on what weights to apply to set WACCs for the 2020 determinations of prices for Sydney Water, Hunter Water and Water NSW Greater

128 While we consider this approach remains open to PoM, we have sought to maintain consistency between the on-the-day risk-free rate used in the return on equity, and the same on-the-day risk-free rate used to calculate the annual on-the-day cost of debt (which is then used to update the trailing average).

129 IPART (2020). Consultation on debt margin, 9 April.

130 IPART (2020), p.6.

Sydney. These determinations are unlikely to be released until after PoM is required to submit its 2020-21 TCS.

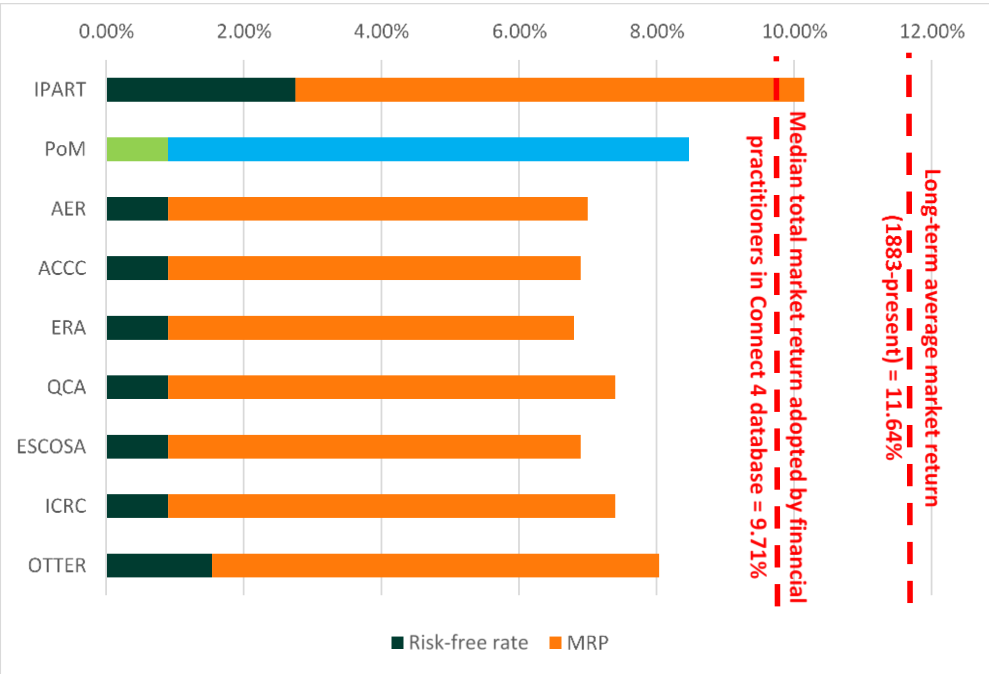
We put this into the context of other Australian regulators' implied market returns in the next section.

Attachment B provides more details on Australian regulators' estimation of the MRP.

6.4 Regulatory estimates of TMRs

Figure 14 shows a wide range for the TMR currently applied by Australian regulators. This effectively shows how these regulatory bodies would assess the return on equity for a firm with an equity beta of 1. All Australian regulators now assume a 10-year risk-free rate in their transport determinations.[131] As such, we have adopted for these regulators the same current 10-year risk-free for PoM, which we calculate to be 0.90%. This ensures that we are making comparisons at the same point in time.

Figure 14 Market returns applied by Australian regulators



Data source: Various regulatory decisions

The TMR ranges between a minimum of 6.90% for the ACCC and ESCOSA, and a maximum of 10.15% for IPART. This compares to a TMR of 8.47% for PoM (based on a

[131] The ERA continues to apply a term-matching rate for its electricity and gas decisions. For IPART and OTTER, we have updated their methodologies for calculating the risk-free rate to March 2020.

70% weighting on the Ibbotson MRP, a 15% weighting on the Wright MRP and a 15% weighting on DDMs). This estimate is well below the median TMR applied by financial practitioners according to our analysis of the Connect 4 database in Section 6.2.

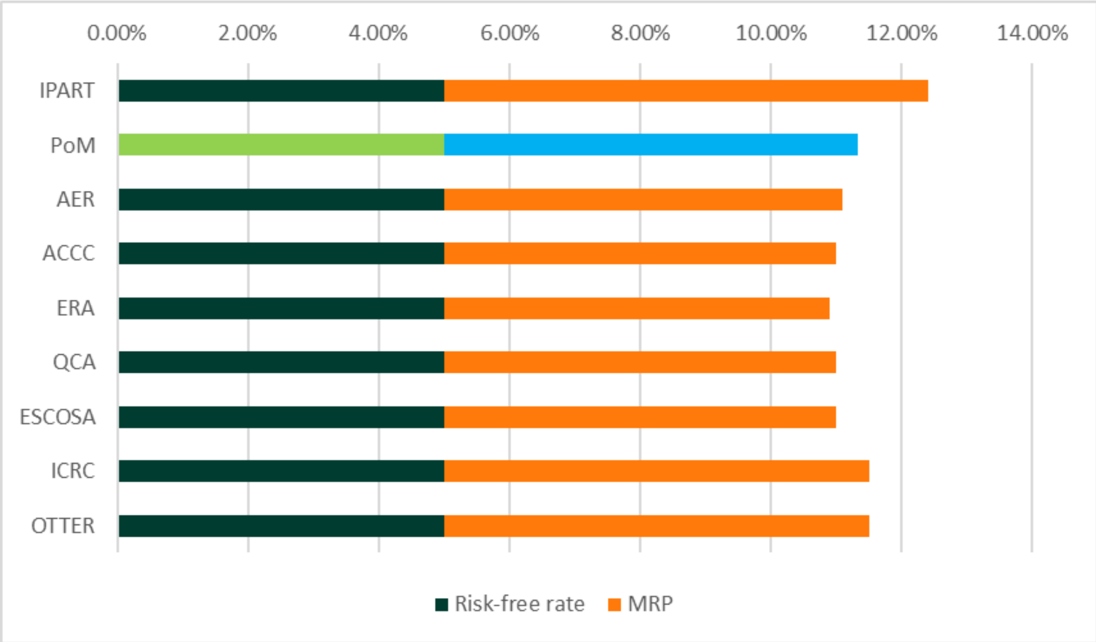
Australian regulators with total markets returns at or around 7% combine a short-term average of the risk-free rate with a long-term average of the historical excess return. If the short-term risk-free rate is reflective of conventional market conditions, then this is less likely to be problematic. Current market conditions are far from this ideal, with Commonwealth Government bond yields close to all-time lows. This is not to say that the long-term averaging period for the MRP is inappropriate. It is wholly appropriate that a long-term data series should be employed, where available. However, regard must be had to the range of risk-free rates that have underpinned these historical excess returns over time. Between 1883 and 2019, the average government bond yield was 5.5%.[132]

As a hypothetical scenario, it is useful to observe how this regulatory range would adjust to a risk-free rate of 5% (which has been observed as recently as 2011 and is close to the long-run risk-free rate underpinning the Ibbotson estimate). This is shown in Figure 15. While DDMs are more responsive to different market conditions, the heavy reliance on the Ibbotson approach means that regulatory MRPs are likely to remain relatively constant over time (except for the QCA, for which we have performed an indicative adjustment based on the weight given to the Wright approach). There is a notable compression of market return estimates, and PoM's approach places it far closer to notional regulatory outcomes when the risk-free rate is higher.

This verifies the notion that an MRP informed primarily by Ibbotson is more appropriate when the risk-free rate is measured over the same period over which the TMR is assessed. This is not surprising as the Ibbotson approach inherently looks to the excess return measured relative to the long-term average risk-free rate (even though it is expressed as being an increment to the current risk-free rate). Moreover, the TMRs in Figure 15 are more in line with those applied by independent experts, as evidenced by the findings from the Connect 4 database in Section 6.2.

132 The average bond yield across shorter sampling periods is actually higher (between 6.2% and 7.7%).

Figure 15 Notional market returns at a risk-free rate of 5%



Note: We have adjusted the QCA's MRP estimate based on our expected impact of the risk-free rate given their weighting on the Wright MRP

Data source: Synergies analysis

In summary, combining an on-the-day risk-free rate with a largely constant MRP will lead to a fluctuating return on equity over time. This, in and of itself is not necessarily a concern to the achievement of the relevant statutory objectives. However, excessive fluctuation in the returns earned by a regulated infrastructure would be inconsistent with the regulatory objectives wherever it compromises the efficient investment in the provision of Prescribed Services for the long-term interests of users and consumers.

All else being the same, it is reasonable to expect that consistency and stability in the returns able to be earned by regulated infrastructure providers will provide these infrastructure providers with the necessary confidence to invest where doing so will contribute to this objective being realised. It is emphasised that confidence in the rate of return outcomes under the regime will be crucial to encouraging the investment the PMA seeks to promote.

In this context, the market evidence from Sections 6.1 and 6.2 makes clear that required rates of return are not as sensitive to these short-run market fluctuations as the approaches of some Australian regulators seem to imply. Moreover, international regulatory precedent supports the use of approaches to the assessment of the MRP that result in more stable rate of return allowances over time.

6.5 Determining a TMR for PoM

The contrast between the outcomes in financial markets and the outcomes of some regulatory methodologies currently applied in Australia raises an important question on how to set the TMR in a way that is consistent with the requirements of the Pricing Order and best capable of achieving the statutory objectives.

The approach of financial practitioners is inherently top-down in nature. The commentary we have presented from independent experts such as Grant Samuel clearly demonstrates that a simple bottom-up compilation of market parameters is not guaranteed to generate an adequate return on equity outcome. In this sense, the well accepted approach among financial valuation experts is to assume a relatively constant MRP, but to provide an uplift to the risk-free rate (or to make other adjustments) in order to ensure that the TMR (i.e. the overall return on equity) allowance is appropriate for the valuation.

Whilst the end result is similar (which is crucial to advancing the statutory objectives), this approach is somewhat different from that which we have previously applied for PoM. We have adopted the prevailing regulatory practice (with the exception of IPART and OTTER in Australia and numerous European regulators) of adopting a short-term average of the contemporaneous risk-free rate, combining this with an MRP methodology that appropriately accommodates fluctuations in the risk-free rate. This ensures that our MRP estimate for PoM moves inversely with the risk-free rate, albeit only partially.

6.6 Ibbotson MRP

6.6.1 The approach

The Ibbotson approach calculates the MRP by taking the difference between the long-term observed average return on the market and the risk-free rate. This method assumes that the market risk premium remains stable over time, and the overall return on market will fluctuate largely in-step with the risk-free rate of return. It is also known as the historical excess returns (or HER) method. The expected return on the market is then determined by adding current risk-free rate to the historic excess market return.

6.6.2 Adoption by regulators

Table 14 shows the adoption of the Ibbotson approach by Australian regulators.

Table 14 Ibbotson MRP: adoption by regulators

Regulator	Summary of approach	Accept/Reject
AER	HER approach Considers a fixed MRP based on relevant risk-free rate, determined at the beginning of the regulatory period, provides a more appropriate reflection of the risks businesses face over the regulatory period	Acceptance
QCA	One among several methods used Considers a range of evidence and applies judgement in arriving at an estimate of the market risk premium. The range of evidence the QCA considers includes historic return estimates averaged using the Ibbotson historical averaging method and the Siegel historic averaging method, survey evidence, and a dividend growth model	Acceptance
IPART	Equal weighting on HER approach and DDM IPART calculates both a “historic” and a “current” cost of capital, and estimates both a historic and a forward looking MRP. It places equal weight on the historic and current approach when the market is in a “normal” state, and it uses its regulatory discretion on how these estimates are combined when the market is not in a normal state IPART notes that an increasing (or decreasing) RFR tends to be offset by a decreasing (or increasing) MRP, i.e. the RFR and MRP negatively co-vary.	Acceptance
ERA	HER approach, and some weight on DDM Uses HER approach to set the bottom of the range and the DGM to set the top of the range. But in its most recent electricity decision it decided to place less weight on the DGM and used regulatory judgement to select a point estimate slightly below the mid-point.	Acceptance
ESCOSA	HER approach ESCOSA states that while there is some evidence on an inverse relationship between MRP and RFR, the magnitude and timing is ambiguous	Acceptance
ICRC	Greatest weight to HER (follows AER)	Acceptance
OTTER	Greatest weight to HER (follows AER)	Acceptance
ACCC	Greatest weight to HER Considered historical estimates, market surveys and previous regulatory decisions when considering the appropriateness of a 6 per cent MRP for ARTC HVN, and placed most reliance on historical estimates	Acceptance

Source: Synergies based on Australian regulatory determinations

6.6.3 Estimating the MRP under the Ibbotson approach

In the 2018 interim commentary, the ESC recommended that we provide more transparency as to how our MRP value is derived. Specifically, the ESC observed that our estimate for the Ibbotson method was towards the upper end of historical excess return estimates from recent regulatory determinations.[133] As part of its rate of return review process in 2018, the AER published its MRP model as a supporting attachment to its draft decision. This allowed us to compare any differences in the AER’s underlying

[133] Interim Commentary, p.54.

calculations in data with our own model. We are not aware of any other Australian economic regulator making its MRP model public in recent times.

Our comparison and reconciliation of the two models revealed the following:

- Synergies favours the NERA adjustment to earlier historical data;
- The AER informs its MRP with shorter averaging periods (the ESC expressed hesitation in its interim commentary about reliance on shorter averaging periods);
- The AER gives weight to geometric averaging in selecting a value towards the lower end of the range of historical excess returns, which likely results in a downwardly biased estimate of the MRP;[134] and
- Synergies and the AER make different assumptions about theta (a component of gamma, as explored in Chapter 10).

6.6.4 NERA adjustment

One of the regulatory debates on historical returns has centred around the treatment of earlier market data (such as the Lamberton 1882-1979 historical accumulation index series). The so-called Brailsford et al. methodology relied on data from the ASX that adjusted the Lamberton series between 1883 to 1957 to account for perceived deficiencies in the series. NERA argued that these adjustments overstate the potential downward bias and only a smaller adjustment was necessary. As such, the NERA-adjusted dataset is our preferred source for historical MRP estimates, although we acknowledge that this adjustment is not currently favoured by the AER. On the other hand, the ERA takes an average of the Brailsford et al. and NERA estimates.

The ESC did not comment further on this issue in the 2019 interim commentary.

6.6.5 Geometric averaging vs arithmetic averaging

Another MRP debate revolves around the reliance on geometric and arithmetic averaging. Regulators have had regard to geometric averages, which compound the market return over time, leading to a lower MRP. On the other hand, experts in regulatory processes have advised that arithmetic averages should be used when there is no compounding applied to the WACC estimate (as is the case for PoM and the way its WACC is applied for a single year).[135]

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134 AER (2018) Rate of return instrument – explanatory statement, December, p.94.

135 See, for example: Lally, M. (2013). Review of the AER's methodology for the risk-free rate and the market risk premium, 4 March.

Despite some support from the AER and ERA for geometric averaging, its implementation in the Australian regulatory setting is not universal. An overview of each Australian regulator's approach is shown in Table 15.

Table 15 Australian regulatory approaches to geometric and arithmetic averaging

Regulators	Date	Reference	MRP averaging approach
AER	December 2018	2018 Rate of return instrument	Gives more weight to the arithmetic averages, but does not disregard geometric averages
ERA	August 2019	2018 and 2019 WACC for freight and urban networks, and Pilbara railways	Gives equal weight to the arithmetic and geometric averaging. Takes the average of the lowest arithmetic mean and the highest geometric mean
QCA	August 2014	Cost of capital: market parameters research decision paper	Supports arithmetic mean (consistent with CAPM), not geometric mean (inconsistent with CAPM)
IPART	February 2018	Review of WACC method (p.88)	Historic MRP is based on an arithmetic average of excess market returns over risk-free rate only
ACCC	December 2018	Draft decision for ARTC interstate access undertaking	Cited arithmetic and geometric averaging data from the AER in using discretion to reach a final point estimate.

Note: Australian regulators not listed in this table (e.g. ICRC, OTTER, ESCOSA, ESC) either cite the decisions of the regulators above, or provide no specific commentary on their preference for arithmetic or geometric averaging.

Source: Various Australian regulatory decisions

In Attachment B, we outline the approaches of these regulators in more detail.

Regulators clearly place heavy reliance on arithmetic averages to inform the MRP estimate. Therefore, particularly in the context of a single year WACC (which does not apply to any of the regulators' decisions set out above), we believe that reliance on an arithmetic average to inform the MRP is consistent with Australian regulatory practice and is therefore a well accepted approach.

6.6.6 Averaging periods for historical market data

Irrespective of whether they pursue arithmetic or geometric averaging, regulators consider various historical averaging periods for the MRP.

For instance, in the AER's December 2019 Rate of return Annual Update, the AER used sampling periods of 1883-2018, 1937-2018, 1958-2018, 1980-2018 and 1988-2018. Our preferred averaging period is 1883-present, because it uses all available data, and is least susceptible to short-run fluctuations in market conditions. This is also consistent with the ESC's apparent preference for longer averaging periods inherent in its previous criticisms in relation to the relative brief averaging period for the size and value premia used in the Fama-French model.[136] Moreover, as explained by Bishop et al. (2018) in a research paper for Chartered Accountants:[137]

> A longer time series is best as it will not only improve statistical 'accuracy' but also best weight events according to the likelihood of occurrence. For example, a short time period that incorporates the 1987 crash could potentially overweight that event compared to its likelihood of occurrence.

The recent COVID-19 pandemic highlights the importance of a long-term horizon for consideration of the MRP. The last comparable pandemic occurred nearly 100 years ago. In the intervening period, finance markets have not had to adjust to the challenges on a scale presented by COVID-19. In our view, this underscores the benefits of longer-term averaging periods horizons for consideration of the TMR (and, in turn, the MRP).

However, we recognise that Australian economic regulators also have regard to shorter averaging periods. These are shown in Table 16 for both arithmetic and geometric averaging. Note that all of these estimates assume a theta of 0.4125 largely consistent with our gamma assumption of 0.33.

Table 16 Ibbotson arithmetic and geometric MRP estimates

	Arithmetic	Geometric
1883-2019	6.64%	5.30%
1937-2019	5.97%	4.17%
1958-2019	6.50%	4.24%
1980-2019	6.42%	4.28%
1988-2019	6.00%	4.49%
Average	**6.31%**	**4.49%**
Median	**6.42%**	**4.28%**
Minimum	**5.97%**	**4.17%**
Maximum	**6.64%**	**5.30%**

Note: The averaging periods are the same as those presented by the AER, ERA and ACCC in their decisions. All estimates assume a theta of 0.4125, consistent with a gamma of 0.33 and a distribution rate of 0.80.

Source: Synergies' historical MRP model

6.6.7 Approach

Having regard to the estimates in Table 16, we believe an appropriate Ibbotson estimate at the present time is 6.42%, based on the median of the arithmetic averages across the various time periods. This recognises the range of results across averaging periods, while

136 ESC (2018). Interim commentary – Port of Melbourne tariff compliance statement 2018-19, 26 October, pp.51-52.

137 Bishop, S., Carlton, T. & Pan, T. (2018). Market risk premium: Australian evidence, Research paper for the CAANZ Business Valuation Specialists Conference, 13-14 August, p.9.

not weighting any averaging period more highly than another. The resulting estimate is marginally above AER, ACCC, ERA and IPART historical (i.e. Ibbotson) estimates, which range from 5.6% to 6.1%, but below the QCA's most recent estimate of 6.5%, which gives no weight to geometric averaging.

6.7 Wright MRP

6.7.1 The approach

The Wright approach calculates the MRP by taking the difference between the long-term observed average return on the market and the prevailing risk-free rate. This method assumes that the TMR remains stable over time, and the MRP will fluctuate inversely with the risk-free rate of return. The expected return on the market is then determined by adding current risk-free rate to the MRP.

The contribution of the Wright approach to the determination of the TMR is that it takes into account the interaction between the MRP and risk-free rate under different market conditions. By doing so, the TMR outcomes from this methodology are more consistent with actual practices and outcomes we see adopted by financial experts, especially relative the Ibbotson MRP, which assumes that any decrease in the risk-free rate leads to a decrease in the TMR. For example, the Fernandez et al. (2020) survey introduced in Section 6.2.4 makes clear that Australian practitioners have not decreased (and may have in fact increased) their TMR estimates in response to decreases in the risk-free rate.

6.7.2 Adoption by regulators

The Wright approach was widely applied by Australian regulators, particularly as the risk-free rate declined following the GFC. More recently, it has been applied by the QCA and the relevance of the approach has been acknowledged by other regulators, including ESCOSA and the ICRC. IPART's and OTTER's approach is not incompatible with the Wright approach given its consideration of a longer run average risk-free rate. The QCA has assigned a 15% weighting to the Wright methodology. The stances of Australian regulators towards the Wright approach are outlined in Table 17.

Table 17 Australian regulators' acceptance of the Wright approach

Regulator	Relevant commentary	Accept/Reject
IPART	IPART draws on the HER approach in estimating its allowed cost of equity. However, it notes that an increasing (or decreasing) RFR tends to be offset by a decreasing (or increasing) MRP, i.e. the RFR and MRP negatively co-vary. This is a central argument in favour of the Wright approach.	Implicit acceptance of underlying principles of Wright
OTTER	OTTER draws on the HER approach in estimating its allowed cost of equity, but does so in recognition of a longer term average of the RFR	Implicit acceptance of underlying principles of Wright
QCA	QCA calculates the MRP as weighted average of 5 estimates, with DDM and Wright having a combined weight of 40 per cent. For instance, in its decision on Queensland Rail's draft access undertaking, the QCA uses an MRP of 6.5 per cent. The QCA arrived at a 6.5 per cent MRP using a weighted mean of a number of estimation methods where the weightings are relative to the strengths and weaknesses of each estimation method. On how the estimation methods are weighted, the QCA refers to its draft decision which states: A statistically defensible set of weights is: Ibbotson (25%); Cornell DGM (25%); Siegel (15%); Wright (15%); and surveys (20%).	Acceptance
ESCOSA	ESCOSA acknowledges that while there is some evidence of an inverse relationship between the risk free rate and historical returns, the magnitude and timing is ambiguous. ESCOSA also notes that the view among many Australian regulators is that more weight should be given to the Ibbotson approach estimating MRP.	Acknowledgement of relevance of Wright
ICRC	The ICRC notes that historically, Australian regulators have not assumed any relationship between the market risk premium and the risk-free rate, estimating them both separately. ICRC refers to the AER's view in its Rate of Return Guidelines published in 2013 that no weight should be given to the Wright approach as there is no consensus in the academic literature on the direction or magnitude of the relationship between the market risk premium and the risk-free rate. However, the ICRC noted 6.5 per cent was consistent with the QCA's most recent decision and that it also placed weight on the QCA's approach.	Acknowledgement of relevance of Wright

Source: Various regulatory decisions

In the most recent regulatory decisions, the Wright approach has been given less weight by the ERA and the AER even as risk free rates have declined further. In general, the regulators that have ceased to rely on the Wright approach have instead relied more heavily on the Ibbotson approach. The ultimate outcome of this change in approach is that these regulators have decreased TMR allowances even more rapidly than the corresponding reductions in the risk-free rate.

However, despite the less widespread adoption by Australian regulators, Table 17 shows that it remains a well accepted approach. This is underscored by its widespread application by regulators elsewhere in the world who operate under statutory instruments with similar objectives to the PMA.

6.7.3 Use of Wright approach by international regulators

The widespread usage of Wright by regulators overseas operating under regimes with regulatory objectives analogous to that of the Pricing Order and the PMA demonstrates that the approach is well accepted.[138]

New Zealand

Dr Martin Lally was recently engaged to update the New Zealand Commerce Commission's (NZCC) tax-adjusted MRP (TAMRP), which has been 7.0% since 2015.[139] He recommended an increase in the TAMRP to 7.5% (September 2019),[140] which will be applied for regulated fibre service providers. This assessment had regard to both New Zealand and overseas MRP estimates. Lally observed that "the optimal estimator for a country should place high weight on foreign data because estimates using only local data are very noisy and the true MRPs do not vary greatly across countries." Lally calculates the NZCC TAMRP based on the median of the Ibbotson approach, a three-stage DDM estimate, surveys and two versions of Siegel (Siegel Version 1 and Siegel Version 2). Siegel Version 2 is equivalent to the Wright methodology.[141]

Europe

In 2018, the UK Regulators Network (UKRN) commissioned an independent review of the cost of capital in price controls. The study reaffirmed the 2013 recommendation concerning the use of the Wright approach to inform the MRP and this recommendation has been adopted by UK regulators. The authors observed that:[142]

> The sustained falls in nominal and real interest rates since the financial crisis are not, in themselves, evidence of a secular shift in the long-run value of the EMR [expected market return]… Similar or larger sustained shifts in real returns on risk-free assets

138 The objectives are summarised in NERA (2020), Appendices A to C. NERA was commissioned by PoM to undertake an extensive review on regulator's approaches to the MRP in Europe, NZ and Australia. NERA found that the Wright approach was the most commonly applied method to estimate MRP by these regulators.

139 Lally, M. (2019). Estimation of the TAMRP, 26 September.

140 The 7.5% TAMRP estimate is based on risk-free rates with terms of between 3 and 5 years, reflecting the regulatory periods of the relevant fibre network decisions. As such, it can be argued that this decision is not directly compatible with a cost of equity based on a 10-year risk-free rate. Moreover, the TAMRP is used in the Brennan-Lally CAPM, a New Zealand-specific model that differs from the CAPM used in Australia. Using the transformation from the Earwaker (2018) report to the AER, a 7.5% TAMRP approximately corresponds to an MRP compatible with Australian frameworks of 7.19% (assuming a 5-year risk-free rate).

141 Lally (2019), p.15.

142 Wright, S., Burns, P., Mason, R. & Pickford, D. (2018). Estimating the cost of capital for implementation of price controls by UK Regulators.

> and bonds have occurred historically, without any evidence of similar shifts in the mean stock return.
>
> This is not to deny the logical possibility that the hypothesis of a sustained, or even permanent fall in the EMR may ultimately be proved correct. But the problem with such arguments is that, whether or not we find them persuasive, they can neither be supported nor refuted by data until after the elapse of long periods of time. We can directly *observe* the fall in the risk-free rate; but, we reiterate, the EMR is not observable. As MMW [a 2003 report by some of the 2018 report's authors] noted in their original report, even over extremely long samples we can only *infer* it from the long-run average of *actual* stock returns. Given the volatility of market returns it would take decades to provide clear statistical evidence of a structural shift in the mean stock return: i.e., to reject the null hypothesis of *no* shift. As such, attempting to take account of such secular shifts (in the face of more than two centuries of evidence, from multiple markets, in favour of stable stock returns) would clearly fall foul of our twin criteria of implementability and defensibility.
>
> [emphasis in the original]

Ofgem explicitly estimates MRP by reference to the Wright approach, which ensures that the cost of equity remains relatively stable despite falls in the risk-free rate.[143] In its May 2019 RIIO-2 Sector Specific Methodology Decision, Ofgem proposed to focus on long-run averages of the TMRs, while placing due weight on TMR cross-checks, among which was a multi-stage DDM prepared by its consultant, CEPA.[144] Ofgem maintained its view that historical long-run averaging of TMRs was the best single objective estimate of investors' expectations of the future, while also placing due weight on forward-looking approaches.[145]

In the UK transport sector, the Wright approach is also adopted by the Civil Aviation Authority (CAA) for Airports, as well as by the Competition and Markets Authority (CMA) for Air Traffic Control.[146] As such, there is effectively universal application of the Wright MRP by UK regulators in transport, energy and water sector decisions.

143 Ofgem (2019). RIIO-2 sector specific methodology decision – Finance, p.78.

144 Ofgem (2019), p.42.

145 Ofgem (2019), p.31.

146 CAA (2019). UK RP3 CAA decision document, August; CMA (2020). NATS provisional findings, March.

Elsewhere in Europe, the Wright approach is adopted by the Commission for Aviation Regulation (CAR) in Ireland, as well as the Italian Regulatory Authority for Energy, Networks and Environment (ARERA).[147]

North America

In support of the Wright approach, the Alberta Utilities Commission (AUC) first acknowledged in 2011 that the market risk premium may be higher than its historical average due to low prevailing interest rates. This decision was supported by regression analysis, which demonstrated that the market return on equity changes by less than changes in the risk-free rate.[148] In its most recent methodological update, the 2018 Generic Cost of Capital Guidelines, the AUC reaffirmed the view that the forward-looking MRP should be greater than the historical average in the current low interest rate environment, highlighting that:[149]

> In the 2016 GCOC [Generic Cost of Capital] decision, the Commission acknowledged the inverse relationship between the risk premium and the level of interest rates. The Commission continues to acknowledge this relationship.

In particular, in its findings the AUC stated that its position "corresponds" to the submissions of experts that since both the US and Canadian economies have experienced a prolonged low interest rate environment historical arithmetic averages will understate the current MRP, and forward-looking MRP evidence needs to be incorporated to respond to changes in capital market conditions.[150]

The US Federal Energy Regulatory Commission (FERC) has adopted a similar stance. It was previously FERC's practice to adjust the return on equity with a 1:1 correspondence between the return on equity and changes in US Treasury bond yields. However, in light of the GFC, it has decided that this methodology may no longer "produce a rational result":[151]

> The capital market conditions since the 2008 market collapse and the record in this proceeding have shown that there is not a direct correlation between changes in U.S. Treasury bond yields and changes in ROE… U.S. Treasury bond yields do not provide a reliable and consistent metric for tracking changes in ROE.

147 CAR (2019). Maximum level of airport charges at Dublin Airport – 2020-2024 final determination, May; ARERA (2015). Relazione Tecnica, Delibera 583/15, Chapter 9.

148 Villadsen, B., Vilbert, M.J. and Brown, T. (2012). Survey of Cost of Capital Practices in Canada, 31 May.

149 Alberta Utilities Commission (2018). 2018 Generic Cost of Capital, 2 August, p.70.

150 Alberta Utilities Commission (2018), p.70.

151 Opinion 531, Docket EL11-66-001, FERC, June 2014, pp 77-78.

6.7.4 ESC considerations on the Wright approach

In the 2019 interim commentary, the ESC retained its preliminary view from the 2018 interim commentary that PoM's weighting on the Wright approach may not be well supported, given recent AER precedent and withdrawal of support for the approach by the ERA. The ESC acknowledged our arguments in response to its previous interim commentary, but reiterated the AER's belief that a stable return on equity is less likely to reflect market conditions over time, and that negative correlation between the risk-free rate and MRP is not observed consistently.

The ESC considered that the Wright approach is not widely relied upon by Australian regulators, and where it has been adopted, regulators have contended that the evidence supporting its core premise is mixed (noting that we have never suggested that exclusive reliance should be based on the Wright approach to inform the MRP). However, the NERA report shows clearly that the Wright approach is well accepted by virtue of its widespread adoption in regulatory frameworks that are analogous to that applying to PoM.[152]

Further, evidence supporting the core premise of a constant MRP (as provided by the Ibbotson approach) is far from unanimous. Indeed, the AER's own advisors have acknowledged the plausibility of an inverse risk-free rate-MRP relationship.

For instance, Partington and Satchell did not rule out the possibility that a decrease in the risk-free rate could be associated with an increase in the MRP, writing that "on occasion, it is entirely possible that the MRP may increase as interest rates fall."[153] In addition, Professor Martin Lally has recently stated the following in a submission accompanying the final Rate of Return Guideline:[154]

> As with the AER, I do not think that there is any clear evidence that the MRP is inversely related to the risk-free rate. However, I consider that the proposition of an inverse relationship is plausible and therefore favour some weight being placed on the Wright methodology, consistent with my previously expressed views.

At no point in time have we recommended that the Wright approach should be the *only* source of information that informs the MRP estimate. Even if the MRP does not move exactly one-for-one with the risk-free rate, there is certainly evidence that there is at least

152 See also NERA Economic Consulting (2020) Review of Regulators' Approaches to Determination of the Market Risk Premium (report at Appendix R of PoM's TCS submission).

153 Partington & Satchell (2016), p.15.

154 Lally, M. (2018). Review of the Earwaker report, 4 December, p.9.

some inverse relationship. For this reason, it is prudent that we give the Wright MRP weight in our analysis, in conjunction with the Ibbotson MRP and DDMs.

6.7.5 Interactions between Wright and Ibbotson

The Wright and Ibbotson approaches reflect different interpretations of historical average returns. As such, a further relevant consideration is not simply the inclusion of the Wright approach to inform the assessment of the MRP – rather it is the inclusion of the Wright approach in combination with the Ibbotson approach. This combination of well accepted approaches reflects the phenomenon that the MRP tends to increase during periods of low interest rates (albeit not necessarily in a perfectly correlated way). This is consistent with the comprehensive evidence from independent experts and financial practitioners on their approach to TMRs presented in Section 6.2. Their overarching view is that investors have not reduced their required rates of return by the same amount as the falls in the risk-free rate that have been observed. Moreover, several independent experts expressed the view that interest rates are unsustainably low, and instead focus on longer-term averages of market returns.[155]

Accordingly, a benefit of combining the Wright and Ibbotson approaches is to efficiently incentivise investment in long term infrastructure, such as the Port of Melbourne; the combination of approaches brings long term stability to the cost of equity that moderates the impact of movements in the risk-free rate. All else being the same, it is reasonable to expect that greater stability in the rate of return will provide a more supportive investment environment (and less volatility in tariffs for users).

6.7.6 Quantifying the Wright MRP estimate

Arithmetic and geometric Wright TMR and MRP estimates (assuming a risk-free rate as at 31 March 2020 of 0.90%) for different averaging periods, are shown in

Table 18. In the first two columns, we present TMRs based on arithmetic and geometric averaging. These estimates are based on long-term averaging of annual market returns in Australia for the specified time period. In the second two columns, we derive the MRP (based on both geometric and arithmetic averaging) by subtracting the current risk-free rate (0.90%) from the TMR.

155 See Section 6.2 for further discussion of these independent experts' positions.

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Table 18 Wright arithmetic and geometric MRP estimates

	Wright TMR averages		Wright MRP averages	
Period	**Arithmetic**	**Geometric**	**Arithmetic**	**Geometric**
1883-2019	11.64%	10.21%	10.74%	9.31%
1937-2019	9.99%	8.20%	9.09%	7.31%
1958-2019	11.50%	9.37%	10.61%	8.47%
1980-2019	12.39%	10.46%	11.50%	9.56%
1988-2019	11.71%	10.25%	10.81%	9.35%
Average	**11.45%**	**9.70%**	**10.55%**	**8.80%**
Median	**11.64%**	**10.21%**	**10.74%**	**9.31%**
Minimum	**9.99%**	**8.20%**	**9.09%**	**7.31%**
Maximum	**12.39%**	**10.46%**	**11.50%**	**9.56%**

Note: The averaging periods are the same as those presented by the AER, ERA and ACCC in their decisions. All estimates assume a theta of 0.4125, consistent with a gamma of 0.33 and a distribution rate of 0.80.

Source: Synergies' historical MRP model

In regard to the QCA's Wright MRP estimate, it used a TMR of 11.48% as at November 2019 for the Queensland Rail final decision. Updating this estimate to reflect the risk-free rate as at the end of March 2020, the resulting MRP would be 10.58%. Whilst acknowledging that the QCA adopts a higher theta that, holding all else constant, increases the MRP, this estimate is nevertheless within the range of arithmetic averages shown in Table 18. The QCA's most recent Ibbotson estimate (as at November 2019) was 6.5%, which gives no weight to geometric averaging.[156]

Accordingly, we consider that 10.74%, the median of the five arithmetic averaging periods, is an appropriate estimate for the Wright MRP at this time. This recognises the range of results across averaging periods, while not weighting any more highly than another.

6.8 Dividend discount models (DDMs)

6.8.1 The approach

Dividend Discount Models (DDMs) are forward-looking approaches which estimate the market risk premium by reference to dividend yields, long-term expected dividend growth and a transitional path between these values. The importance of DDMs to the estimation of the TMR is that they represent investors' actual expectations about future equity market conditions, as captured by consensus dividend forecasts. For this reason, the forward-looking nature of DDMs offers valuable insights in conjunction with the

[156] QCA (2020). Queensland Rail 2020 draft access undertaking, Decision, February.

historical perspective offered by backward-looking measures such as the Ibbotson and Wright MRPs.

The DDM is based on the principle that the value of an asset is equal to the present value of future cash flows. The DDM solves for the discount rate that equates the present value of the forecast future dividends with the current market price of a broad equity index such as the ASX200.

6.8.2 Adoption by regulators

Table 19 shows that there is widespread acceptance of DDMs by Australian regulators (noting that there is in turn a range of DDM methods that are used).

Table 19 Australian regulators' acceptance of DDMs

Regulator	View on DDM	Acceptance
QCA	In its decision on Queensland Rail's draft access undertaking, the QCA used a Cornell DGM as one piece of evidence to calculate the weighted average used for the final MRP. The DGM is given a 25 per cent weighting. The QCA used the same weighting in Gladstone Area Water Board price monitoring 2020-2025	Acceptance
IPART	Gives equal weighting to HER approach and forward-looking MRP methodologies when the market is in a "normal" state, and uses its regulatory discretion on how these estimates are combined when the market is not in a normal state. For its forward-looking estimate of the MRP it relies on six methods; four of which are variants of the DDM and are given a 2/3 weighting (corresponding to a weighting of 1/3 in the overall MRP estimate).	Acceptance
ERA	The ERA historically essentially placed equal weight on the DGM and HER methods when estimating the MRP. However, in its most recent decision for electricity it has placed less weight on the DGM. Concerned with the form of the model, input assumptions, sensitivity to assumptions and upward bias	Acceptance
ESCOSA	ESCOSA states that "market implied estimates" (i.e. DGM estimates) are one of the cross-checks it considers. However, it notes the variability of estimates produced and sensitivity to assumptions made.	Implicit acceptance
ICRC	It followed AER's 2017 decision for the Victorian gas transmission system, in which a dividend growth model is used as the piece of evidence "given second most reliance" after historical excess returns in informing the view on the MRP. The DGM estimate formed the top end of the AER's MRP range. Thus, while not forming a mechanistic part of the MRP estimate, it was used as part of the evidence base rather than as a 'cross check'	Implicit acceptance
OTTER	Followed service provider's proposal, previous decisions which are ultimately based on the AER's 2013 guidelines which uses the DGM to inform MRP.	Implicit acceptance

Source: Various regulatory decisions

This widespread acceptance of DDMs is shared by regulators overseas operating under similar statutory objectives.[157] For example, in July 2019, Ofwat identified DDMs as "one

157 See also NERA Economic Consulting (2020) Review of Regulators' Approaches to Determination of the Market Risk Premium (report at Appendix R of PoM's TCS submission).

of the more common forward-looking approaches in economic regulation."[158] Similarly, Ofgem, in its May 2019 RIIO-2 Sector Specific Methodology Decision, relied on DDMs as a cross check on its TMR assessment which was informed by the Wright approach. DDMs have also been used for regulatory decisions in the states of Oregon, Utah, Massachusetts and Colorado in the U.S.[159]

Given the range of methodologies that can be deployed to estimate DDMs we turn to the specific methodologies applied by Australian regulators.

6.8.3 ESC considerations on DDMs

The ESC's preliminary view in the 2019 interim commentary was that it did not consider the DDM is a well-accepted approach and that PoM had not provided a sufficient explanation as to why it had adopted this third approach to estimating the MRP. There are currently three economic regulators in Australia that assign either an explicit or implicit weighting to DDMs of at least 20%. This compares to the weighting we applied to DDMs in the 2019-20 WACC range was between 16.7% and 25%.[160]

The 6.5% MRP estimates currently adopted by ICRC and OTTER also implicitly apply DDMs, as these regulators closely followed the 2013 AER guidelines, which used DDMs to select an MRP towards the upper end of the range from historical excess returns.[161] Taking these additional regulators into account, five Australian economic regulators currently rely on DDMs on either an implicit or explicit basis. On top of this, the New Zealand Commerce Commission (NZCC) also uses a DDM estimate, which is given equal weighting with other approaches in its overall median MRP. DDMs are also used extensively throughout the UK (see Section 6.8.2).

In response to our inclusion of DDMs, the ESC stated the following:[162]

> We are concerned that the port is adopting inconsistent approaches over time, which may be driven by outcomes rather than sound principles. Our preliminary view is that at this stage the port has not provided sound justification for adopting the

158 Ofwat (2019). PR19 draft determinations – Cost of capital technical appendix, July, p.37.

159 Cost of Capital for Utilities: A Cross Country Survey and Synthesis (July 2008)

160 The QCA currently assigns a 25% weighting to its Cornell DDM approach. The ERA's final determination for rail networks adopted an MRP of 5.9%. It used regulatory discretion to select a point estimate between a 5.6% estimate based on "historical data" (effectively Ibbotson) and a 7.2% estimate based on its two stage DDM. This implies an 80% weighting on the Ibbotson approach, and a 20% weighting on DDMs.

161 Australian Energy Regulator 2013, Better Regulation Explanatory Statement: Rate of Return Guideline, December.

162 ESC (2019), p.19.

dividend discount model when in previous tariff compliance statement [sic], it had set out the shortfalls of this model and has not otherwise addressed those limitations.

The caution we have previously expressed in relation to DDMs largely centred on their use for calculating the cost of equity as a whole, rather than just the MRP. As elaborated in our 2019-20 WACC report for PoM, this is because the former application requires the identification of suitable transport comparators, preferably in Australia or possibly New Zealand. Application of a cost of equity DDM approach for international comparators requires assumptions about key economic inputs (such as long-run growth rates), which may differ from the Australian context.[163]

Despite the ESC's criticism, it is clear that the views that we have previously expressed in relation to the use of DDMs to capture the cost of equity as a whole reflect the fact that no Australian regulator uses DDMs in this way. As a consequence, it is likely that the level of acceptance of an application of this approach would be challenged. This is clearly in contrast to the manner in which we have applied DDMs, which is well accepted amongst regulators.

Accordingly, one of our main justifications for including DDMs, which the ESC appears to have acknowledged, is their use by economic regulators (especially the QCA and IPART, and to a lesser extent the ERA). Acceptance by economic regulators forms the basis for virtually all of the ESC's other WACC commentary, both on specific elements of the MRP (e.g. the ESC's views regarding our application of the Wright approach) as well as other WACC parameters (e.g. gamma). As such, we are responding to the ESC's feedback by moving into closer alignment with regulatory precedent.

The ESC also considered that we had not provided enough information on the assumptions we used in our DDMs, pointing to the possibility of "implementation errors" that could lead us to misestimate the WACC. We are not aware of any implementation errors and note that we have demonstrated that our DDM outputs were comparable with other recent regulatory decisions.[164]

In regard to information about the assumptions underpinning our DDMs, IPART has previously published detailed methodologies on how the Damodaran (2013) and Bank of England (2010) estimates operate. On this basis, we consider that the assumptions and implementation are readily available and transparent. However, in order to augment the

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163 Synergies Economic Consulting (2019). Determining a WACC estimate for Port of Melbourne, May, pp.123-124, 143.

164 In the 2019-20 TCS WACC report, we demonstrated that the Damodaran (2013) and Bank of England (2010) estimates that we calculated in March 2019 were similar to the estimates published by IPART as at the end of January 2019 (see p.144 of last year's report). We are now assuming a higher gamma than IPART (0.33 compared to IPART's assumption of 0.25). Thus, holding all else constant, this will cause our DDM estimates to be higher relative to IPART's estimates.

transparency of our approach and respond to the ESC's commentary, we provide further details on these methodologies in Attachment B.

In earlier reports for PoM, we have treated DDMs with caution, as the ESC noted in its 2018 interim commentary. In particular, while we endorsed the principles underpinning the approach, we observed that there was a lack of consensus around the values of key inputs, such as the assumed long-run growth rate. This, along with fluctuating dividend forecast inputs and a relatively small sample of relevant Australian listed entities, led us not to adopt the approach for the purposes of assessing PoM's cost of equity.

Nevertheless, there is an important difference between applying DDM for estimating the cost of equity given a limited sample of Australian entities to draw upon and its use for informing the MRP. A particular advantage of the DDM is that it offers a forward-looking component to PoM's MRP estimate. We note that three Australian economic regulators assign DDMs a weighting of at least 20% (either implicitly or explicitly). These are summarised in Table 20.

Table 20 DDM approaches used by Australian economic regulators

Regulator	Value	Weighting	Methodologies
IPART	8.80%	33% (explicit)	Damodaran, Bank of England (2002, 2010), Bloomberg, SFG market indicator, SFG analysts implied (based on most recent estimates from 31 January 2019). Note that the Bloomberg MRP estimate is always withheld for copyright reasons. Although IPART places a 50% weighting on its short-run MRP methodologies, only two-thirds of this 50% weighting is assigned to DDMs (the remaining one-third is assigned to the market indicators approach). Thus, the actual weighting on DDMs in the overall MRP estimate is 33%.
QCA	4.7%	25% (explicit)	Cornell DGM (based on most recent estimate from November 2019). Outputs from this model tend to be lower than other forward-looking regulator estimates, due to adjustments relating to reductions the QCA applies to long-run dividend growth rates, as well as assumptions about future government bond yields.
ERA	7.2%	20% (implicit)	The most recent estimate available using the ERA's in-house two-stage DDM as at October 2018. The ERA's two-stage approach assumes that dividends grow at the long-term growth rate following the dividend forecast period. The ERA calculates a historical MRP of 5.6% and a DDM estimate of 7.2%. The ERA then used regulatory discretion to select a point estimate of 5.9%. This implies a weighting of approximately 20% on the DDM (20%*7.2% + 80%*5.6% = 5.9%). However, the ERA does not mention this explicitly.

Source: Synergies analysis of regulatory decisions

As evidenced by Table 20, while the concept of DDMs is well-accepted, no specific model has emerged as superior to any other model. Rather, each regulator adopts a different model or set of models. Likewise, while DDMs are used in New Zealand and by various regulators in the UK operating in analogous regimes (see Section 6.8.2), precedent from international regulators does not offer any consensus for a preferred DDM. In previous years, we have presented three well accepted approaches to the estimation of the MRP using DDMs:

- Damodaran (2013), a modified two stage method;[165]
- Bank of England (2010), a multi-stage dividend discount model; and
- Gordon Constant Growth Model, a simpler model that serves as a useful robustness check on multi-stage approaches.

To bring our coverage of DDMs further into alignment with Australian regulatory precedent, we have now incorporated the ERA's two-stage model and the QCA's Cornell DDM. We have constructed these models based on publicly available information, and have successfully replicated their recent outputs. In modifying our approach to DDMs from previous TCS submissions for PoM, we recognise that while DDMs are frequently applied by Australian regulators, there is not yet consensus on a single DDM methodology that is superior to all other alternatives. In light of this, we consider it preferable to give equal weight to all publicly available DDM methods currently in use by Australian regulators.[166]

In regard to IPART's DDM methodologies, we have not had regard to the Bloomberg MRP that IPART uses, as it cannot be publicly reported for copyright reasons. However, we have introduced the Bank of England (2002) method for completeness, which IPART has relied upon in conjunction with Damodaran (2013) and Bank of England (2010). While we have previously noted that it was not developed to derive implied MRPs, it nevertheless forms part of IPART's methodology. On the other hand, we have not included the SFG analysts forecast method or the SFG market indicator method.[167] IPART identifies itself as only having four DDM methods (Damodaran, the two BoE measures and the Bloomberg MRP, which is withheld for copyright reasons).

We have decided to remove the Gordon Constant Growth Model from consideration, because while it is a widely recognised model, it is not used by any Australian regulator.

As noted in Section 6.8.2, DDMs are widely used by overseas regulators, although there are subtle variations in the precise DDM approaches that are adopted.

We apply equal weighting to each Australian regulator that uses DDMs in determining the overall DDM estimate (i.e. a weighting of one-third on the average of IPART's three publicly available DDM estimates, a weighting of one-third on the ERA's two stage

165 Damodaran, A. (2013). Equity risk premiums (ERP): Determinants, estimation and implications – The 2013 edition, pp.63-73.

166 We have not been able to apply IPART's Bloomberg MRP due to copyright limitations.

167 The SFG analysts forecast method differs from convention DDM approaches in that it is based on the forecasts of stock market analysts for individual stocks rather than the market index as a whole (e.g. the ASX200). The SFG market indicator method is not a DDM; rather, it uses economic indicators to derive an indirect estimate of the MRP.

DDM, and a weighting of one-third to the QCA's Cornell DDM). We consider that, when they are averaged, there is sufficient differentiation between assumptions in these models to generate an estimate that robustly reflects the return that would be required by a BEE providing services with a similar degree of risk to those provided by the Port Licence Holder. Moreover, in our view it presents the most balanced snapshot of current Australian regulatory practice. Table 21 presents the results of these approaches. In Attachment B, we provide details on how these models are derived, and we also outline the values for key parameters (e.g. long-run growth rates) that are used by the various regulators in their respective models.

Table 21 Forward looking MRP estimates based on DDM

Methodology	Estimate	Weighting
Damodaran (2013)	10.90%	
Bank of England (2002)	11.42%	
Bank of England (2010)	10.81%	
Average of IPART models	11.04%	33.33%
ERA two-stage DDM	9.55%	33.33%
QCA Cornell DDM	8.67%	33.33%
Weighted Average MRP	**9.75%**	

Note: All MRP estimates are based on a gamma of 0.33. The QCA Cornell DDM estimate is based on the approach described in the 2014 Cost of capital: market parameters report and on subsequent discussion with QCA staff.

Source: Synergies' analysis

For comparison, IPART's estimate of the Damodaran (2013) MRP as at 31 January 2020 was 9.43%, its Bank of England (2002) MRP was 10.20% and its Bank of England (2010) MRP was 9.45%. At the time of writing, the QCA and ERA have not released any MRP estimates using data for 2020.

6.9 Conclusion on the TMR

Neither the MRP nor the expected TMR is readily observable. Whilst regulatory precedent is not the only criterion that should be used to establish whether an approach is well accepted, our assessment of this precedent confirms that regulators in Australia and overseas apply a wide range of well accepted TMR approaches to overcome this challenge. Moreover, it is clear that different regulators apply different weights to the various well accepted approaches they apply to inform their estimates (although not always in a transparent manner). This is because observed historical returns and expected future returns implied by market data both have a role to play in refining estimates of this parameter, even though the relative importance of these evidence sources may vary over time.

We have also taken into account comments made by the ESC in the Interim Commentary, including in relation to the change in approach by some regulators regarding the Wright approach, and reduced the weighting of the Wright approach for the estimation of the MRP.

Accordingly, for the 2020-21 TCS, we have adopted a 70% weighting on the Ibbotson MRP, a 15% weighting on the Wright MRP, and a 15% weighting on dividend discount models (DDMs). We consider that this weighting scheme contributes to a return that is commensurate with that required by a BEE providing services with a similar degree of risk to the Prescribed Services, because it combines well accepted sources of historical and forward-looking information in line with their application by practitioners and regulators. The greater weight assigned to the Ibbotson MRP reflects its widespread use by domestic regulators, as well as financial practitioners (although in the latter case, the risk-free rate is frequently adjusted in response to prevailing market conditions).

Although we maintain our view that PoM's degree of reliance on specific MRP approaches is not constrained by regulatory precedent, we note that our weighting on the Wright MRP is consistent with that currently adopted by the QCA, and the proposed weighting is also substantiated by extensive overseas reliance on the approach. In regard to DDMs, we have documented that three Australian regulators place at least 20% weight on DDMs, and DDMs are routinely applied overseas where they are given material weight.

Overall, the combined weighting of 30% assigned to the Wright MRP and DDMs accommodates the observation that recent decreases in the risk-free rate have not always been offset with corresponding increases in the MRP by regulators and practitioners in equal measure. Furthermore, in accordance with the PMA regulatory objective of fair and reasonable prices, this level of reliance on the Wright MRP and DDMs ameliorates fluctuations in the return on equity induced by changes (whether increases or decreases) in the risk-free rate, which are not in the long-term interest of users and consumers.

Our MRP and TMR estimates for the 2020-21 TCS are displayed in Table 22.

Table 22 MRP and TMR estimates for 2020-21 TCS

Methodology	Estimate	Weighting (Lower range)
Ibbotson MRP	6.42%	70%
Wright MRP	10.74%	15%
Dividend Discount Models (DDMs)	9.75%	15%
Weighted Average MRP		**7.57%**
Risk-free rate		0.90%
Total market return		**8.47%**

The resulting range TMR is 8.47%, which is well below the TMR of 10.15% estimated by IPART in its February 2020 biannual update.

6.10 Total market return cross-checks

To verify the appropriateness of our TMR estimate, we have performed a number of cross-checks based on data and publications referenced throughout the chapter.

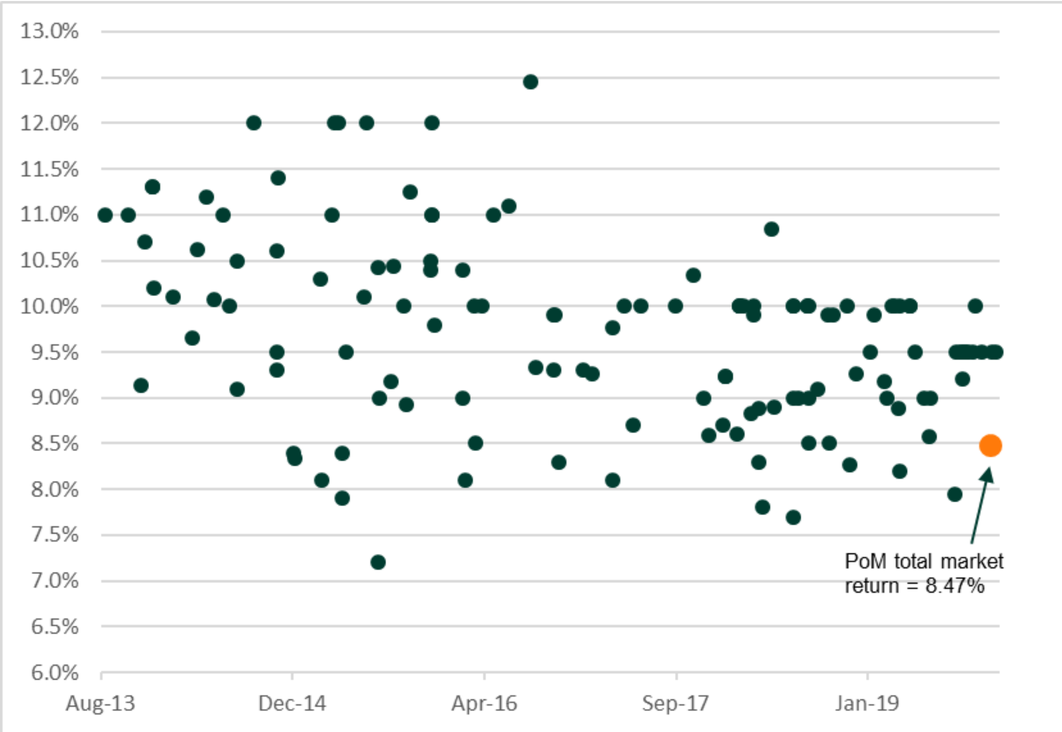
6.10.1 Total market return from Connect 4 database

Total market returns applied by financial practitioners are likely to provide the strongest indication of outcomes in a workably competitive market. As introduced in Section 6.2, we have used data on independent expert reports extracted from the Connect 4 database to generate estimates of the post-tax TMR, which is equivalent to the post-tax return on equity for an entity with an equity beta of 1.0.

The median post-tax TMR across the sample period is 9.71% (with an average of 9.68%), as shown in Figure 16. This compares to the post-tax TMR of 8.47% that we currently estimate for PoM as at 31 March 2020.[168] We do observe a modest decline in the TMR since 2017, with estimates used by independent experts clustering between 8% and 10%. Nevertheless, our TMR of 8.47% is clearly towards the lower end of this range. The majority of TMR estimates are situated above the estimated TMR for PoM (shown with an orange data point).

[168] 8.47% = risk-free rate (0.90%) + MRP (7.57%)

Figure 16 Post-tax TMRs implied by independent expert reports



Note: The TMRs in this chart are presented on a post-tax basis and do not include any ad hoc risk premia, which would further increase the post-tax return on equity for a firm with an equity beta of 1.

Data source: Connect 4, Synergies calculations

6.10.2 MRP and TMR surveys

In Section 6.2, we introduced two surveys, the KPMG Valuation Practices survey, and the annual Fernandez et al. survey. These surveys are frequently cited by Australian regulators, and in the case of the QCA, they contribute to the "Surveys and independent experts" approach, which is assigned a 20% weighting in the overall MRP estimate.

Total market returns reported by the participants in these surveys are summarised in Table 23. (A comprehensive overview of these surveys is presented in Section 6.2 and Attachment B).

Table 23 Total market return estimates from financial practitioner surveys

Survey	Estimate
KPMG (2019)	8.8%
Fernandez et al. (2019) average	9.2%
Fernandez et al. (2019) median	8.7%
Fernandez et al. (2020) average	10.3%
Fernandez et al. (2020) median	9.0%

Note: KPMG respondents were asked to provide estimates as at 30 June 2019. The Fernandez et al. (2019) survey asks respondents to report the parameter they used in 2019. Thus, no specific point in time is specified as in the KPMG survey. However, Fernandez et al. (2019) report that they initially sent out emails to survey participants in February 2019, and responses were collated by 22 March 2019. Similarly, the 2020 survey asks participants to report the parameters they used in 2020, again with no specific point in time specified, but responses were collated by 23 March 2020.

Source: KPMG (2019), Fernandez et al. (2019), Fernandez et al. (2020)

The TMRs in these surveys range between 8.7% and 10.3%. Consequently, our proposed TMR for PoM of 8.47% sits below this range. This implies that the estimated return on equity for PoM will be a conservative estimate for a firm with an equity beta of 1.0.

6.10.3 IPART TMR

As discussed in Section 6.3.2, IPART's TMR is informed by the midpoint of long-term and short-term risk-free rate averaging. For this reason, IPART's recent estimates are a useful cross-check on the TMR for PoM, which is informed exclusively by a short-term (20-day) average of the risk-free rate.

IPART's most recent biannual update (which used data to 31 January 2020) adopted a midpoint risk-free rate of 2.75% and a midpoint MRP of 7.4%, for a TMR of 10.15% (see Section 6.3.2). IPART also released a consultation paper in April 2020, which contained estimates as at 31 March 2020. The midpoint risk-free rate was 2.00%, while the midpoint MRP was 7.85%, for a TMR of 9.85%, as shown in Table 24.

Table 24 Recent IPART TMR estimates

Date	Risk-free rate	MRP	Total market return (TMR)
31 January 2020	2.75%	7.40%	10.15%
31 March 2020	2.00%	7.85%	9.85%

Source: IPART biannual update (February 2020), IPART consultation on debt margin (April 2020)

Both of IPART's recent TMR estimates significantly exceed the proposed TMR for PoM of 8.47%.[169]

[169] In contrast, the lowest MRP (TMR) currently determined by an Australian regulator is 5.9% (6.8%, based on the risk free rate as at 31 March, 2020) by the ERA.

7 Estimating beta for the BEE

Chapter overview		
2020-21 submission	**2019-20 submission**	**Comments**
Asset beta: 0.70-0.75 **Equity beta: 1.00-1.07**	Asset beta: 0.70-0.75 Equity beta: 1.00-1.07	Our estimate of PoM's asset and equity betas are unchanged from last year's submission. The average and median of the comparator set, across both 5 and 10-year timeframes, reinforces an asset beta value of 0.7 (from a range of 0.70 to 0.75) represents a conservative assessment. An asset beta of 0.70 (0.75) corresponds to an equity beta of 1.00 (1.07) assuming gearing of 30%.

There are two key determinants of an entity's equity beta:

- business risk arising from the sensitivity of an entity's cash flow to overall economic activity, where more cyclical cash flows are associated with higher betas; and
- financial risk arising from capital structure, where a higher level of debt introduces financial risk and implies a higher beta.

The asset beta represents *only* the systematic risk of the ungeared entity (and as such includes only business risk). The equity beta incorporates *both* the business risk and the financial risk for an entity.

In practice, we *observe* equity betas (from the estimated betas of listed companies), but we want to *compare* asset betas (to understand the fundamental systematic risk of a business without regard to the impact of gearing). Hence, the major part of the discussion in this chapter relates to asset beta.

The process of the estimation of beta involves consideration of the following issues:

- identifying appropriate comparators set, which includes:
  - consideration of relevant industry
  - use of international comparators
  - identification of relevant comparators through the use of an industry classification system and an assessment of comparability to the BEE
- assessing whether filtering (such as a market capitalisation threshold or statistical tests) should be applied to candidate companies to arrive at a comparator set, and if so, applying that filtering
- using the comparator set to determine a range for the asset beta for the BEE (by removing the impact of financing from the calculated equity betas)
- undertaking first principles analysis to form a view on an appropriate beta within the range for the BEE.

For each of these issues, we establish that the approach adopted by PoM is a well accepted approach to beta estimation, by reviewing regulatory precedent and evidence from finance practitioners. In so doing, we respond to the ESC's 2019-20 interim commentary on beta. Finally, we apply our approach to establish the beta for the BEE.

7.1 Estimating beta

Under incentive-based economic regulation, the asset beta of the regulated entity is set by identifying comparators based on whether they are exposed to similar levels of systematic risk (that is, covariance of their returns with market returns) as the regulated entity's business.

The Pricing Order is consistent with this approach by requiring that the rate of return allowance be calculated commensurate with that which would be required by a BEE providing services with a similar degree of risk to PoM in the provision of Prescribed Services.[170]

In regards to comparator entities, the ESC recognises there are no publicly-listed ports in Australia.[171] Accordingly, it suggested the following methodology:[172]

> Consequently, the port will have to determine a comparator set by considering other characteristics of the port's prescribed services, and by making trade-offs between elements of comparability. For example, by including other firms (not ports) that provide similarly risky services or to include overseas ports in the comparator set. Whichever approach is adopted, it is important that a systematic approach to comparator selection be used to avoid 'cherry picking' comparators in each regulatory period.

Accordingly, in undertaking an empirical analysis of beta estimates, reference needs to be made to an appropriate set of listed comparators for whom equity betas can be estimated and we have explained our approach in Chapter 4 of our report. However, the relative dearth of port comparators from comparable nations and their circumstances can mean that freight focused entities from related transport sectors (such as railroads) can usefully inform the asset beta assessment for the BEE.

170 Clause 4.1.1 (a) of the Port Management Act 1995 (Vic).

171 Essential Services Commission, May 2017 (ESC 2017a), Regulatory Approach to the Pricing Order – a consultation paper, p.40.

172 ESC (2017a), p.40.

Equity betas are estimated using regression analysis using share price information for the identified comparator companies. As the companies will have different gearing levels (and hence different levels of financial risk), these equity betas must be 'de-levered' to produce an asset beta. This approach is generally applied by regulators and financial practitioners for the assessment of asset betas under the SL CAPM.[173]

The comparator analysis will typically produce a range of estimates for beta, necessitating an assessment of where PoM's asset beta might sit relative to these other comparators. This assessment is facilitated by a first principles analysis, which is a predominantly qualitative assessment of PoM's systematic risk profile. This approach analyses the key factors that impact the sensitivity of the firm's returns to movements in the stock market on which it is listed. Accordingly, in practice, we see a first principles analysis helping to inform, for a particular firm (in this case, a BEE), where it is likely to sit in the range generated from an empirical assessment.

In this respect, important considerations in a first principles analysis include:

- the range of business activities undertaken by comparator ports relative to the BEE. For example, ports that are listed typically enjoy a stable source of revenue from property leases. However, the Prescribed Services are narrower and do not include leasing revenue. Consequently, the BEE will not have the benefit of the relatively stable revenue source leasing provides. All else being the same, this means that the BEE can be expected to be exposed to greater systematic risk than otherwise comparable landlord ports;

- ports that are involved in predominantly export activity will tend to have a lower asset beta than those, like the BEE, which are heavily dependent on imports. All else being the same, imports will be more affected than exports by economic cycles;

- the extent to which comparator entities have global operations – all else being the same, entites with international diversification in their operations (such as is the case for some stevedores) will tend to have lower asset betas than those whose operations are in a single location (such as the BEE) because international diversification means company profit will be influenced by the economic circumstances of numerous countries (other than solely the country of listing)

- the extent of competition faced by comparators and their operating leverage (the extent to which additional volume affects profit) influences first principles outcomes.

173 See, for example, ERA (2019). 2018 and 2019 weighted average cost of capital for the freight and urban rail networks, and the Pilbara Railways, 22 August, p.55.

7.2 Well accepted approaches to asset beta estimation

7.2.1 General principles

Economic regulators use empirical evidence to determine an appropriate asset beta for the regulated businesses. A well accepted approach of regulators is to first identify relevant comparator firms and estimate their asset betas (from equity betas), then form a view on the appropriate asset beta for the regulated firm.

An underlying principle regulators consider in identifying appropriate comparators is whether their systematic risk profile is similar to the regulated entity. For instance, the QCA said that:[174]

> In identifying appropriate comparators for Queensland Rail, we have considered the extent to which the proposed industry group comparators are exposed to similar levels of systematic risk (that is, covariance of their returns with market returns) as Queensland Rail's West Moreton coal business.

Similarly, in relation to estimating the equity beta, IPART has observed that:[175]

> We start with a target industry or industries containing firms with a similar risk profile to the firm in question.

The AER, in its rate of return instrument, stated that:[176]

> To include additional firms in the comparator set, we must first be satisfied that they bear a sufficiently similar degree of risk as an efficient service provider supplying Australian regulated energy services after assessing their risks, operations, regulatory framework, etc.

This practice of establishing a regulated firm's asset beta based on estimated betas of relevant comparators is applied in all regulated infrastructure services, such as energy and water utilities.[177] Nevertheless, since the services provided by PoM relate to transport infrastructure, for this submission, we have focused on the beta estimation approaches of regulators and finance practitioners in relation to transport infrastructure services.

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174 QCA, April 2019, Draft decision: Queensland Rail's 2020 Draft Access Undertaking, p. 134.

175 IPART, April 2019, Fact sheet, Estimating equity beta, p. 1.

176 AER, December 2018, Rate of return instrument, explanatory statement, p. 153.

177 For instance, QCA, February 2020, draft report, Gladstone Area Water Board price monitoring 2020–25 Part A: Overview, pp 67–68; AER, December 2018, Rate of return instrument, Explanatory statement, pp 150–151 for regulated energy network businesses.

In general terms, the approach used by regulators in transport infrastructure services mirrors that adopted for other infrastructure providers. Focusing on the regulatory precedent on transport infrastructure services clarifies the approaches that are taken in that sector which are of greatest relevance for the Pricing Order, even though several regulated transport infrastructure providers in Australia are poor comparators for the BEE.

Six Australian regulators have considered regulated revenues of transport infrastructure service providers: [178]

- ACCC – rail
- IPART – rail
- ERA (WA) – rail
- QCA – rail and export coal terminal
- ESC – rail
- ESCOSA – rail.

All regulators have acknowledged the specific challenges the sector presents to identify comparators given the paucity of listed Australian transport entities.[179]

Independent expert reports specifically pertaining to transport infrastructure services providers have been limited in recent years. However, in this section, we provide an overview of Grant Samuel's beta analysis for Asciano and Toll, recognising that (as documented below), the ERA has relied on these businesses as comparators for Arc Infrastructure.

In the following sections, we identify the beta estimation approach of regulators and financial practitioners in respect of the following issues:

- Consideration of relevant comparator industry
- Use of international comparators
- Comparators sample identification process
- Statistical diagnostics in beta estimation

[178] On a first principles basis, DBCT, Aurizon and the Hunter Valley and are not relevant comparators for PoM given the nature of the take-or-pay contracts and regulatory regimes in place at those assets (which differ significantly from the Pricing Order).

[179] Detailed analysis of regulatory approaches is presented in Attachment C of this report.

- The use of a size filter
- Assessment of the regulated firm's beta relative to relevant comparators.

7.2.2 Consideration of relevant comparator industry

Regulators have considered a range of industries as relevant comparators for the regulated business. For example, IPART in its 2019 review of the WACC for the NSW rail access undertaking had regard to betas for railroads, coal mining and electricity generation. That is, it had regard to sectors that were different from, but related to (as producers or consumers of coal), the asset being assessed (namely a coal based railroad). Similarly, the ERA has previously considered comparators whose operations extend beyond purely rail, such as Toll and Asciano (now delisted) and Port of Tauranga.

Regulators consider a range of characteristics to identify relevant comparator industries. For instance:

- the QCA undertakes a comprehensive first principles analysis involving a range of characteristics (including nature of industry, regulatory and competition environment, contractual arrangement) to identify appropriate comparators, with the actual determination of beta subject to first principles analysis and regulatory discretion. For instance, for Queensland Rail's coal network, the QCA considered the asset beta of regulated energy and water businesses provided a lower bound and that of toll road businesses provided an upper bound.[180]
- the ACCC considered the use of North American railroads as potential comparators was: [181]
  - likely to be appropriate for the ARTC Interstate network, but
  - unlikely to be appropriate for the Hunter Valley network
- IPART is proposing to apply a pre-estimation screening rule comprising industry, capital market and operating characteristics to identify appropriate comparators.[182]

These various regulatory approaches are summarised in Table 25.

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180 QCA, April 2019, Draft Decision, Queensland Rail's 2020 Draft Access Undertaking

181 The ACCC formed this contrasting view because it considered that the Interstate Rail Network faced competition from trucking for certain freight which in its view was similar to the competition North American railways face from road transport. In contrast, the ACCC considered there was an absence of effective alternative modes of transport for coal shipped on the Hunter Valley rail network. (ACCC, March 2010, Draft Decision, ARTC Hunter Valley Coal Network access undertaking, p.559).

182 IPART, April 2019, fact sheet, Estimating equity beta, pp 2–3.

Table 25 Regulatory approaches: consideration of relevant comparator industry

Regulator	Comparator selection - analytical filter	Relevant comparator industry	Not relevant comparator industry
QCA/Incenta (DBCT, November 2016)[1]	Considers range of characteristics (first principles analysis)	Regulated energy and water industries Toll roads (upper bound) Aurizon Network (similar regulation and same coal chain)	Commercial ports
QCA (QR coal network, April 2019)	Considers range of characteristics (first principles analysis)	Regulated energy and water industries (lower bound) Toll road businesses (upper bound)	No comment
ACCC (ARTC Interstate rail network, April 2008)	Providing same type of service (below rail service)	Overseas non-regulated below rail operators	Australian trucking, shipping and other non-rail service providers
ACCC (PNO, September 2018)	Dependent on same commodity trade (thermal coal exports) and part of same supply chain	ARTC Hunter Valley rail network	No comment
ACCC (ARTC Hunter valley network, March 2010)	Range of characteristics (demand drivers, market power, duration of contracts)	Regulated electricity distribution or transmission business (lower bound) QR central coal network (now Aurizon Network) (upper bound)	Coal mining
IPART (estimating equity beta approach paper, April 2019)	Operate in a nominated industry with similar risk characteristics Undertake activities in capital markets sufficiently similar to Australia Similar operating profile to the BEE	No comment	No comment
IPART (NSW rail access undertaking, July 2019)	In selecting proxy industries, considers the type of business in which the firm operates. If proxy firms in the same business cannot be directly identified, then IPART considers other industries which exhibit returns that are comparably sensitive to market returns.	Rail transport, with coal mining and electricity generation as proxy industries for different parts of the supply chain.	Regulated energy and water utilities
IPART (NSW rail network, July 2014)	Transport related infrastructure and/or infrastructure subject to similar form of regulation	Railroads Toll roads Energy and water utilities	No comment
IPART (ARTC Hunter valley network, August 2009)	Risk relative to that of comparable listed companies Range of characteristics (revenue variability, regulation structure, operating leverage)	North American rail operators	Electricity networks
ERA (rail networks, August 2019)	Based on relevance to the Australian economy and to the industry of the BEE	Rail businesses, ports and toll roads	Depends on rail network being assessed (see below)

Regulator	Comparator selection - analytical filter	Relevant comparator industry	Not relevant comparator industry
ERA (Arc infrastructure, August 2019)	Type of business, and associated capital assets, that the firm operates	Railroads and ports	Toll roads
ERA (Pilbara Infrastructure, August 2019)	Composition of freight compared to other railroads	Railroads (particularly with similar freight composition), reflecting a supply chain approach	Toll roads, ports, rail with different freight composition
ERA (Public Transit Authority, August 2019)	Type of business, and associated capital assets, that the firm operates	Toll roads	Railroads and ports
ESC (rail, June 2012)	Operating factors such as market demand and price constraints due to potential road competition	No specific comparator set used	No specific comparator set used
ESCOSA (rail, August 2015)	No specific beta analysis in 2015 Tarcoola-Darwin Railway 10-year revenue review	No specific beta analysis in 2015 Tarcoola-Darwin Railway 10-year revenue review	No specific beta analysis in 2015 Tarcoola-Darwin Railway 10-year revenue review

Note: 1. QCA accepted its consultant's (Incenta) analysis in respect of DBCT Management's systematic risk profile and comparator analysis, in the context of DBCT Management's 2015 draft access undertaking (DAU); see QCA, November 2016, Final decision: DBCT Management's 2015 DAU, p. 87.

Source: Synergies analysis based on ACCC, March 2010, Draft Decision, ARTC, Hunter Valley Coal Network access undertaking; ACCC, September 2018, Final Determination, Statement of Reasons, Access dispute between Glencore Coal Assets Australia Pty Ltd and Port of Newcastle Operations Pty Ltd; ACCC, April 2008, Draft decision, Australian Rail Track Corporation's 2008 Interstate Access Undertaking; QCA, April 2019, Draft Decision, Queensland Rail's 2020 Draft Access Undertaking; QCA, November 2016, Final decision, DBCT Management's 2015 draft access undertaking and Incenta, March 2016, DBCT 2015 DAU: Review of WACC parameters; IPART, July 2014, Transport – Final report and decision, NSW Rail Access Undertaking – review of the rate of return and remaining mine life; IPART, August 2009, Rail Access — Final Report and Decision, New South Wales Rail Access Undertaking - Review of the rate of return and remaining mine life from 1 July 2009; IPART, July 2019, Rate of return and remaining mine life, 2019-2024; IPART, April 2019, Fact sheet, Estimating equity beta; ERA (WA), Final Determination, 2018 and 2019 Weighted Average Cost of Capital For the Freight and Urban Networks, and the Pilbara Railways, 22 August 2019; ESCOSA Tarcoola-Darwin Railway: 10-year review of revenues – Final report, August 2015; ESC, June 2012, final decision, V/Line access arrangement.

Table 25 demonstrates that Australian regulators consider a range of operating factors, risk drivers and supply chain characteristics when constructing analytical filters for the BEE of a regulated entity. When applying these analytical filters to the selection of specific relevant comparator industries, it is clear that economic regulators do not constrain themselves to the sector of the comparator whose beta is being determined if there is a dearth of relevant comparators or where entities in other sectors provide more relevant comparators.

For instance, although its systematic risk profile is very different from that of the BEE for PoM, it is noteworthy that the QCA has used energy networks, water utilities and toll roads as comparators for DBCT, a coal export terminal subject to a revenue cap form of regulation. The revenue cap form of regulation applying to DBCT was a major factor motivating the QCA's choice of comparators (and which is not relevant to the BEE here).

Importantly, the comparability of railroads and ports is well accepted in Australian regulatory precedent. This is evident in:

- the ERA's use of port comparators for Arc Infrastructure[183]
- the parallels that the QCA has drawn between Aurizon Network and DBCT in the context of setting DBCT Management's beta[184]
- the parallels drawn by the ACCC between the ARTC's Hunter Valley rail network and PNO (an export coal terminal and port) in considering an appropriate asset beta for PNO[185].

Once relevant (and irrelevant) comparator industries have been distinguished, the next step in the comparator selection process is to assess to what extent specific comparator firms outside Australia are to be relied on.

7.2.3 Use of international comparators

The issue for the selection of beta comparators from countries other than Australia revolves around the extent to which regulators consider an international sample necessary (due to a dearth of domestic comparators) and relevant (given the similarity of international comparators to the BEE), and if considered necessary and relevant, which countries (or jurisdictions) comparators are generally drawn from.

As summarised in Table 26, the practice of using an international sample is a well accepted approach by Australian regulators. Regulators accept international comparators due to a lack of (or limited) relevant comparators in Australia. There appears to be no presumption by regulators that the systematic risks of international comparators are not comparable to the relevant BEE in each case, although this is likely to be influenced by the comparability of the economies from which comparators are selected (an issue to which we turn later).

For instance, the ERA noted that:[186]

> For rail there was a lack of comparable Australian companies. As a consequence, and consistent with its 2015 rail WACC approach, the ERA relied on overseas railway

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183 ERA (WA), Final Determination, 2018 and 2019 Weighted Average Cost of Capital For the Freight and Urban Networks, and the Pilbara Railways, 22 August 2019, p.55.

184 QCA, November 2016, final decision, DBCT Management's 2015 draft access undertaking, pp. 102–103.

185 ACCC, September 2018, final determination: statement of reasons, Access dispute between Glencore Coal Assets Pty Ltd and Port of Newcastle Operations Pty Ltd, p 159.

186 ERA (WA), Final Determination, 2018 and 2019 Weighted Average Cost of Capital For the Freight and Urban Networks, and the Pilbara Railways, 22 August 2019, p.55.

network operators in order to form the benchmark samples to estimate equity beta for the Public Transport Authority, Arc Infrastructure and Pilbara Railways.

Based on our review of regulatory decisions, Australian regulators have previously relied upon transport comparators from Australia, New Zealand, the US, Canada, the UK, France, Italy and Spain in the face of limited relevant domestic comparators.[187] For instance, for rail businesses, Australian regulators have generally adopted an international sample of rail and port businesses, as shown by the ERA (for a freight rail network) and ACCC (for the Interstate network) (see Table 26).

Table 26 Regulatory approaches: use of international comparators

Regulator	Accept or reject international sample	Preferred comparator countries	Not preferred comparator countries
QCA/Incenta (DBCT, November 2016)	Accepts	Incenta's report to the QCA provided only averages/medians for each sector, so not all specific comparators are listed, but it would be unlikely to assemble the number of comparators relied upon if restricted to Australia. Note that the QCA departed from Incenta's recommended asset beta of 0.40 (instead opting for 0.45)	No specific commentary
QCA (QR coal network, April 2019)	Accepts	Spain, Italy, France, US, Canada, UK, New Zealand	No specific commentary
ACCC (ARTC Interstate rail network, April 2008)	Accepts	North America	No specific commentary
IPART (estimating equity beta approach paper, April 2019)	Accepts	North America, Europe, various Asian countries (e.g. Hong Kong, Vietnam, the Philippines, India, Malaysia and Thailand) and various South American countries (e.g. Chile and Brazil)	China, Russia, some African countries
IPART (NSW rail undertaking, July 2019)	Accepts	North America and Europe	No specific commentary
IPART (ARTC Hunter valley network, August 2009)	Accepts	North America	No specific commentary
ERA (rail networks, August 2019)	Accepts	New Zealand, North America and Europe	No specific commentary
ERA (Arc Infrastructure, August 2019)	Accepts	New Zealand and North America	No specific commentary
ERA (Pilbara Infrastructure, August 2019)	Accepts	North America	No specific commentary
ERA (Public Transit Authority, August 2019)	Accepts	Europe	No specific commentary

187 IPART, in its recent consultation paper on "Estimating equity beta", relied on a sample of 35 water utilities for the entities it regulates. These comparators were sourced from countries such as Hong Kong, the Philippines, Malaysia, Thailand, Vietnam and Chile. Many of these countries have appeared in PoM's comparator set previously. Further information about this review process (which is in progress at the time of writing) is presented in Attachment C.

Note: ACCC determinations for the Port of Newcastle and the ARTC Hunter Valley Access Undertaking did not use a listed comparator set.

Source: Synergies analysis based on QCA, April 2019, Draft Decision, Queensland Rail's 2020 Draft Access Undertaking; QCA, November 2016, Final decision, DBCT Management's 2015 draft access undertaking and Incenta, March 2016, DBCT 2015 DAU: Review of WACC parameters; ACCC, April 2008, Draft decision, Australian Rail Track Corporation's 2008 Interstate Access Undertaking; IPART, April 2019, Fact sheet, Estimating equity beta; IPART, August 2009, Rail Access — Final Report and Decision, New South Wales Rail Access Undertaking - Review of the rate of return and remaining mine life from 1 July 2009; IPART, July 2019, Rate of return and remaining mine life, 2019-2024; ERA (WA), Final Determination, 2018 and 2019 Weighted Average Cost of Capital For the Freight and Urban Networks, and the Pilbara Railways, 22 August 2019.

Australian regulators do not appear to have presented an explicit framework for how countries are selected, although as a matter of practice, Table 26 shows regulators rely predominantly on developed countries in Australasia, Europe and North America. Regulators accept these countries as having sufficiently comparable economies and market characteristics to Australia to infer a reliable beta estimate for use in the Australian market (even though specific rationales and countries may vary with regulators).

These countries align closely with the members of the FTSE Developed category that we have used for PoM (see Section 7.3.2). This in turn suggests that adoption of the FTSE Developed category conforms to a well accepted approach, even though IPART and independent experts have relied on countries outside this category.

Similarly, financial practitioners commonly draw on international comparators to supplement a dearth of relevant domestic comparators. In an independent expert report for Asciano (described further in Section 7.2.4), Grant Samuel used transport comparators from a broad sample of countries, including the US, Canada, Germany, the Philippines, the United Arab Emirates, Hong Kong, Slovenia and New Zealand.

Our interrogation of the Connect 4 database of independent expert reports (introduced in Chapter 6 in regard to total market return) shows that analyses for non-transport sectors also rely on a wide range of countries, although we have not uncovered explicit evidence of independent experts relying on formal classification systems such as the FTSE country classifications discussed below.

The key issue is the extent to which international comparators can inform the estimate of the BEE's systematic risk. This is the case notwithstanding the fact that betas from different markets reflect the observed variability of a foreign firm's returns relative to the market index of its country and may be influenced by differences between the firm's own market index and the Australian market.

Once the range of admissible countries has been established, the next step is to identify specific comparators from within these countries.

7.2.4 Comparators sample identification process

The use of a reputable classification system for identifying comparators from a particular sector is well accepted by regulators as a systematic means of identifying possible comparators. Whilst regulators generally rely on a single classification system, there appears to be no unanimous support for any particular classification system. Moreover, Australian regulators and their consultants are not always explicit about the classification systems that they use. An overview of the classifications used by Australian regulators is shown in Table 27.

Table 27 Regulatory approaches: comparators sample identification process

Regulator	Sample identification process
QCA	In their December 2019 review of Gladstone Area Water Board's WACC for the QCA, CEPA used the Bloomberg Industry Classification System (BICS) and the Global Industry Classification Standards (GICS) to identify water utilities. (The QCA accepted the findings of this report.)[188] Incenta has not specified the classification system that it used to source comparators in its analysis for DBCT or Aurizon Network. However, Incenta used GICS to source water utilities for GAWB in its 2015 review.[189]
ACCC	No classification system specified for comparator set used in 2008 Interstate access undertaking. The ACCC did not undertake its own listed comparator analysis for either of the 2017 Hunter Valley and 2018 Interstate access undertakings.[190]
IPART	Thomson Reuters Business Classification (TRBC). In the case of the NSW rail access undertaking, IPART searched for firms in the "Industrial transportation – Railroads" category. IPART did not specify what categories it used for the coal mining and electricity generation proxy industries[191]
ERA	2015 rail WACC review used Industry Classification Benchmark (ICB) Subsector: Railroads No classification system mentioned in 2019 rail WACC reviews, but the comparator sets were similar in both reviews[192]
OTTER	No classification system specified for comparator set used in the 2018 water and sewerage price determination[193]

Source: Various regulatory decisions

Table 27 suggests that while many different reputable classification systems are used by economic regulators, the use of some form of reputable system is clearly a well accepted

188 Cambridge Economic Policy Associates (CEPA), December 2019, Advice on an appropriate asset beta, capital structure, credit rating, and debt risk premium for GAWB's 2020-2025 pricing period for the QCA, p.10; QCA (February 2020), pp. 67–73.

189 Incenta, May 2015, WACC parameters for GAWB price monitoring investigation 2015-20 – final report to the QCA, p.17.

190 ACCC, April 2017, draft decision, ARTC 2017 Hunter Valley access undertaking, pp 154–157; April 2008, draft decision, ARTC Interstate rail network access undertaking, p 154–155; December 2018, draft decision, ARTC's 2018 Interstate access undertaking, pp 136–139.

191 IPART, April 2019, draft report, NSW Rail access undertaking – Review of the rate of return and remaining mine life from 1 July 2019, pp 9, 11.

192 ERA (2014). Review of the method for estimating the weighted average cost of capital for the freight and urban railway networks - Draft determination, 5 June, p.31.

193 OTTER, May 2018, 2018 Water and Sewerage price determination investigation final report, p.170.

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approach. Only CEPA on behalf of the QCA has consulted more than one classification system, namely GICS and BICS.[194]

As such, a well accepted approach involves a regulator selecting a single reputable classification system, although more than one system has been utilised in some cases.[195] The ESC has accepted that GICS (which we have used) is one such reputable classification system. Consequently, the use of GICS conforms to a well accepted approach that is compliant with the Pricing Order.[196]

Among financial practitioners, there does not appear to be a single well accepted classification system for transport comparators, although financial practitioners have demonstrated a proclivity to consider comparators from a wider range of countries than regulators.

Grant Samuel undertook a comprehensive beta analysis in an independent expert report for Asciano in 2015.[197] It adopted an equity beta range of 0.9-1.0 for Asciano's Pacific National division, and an equity beta range of 1.0-1.1 for the Patrick Terminal and Logistics and Bulk and Automotive Port Services (BAPS) divisions. Grant Samuel generated beta estimates for four sectors that it deemed comparable to these business areas. The four sectors relied upon were Rail Transport; Container Port Operators; Diversified and Bulk Ports; and Freight and Logistics. However, Grant Samuel did not associate this choice of sectors with any formal classification system.

Grant Samuel also prepared an independent expert report in relation to the acquisition of Toll Holdings in 2015.[198] On that occasion, no formal comparator set analysis was presented, but Grant Samuel explains that it applied an equity beta of 1.0-1.1. While Grant Samuel acknowledged that Toll's own equity beta at the time was over 1.5, it also observed that the majority of peer group companies had betas less than 1.

In summary, while many different reputable classification systems are used by Australian regulators, the use of one form of reputable system is clearly a well accepted approach, even if no particular system is unanimously adopted.

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194 One feature of BICS (which could be considered both an advantage and disadvantage) is that companies can be assigned to more than one sector. In a beta analysis, this means that the assignment of a firm to a particular sector in a beta analysis can sometimes be an arbitrary decision.

195 Frontier Economics' procedure of pooling multiple classification systems results in much the same set of available firms compared to relying on a single system such as GICS (the system we have previously used for PoM), implying that there is a considerable overlap between classification systems (see below).

196 The ESC adopted a different approach in its Interim Commentary in response to the PoM's 2019-20 TCS (p 26)

197 Grant Samuel (2015). Proposal from Brookfield Infrastructure Partners L.P., 29 September.

198 Grant Samuel (2015). Offer by Japan Post Co., Ltd, 1 April.

7.2.5 Statistical diagnostics in beta estimation

In any statistical analysis, use of diagnostic tests to filter observations or estimation results is a well accepted approach to reduce bias in results and gain confidence in the results. We have identified several examples of statistical filtering being used for beta estimates in both regulatory and financial practitioner contexts.

For instance, in the 2013 Gas Rate of Return Guidelines Explanatory Statement, the ERA examined the statistical significance of each of its beta comparators.[199] It found that the estimates for Duet and SP Ausnet were not statistically significant using OLS (Ordinary Least Squares, the most common regression method for deriving beta estimate), but all firms had significant estimates using its other econometric methodologies.[200] Thus, although in that particular instance the ERA found that all of its selected comparators were statistically significant, this is nevertheless an example of an economic regulator using this approach to verify the precision and reliability of its evidence.

More recently, the ERA repeated this analysis in its 2018 Gas Rate of Return Guidelines, again noting that all beta estimates were statistically significant at the 5% significance level. The ERA also tested the statistical significance of its beta estimates in its September 2018 final decision for Western Power, finding that all beta estimates were significant at the 5% level (equivalent to having t-statistics above 2).[201] The ERA has not stated whether it explicitly used any statistical filtering in its rail decisions. However, there is no reason to believe that the practice of statistical filtering would be relevant in some sectors and not others. Our own analysis of these same comparators (which include Class I railroads and Port of Tauranga) shows that statistical significance is unlikely to be an issue for the sample the ERA has used for its rail decisions.

In a 2014 report for the AER, Professor Olan Henry tested the statistical significance of betas for energy comparators.[202] When reporting results, he excluded statistically insignificant estimates from the defined range.[203] Although the AER did not calculate t-statistics or R^2 values in its beta analysis 2018 rate of return instrument (which the AER described as an update of Professor Olan Henry's 2014 study), at no point did the AER contest Professor Henry's reliance on statistical significance tests.

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199 ERA (2013). Explanatory statement for the rate of return guidelines, 16 December, pp.174-176.

200 These include the LAD (least absolute deviations), Robust MM (Maximum Likelihood) and Theil-Sen methodologies.

201 ERA (2018). Final decision on proposed revisions to the access arrangement for the Western Power Network – Appendix 5: Return on regulated capital base, p.18.

202 Henry, O.T. (2014). Estimating beta: An update, April.

203 For example, on p.24 of his report, Professor Henry writes that: "The evidence … suggests that, ignoring insignificant estimates, the majority of the OLS point estimates lie in the range 0.26 to 0.86."

The QCA has accepted the analysis of its consultants which have applied statistical diagnostics in beta estimations.[204] IPART applies filtering to remove observations that do not pass its liquidity filtering threshold.[205] More recently, IPART in its consultation paper for its ongoing review of equity beta estimation proposed that:[206]

> Going forwards, we will consider developing formal robustness checks, eg, tests for statistical significance, autocorrelation and heteroskedasticity. We seek feedback from stakeholders on the appropriate robustness checks we could include, provided they are meaningful, simple to interpret and calculate.

This evidence highlights that it is a well accepted approach for regulators to have regard to the statistical reliability of beta estimates, with a range of approaches being deployed to this effect. We have also uncovered considerable evidence of financial practitioners reporting and relying on R^2 in beta analyses for independent expert reports.[207] Recent examples of such reports are presented below (noting that the commentary is reflective of the approach generally taken of the relevant firm).

In a 2019 independent expert report for MacPhersons Resources, BDO determined the following:[208]

> In order to assess the appropriate equity beta for the Proposed Merged Entity, we have had regard to the equity beta of ASX-listed companies predominantly involved in the exploration, development and production of gold. The betas below have been assessed over a two-year period using weekly return against the S&P/ASX All Ordinaries Gold Index. We have assessed returns against this index as we deem the S&P/ASX All Ordinaries Gold Index to better capture the systematic risks associated with investing in ASX-listed gold explorers, developers and miners compared to a broader market index. We also note that the correlations observed when assessing beta relative to a broader market index were weak, which rendered the betas less meaningful.

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204 For instance, Incenta (May 2015), p 17; QCA, May 2015, final report, Gladstone Area Water Board price monitoring, p 50.

205 IPART, (April 2019), pp 5–6.

206 IPART (April 2019), p.8.

207 R^2 and t-statistics can be shown to be mathematically equivalent in a single variable regression model (such as the CAPM, whose only explanatory factor is the market return), but their interpretation differs. A t-statistic is calculated as the ratio of the coefficient (in this context, the equity beta estimate) to its standard error. Thus, a high t-statistic indicates the precision of the estimate is high and is less likely to be influenced by idiosyncratic factors. R^2 measures the proportion of the variation in the dependent variable (in this context, the returns of an individual stock) that is explained by the regression model (which in the CAPM consists only of the return for the relevant stock market).

208 BDO (2019). MacPhersons Resources Limited – Independent expert's report, 12 April, p.75.

The average and median R^2 resulting from the analysis based on the gold index was 0.12. Beta estimates with low R^2 values were assigned less weight in determining the final beta range. Whilst the situation described by BDO is somewhat idiosyncratic to that sector, their analysis shows that they considered an R^2 of less than 0.1 was not adequate for reliable analysis.

In a 2019 independent expert report for Navitas, Lonergan Edwards made a series of remarks in regard to R^2. These are summarised below:[209]

> R-squared is a statistical measure of how well the regression line approximates the real data points. It has a value between zero and 1.0. The closer r-squared is to 1.0 the more reliable the beta estimate.
>
> Individual stock betas are generally less reliable than industry betas. As a result, it is important to also consider the related r-squared values shown above. The r-squared measures the reliability of the beta estimate, and ranges from zero (being not reliable) to 1.0 (highly reliable). As the above individual stock betas have low r-squared values we consider them to be of limited reliability for valuation purposes.

The six R^2 values in question were 0.02, 0.03, 0.05, 0.08, 0.10 and 0.14. The fact that Lonergan Edwards considered these to be of limited reliability suggests to us that a threshold of 0.10 is not unreasonable.

In a 2019 independent expert report for Ruralco, Grant Thornton reported in regard to R^2 that:[210]

> Betas with a correlation less than 5% are considered not meaningful and excluded.

This criterion resulted in the exclusion of 4 out of 9 potential comparators.

In a 2017 independent expert report for Rio Tinto's proposed disposal of Coal & Allied, Ernst and Young reported that:[211]

> We note that for many of the comparable companies, the data sourced for calculating the betas resulted in non-meaningful data. We have excluded any betas where the R-squared value was less than 0.04 as these betas are not meaningful.

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209 Lonergan Edwards & Associates Limited (2019). Proposed acquisition of Navitas Limited by way of Scheme, 17 April, pp.85-86.

210 Grant Thornton (2019). Ruralco Holdings Limited – Independent expert's report and financial services guide, 5 June, p.89.

211 Ernst and Young (2017). Independent expert's report and financial services guide – In relation to the proposed disposal of the Rio Tinto Group's shareholding in Coal & Allied Industries Limited to Yancoal Australia Limited, 19 May, p.66.

Also, SFG Consulting has previously advised that caution should be applied when R values are low:[212]

> The key point (about which there appears to be general agreement) is that in circumstances where the R-Squared statistic is low "it is difficult to obtain statistically reliable estimates." In my view, this alone should lead one to (a) compute and report R-squared statistics, as is standard practice whenever using regression analysis, and (b) apply great caution in affording material weight to the resulting estimate where the R-squared statistic is low.

We are not aware of any developments in statistical theory over the last decade that would cause these remarks to have any less merit today.

Overall, the evidence presented here shows that whilst regulators apply a range of statistical filtering approaches, financial practitioners in Australia frequently rely on R^2 to filter comparator sets. We acknowledge that the R^2 threshold used in some cases is less than 0.1 (e.g. 0.04 or 0.05) but the principle of relyiong upon the R^2 as a statistical filter is a well accepted approach.

7.2.6 Use of a size filter

Despite evidence that filtering comparators on the basis of statistical significance is a well accepted approach among regulators and financial practitioners, our previous reliance on statistical significance filtering has been an ongoing source of contention with the ESC and Frontier Economics.

In previous submissions, we have applied a size filter to our comparator set of US$100 million.[213] This has been challenged by the ESC in relation to requiring the BEE to have a market cap of US$100 million when assessing compliance with clause 4.1.1(a) of the Pricing Order. However, the ESC has also previously acknowledged that applying a size filter when compiling a sample of comparators may be reasonable to avoid bias in beta estimation.[214]

Regulatory precedent on this issue is summarised in Table 28. In many instances, Australian economic regulators have implicitly adopted a market capitalisation filter by virtue of the selection of their beta comparators. As such, an appraisal of the comparators

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212 SFG (2009). The reliability of empirical beat estimates: Response to AER proposed revision of WACC parameters, 1 February, p.28.

213 Synergies Economics Consulting (2017). Determining a WACC estimate for Port of Melbourne, May, p.24.

214 ESC (2017). Feedback on consultation and other matters: Statement of Regulatory Approach version 1.0, December, p.43.

used in regulatory determinations and their market capitalisations provides valuable indirect evidence of the range of market capitalisations upon which regulators have relied.

Table 28 Market capitalisation for Australian regulatory comparators

Regulator	Decision	Comparators used	Market capitalisation filter	Evidence on market capitalisations used
ERA	Rail WACC Review	Class I Railroads, Aurizon, Toll, Asciano, Port of Tauranga, various toll roads (for Public Transport Authority only)	Implicit	Port of Tauranga has the lowest market capitalisation of any currently listed comparator (currently US$2.8 billion)
IPART	NSW Rail Access Undertaking	Class I railroads, Aurizon and European Railroads	Implicit (but does have explicit liquidity filtering thresholds)	The smallest comparator IPART used was PKP Cargo (based in Poland), which at the time of IPART's decision (July 2019) had a market capitalisation US$520 million. However, the stock price of this company has fallen significantly since that time. (IPART did not list the comparators it used for its coal mining and electricity generation proxy industries.)
QCA	Water	Water utilities	Explicit	Explicit market caps for the DBCT, Aurizon and Queensland Rail decisions are not mentioned. However, in its 2019 report for the QCA on Gladstone Area Water Board (GAWB), CEPA applied a market cap of US$100 million. The QCA has implicitly adopted this threshold by accepting CEPA's beta recommendation. CEPA used market cap as an initial liquidity filter, because smaller and/or less well-established companies may experience thin trading volumes, which may impact upon estimated equity betas. At the same time, CEPA acknowledged that there is no clear specific theory / criterion for selecting a clear capitalisation value below which companies are more likely to experience low liquidity. CEPA noted that Incenta adopted a $US200 million market cap threshold in a report for the QCA on Seqwater in 2017, and the QCA accepted the conclusions of this report.
AER	Rate of Return Instrument	Electricity and gas networks	Implicit	Among the AER's comparators that are still listed, the smallest market capitalisation is Spark Infrastructure (US$2.2 billion)
ACCC	ARTC (Interstate Access Undertaking)	Class I railroads	Implicit	Current Class I market caps range between US$12 billion and US$105 billion

Source: Bloomberg, Synergies analysis, various Australian regulatory decisions ERA (WA), Final Determination, 2018 and 2019 Weighted Average Cost of Capital For the Freight and Urban Networks, and the Pilbara Railways, 22 August 2019; IPART, July 2019, Rate of return and remaining mine life, 2019-2024; Cambridge Economic Policy Associates (CEPA), December 2019, Advice on an appropriate asset beta, capital structure, credit rating, and debt risk premium for GAWB's 2020-2025 pricing period for the QCA, p.10; QCA, February 2020, draft report, Gladstone Area Water Board price monitoring 2020–25 Part A: Overview; QCA, March 2018, final report, Seqwater Bulk water price review 2018-21, pp.59-60 and Incenta, November 2017, Estimating Seqwater's firm-specific WACC parameters for the 2018-21 bulk water price investigation, report for the QCA, p.5; AER, December 2018, Rate of return instrument, explanatory statement, pp.150-151; ACCC, April 2008, Draft decision, Australian Rail Track Corporation's 2008 Interstate Access Undertaking.

Table 28 shows that the comparators used by Australian regulators (at least where the comparators have been clearly identified) have market capitalisations in excess of $US500 million at the time of the relevant determination. As such, adopting a market capitalisation threshold for comparators is a well accepted approach amongst Australian regulators.

In our view, a size filter is appropriate both from:

- a comparability perspective
- a technical perspective.

From a comparability perspective, and as we have previously argued, it would be very unlikely that a small firm could perform activities and be exposed to risk comparable to those of the BEE. Capital intensity is a fundamental attribute of the BEE – indeed, the very nature of the Prescribed Services require that the BEE is capital intensive.[215] In adopting a market capitalisation threshold, we have adopted the threshold advocated by Incenta of US$200 million for the assessment of the systematic risk of a BEE for regulatory purposes.[216]

Moreover, from a technical perspective, small firms tend to be less liquid than larger firms, which may lead to thin trading and biased beta estimation. Further, the market tends to be less well informed about the activities of small firms due to less coverage by analysts. Consequently, the share price of smaller firms is likely to be less responsive to price sensitive information (whether that information affects the individual firm or the market as a whole).[217]

In summary, we remain of the view that it would be very unlikely that a small firm with a market capitalisation of less than US$200 million could reasonably inform the systematic risk of the BEE, given the that that the fact capital intensity of the BEE is a crucial attribute for the provision of Prescribed Services.[218]

[215] This can be seen if we contrast stevedoring, which is a less capital intensive activity. For larger ports, there are normally at least two stevedores competing, and there is no case for these entities to be subject to economic regulation.

[216] Incenta (2020) Estimating the Port of Melbourne's equity beta, A report for the Port of Melbourne.

[217] We do not accept the criticism made by Frontier Economics that applying statistical filters results in a biased estimation of beta for the BEE. Nevertheless, in the context of at least this comparator set, excluding small firms by size filtering has the effect of excluding the least precise beta estimates.

[218] The application of a size filter results on all comparators being reliable estimators from a statistical perspective.

7.2.7 Assessment of regulated entity's beta relative to comparators

The comparator analysis will typically produce a range of estimates for beta, necessitating an assessment of where the regulated firm's asset beta might sit relative to the comparators. A well accepted approach adopted by regulators is to undertake a first principles analysis, which is a predominantly qualitative assessment of the regulated firm's systematic risk profile relative to the comparators and is based on factors that impact the sensitivity of the firm's returns to movements in the economy or market.

For instance, the ERA set Arc Infrastructure's asset beta at 0.7 after considering the estimation results from the benchmark sample, which produced a mean of 0.70 and a range of 0.33 to 1.12. In forming this view, the ERA's assessment of the benchmark sample was that[219]:

- Aurizon Network was not a directly comparable company to Arc Infrastructure. There were differences in the operations of the businesses which meant that it was likely that Aurizon network would have a lower risk than that of the Arc Infrastructure network.
- There was some value in the comparators Toll (which operated in similar markets) and Asciano (which incorporated rail operations).
- Overseas rail operators would possess a higher level of systematic risk, relative to an Australian railway operator.
- The New Zealand port comparator would have a lower level of systematic risk.

In setting the asset beta for Queensland Rail's West Moreton coal network, the QCA had regard to the first principles analysis, and did not consider that any one specific business sample acts as a direct comparator set for West Moreton coal at this time. Rather, the QCA considered that an appropriate asset beta is likely to be:

- higher than the estimated asset beta for regulated energy and water businesses (0.38)
- lower than the estimated asset beta for toll road businesses (0.51).

The QCA also had regard to further crosschecks it performed against other regulated Australian rail networks and considered that the West Moreton coal was likely to be exposed to a higher level of systematic risk relative to Aurizon Network's CQCN, and

[219] ERA, August 2019, Final Determination, 2018 and 2019 Weighted Average Cost of Capital For the Freight and Urban Networks, and the Pilbara Railways, pp. 59-60.

to a lower level of systematic risk relative to Arc Infrastructure. On those bases, the QCA considered there was merit in estimating an asset beta toward the upper bound of the range and considered 0.50 was appropriate.[220]

In summary, a well accepted approach involves regulators undertaking a first principles analysis, which is a predominantly qualitative assessment of the regulated firm's systematic risk profile relative to the comparators, and is based on factors that impact the sensitivity of the firm's returns to movements in the economy or market.

7.2.8 Conclusion: a well accepted approach to beta estimation

A well accepted approach to beta estimation comprises the following aspects:

- The underlying principle for identifying comparators is similarity of systematic risk, which is assessed based on a range of characteristics including demand characteristics, nature of contracts, competition and regulatory environment, and operating leverage.[221]
- In the absence of a sample of sufficient comparators for the BEE under consideration from the BEE's industry, regulators have identified comparators from a range of industries, other than the industry of the regulated firm, based on an assessment of comparable systematic risk. This approach has also been adopted by financial practitioners for independent expert reports concerning the transport sector.
- Comparators are identified from a sample of both Australian and international firms, and the jurisdictions the comparators are drawn from are primarily North American and European countries (the majority of which are classified as FTSE Developed), although IPART has included companies from Asia in some of its comparator sets. Financial practitioners also rely on companies from these countries and/or regions.
- The sample of comparator companies is identified by reference to a reputable industry classification system.
- The use of statistical filtering is a well accepted approach in regulatory and financial practitioner contexts. Regulators and financial practitioners may also have regard

220 QCA, draft decision, Queensland Rail's 2020 draft access undertaking, pp. 29, 155-156.

221 In this report, we define operating leverage as the extent to which EBITDA changes in response to sales. Firms with significant fixed costs tend to have high operating leverage because a high proportion of the additional revenue from additional sales becomes EBITDA. Conversely, firms with a high proportion of variable costs (costs that are sensitive to sales) tend to have lower operating leverage – EBITDA will be less than additional sales revenue due to the higher operating costs.

to different frequencies of stock returns when assessing beta (e.g. weekly or monthly returns) and different sampling windows (e.g. 5 years or 10 years)

- The use of a size filter has been applied in practice by several Australian regulators and as such is a well accepted approach.
- Application of first principles to establish where the beta of the regulated firm is likely to sit in the range generated from an empirical assessment is a well accepted approach.

7.3 Our approach to identifying comparators

This section explains how our approach conforms with the well accepted approaches identified in Section 7.2, in so doing responds to the ESC's 2019 interim commentary on beta, and applies our approach to establish PoM's beta.

7.3.1 Consideration of relevant comparator industry

Ideally, the BEE would have reference to landlord port businesses in Australia (and, if necessary, internationally) that provide a similar range of services to the Prescribed Services (but not more) and hence face comparable risks. However, in practice, there are no listed port businesses operating in Australia providing services that are comparable to PoM's Prescribed Services and that have comparable risks to the BEE as required under the Pricing Order.

For the Marine Ports and Services sector, we are only aware of a regulator setting asset betas for DBCT. However, on a first principles basis, DBCT is not a relevant comparator for PoM given, among other things, the nature of the take-or-pay contracts and regulatory regime in place, which differs significantly from the Pricing Order. In particular, DBCT is subject to revenue cap regulation and benefits from take-or-pay contracts conferring upon it a high degree of revenue certainty and stability, whereas PoM enjoys minimal contract protection and no corresponding revenue certainty or stability. Moreover, DBCT's industry environment is wholly export-oriented, whereas PoM's is predominantly import-driven and more strongly correlated with GDP. A comparison of DBCT and PoM's systematic risk profiles is presented in Attachment F.

Hence, this has required us to identify transport infrastructure entities outside of the Australian port sector with comparable risk profiles to PoM's Prescribed Services. This is similar to the approach adopted by regulators who have considered comparator firms from a range of industries to assess the asset beta for entities in the transport infrastructure sectors (as presented in Section 7.2.2).

We consider Marine Ports and Services a primary comparator set from a first principles analysis due to similar market exposure to container freight trade, albeit with important limitations. It is necessary to differentiate ports from terminals.

Clearly ports, particularly those heavily reliant on container traffic, present a potentially close comparator for the BEE. However, care must be taken with this comparison. This is because the BEE relates to a narrowly defined or prescribed service, which includes channel services, berthing services, short-term storage and cargo marshalling facility services and other services that allow access to, or use of, places or infrastructure (including wharves, slipways, gangways, roads and rail infrastructure).[222]

In addition to these services, most ports will earn revenue from the provision of a wider range of services, including the leasing of property. As a general proposition, the property related returns for these ports will be significantly less affected by movements in economic activity than their equivalent prescribed services. This means that, if it were possible to separate the asset beta of a port into these narrower subsets of activity, the asset beta for their equivalent prescribed services would be relatively higher than the observed beta and the beta for their property related services correspondingly lower.

Many of the entities in the Marine Ports and Services category in the GICS operate primarily as terminal operators or stevedores. Issues also arise with the comparability of these terminal operators with the BEE. Whilst terminal operators and the BEE will have similar market exposures, terminal operators or stevedores do not provide the core infrastructure service that the BEE (or PoM) provides. This is reflected in terminal operators generally having lower operating leverage (lower fixed capital costs and higher variable costs within their total cost base) than a landlord port, such as PoM. This means that these terminal operators' profits will be less sensitive to sales volumes than PoM. Conversely, terminal operators will tend to experience a more intense competitive environment than landlord ports.

Moreover, stevedores (including the stevedores in our comparator set) tend to operate in several jurisdictions; this is important because it will tend to mean these entities have lower asset betas than if they were operating at a single port in the country of its listing. International diversification by stevedores means that their overall returns will be affected by each country of operation, which in turn means that they will be less correlated with the country of listing. In turn, this will tend to reduce the asset beta of these entities.

[222] Section 49 of the Port Management Act 1995 (Vic)

Consequently, whilst PoM's risk profile is not identical to these businesses, we consider there is a sufficiently strong overlap in market exposure and demand drivers between the entities comprising the Marine Ports and Services classification and PoM to warrant their inclusion in our comparable companies set.

In previous reports we have included major city airports in our comparator set. In the 2018 interim commentary, the ESC questioned the inclusion of airports in PoM's comparator set, because airports derive only a small proportion of revenues from freight. This means that they are less likely to be "freight-focused", which is a component of our definition for the BEE. As the ESC acknowledged, we previously recognised that aeronautical services are likely to have different demand drivers relative to the Prescribed Services. Our rationale for including airports previously was instead more on the basis that they had some merit as infrastructure assets with high fixed costs in their total fixed costs base (i.e. high operating leverage). On the other hand, like ports, airport comparators have significant revenue from related (non-aeronautical) services, which differs substantially from the Prescribed Services. On balance, and acknowledging the ESC's concerns, in the 2019-20 TCS we removed airports sample from our comparator set and we continue to exclude them.

We do, however, consider freight railroads (in particular, North American Class I railroads) a primary comparator set due to their freight-focussed business model, strong market position and below rail infrastructure services, and similar demand drivers to ports. Importantly, Class I railroads do not typically derive significant revenue from property leasing, making their scope of operation more comparable to the Prescribed Services.

In the 2019 interim commentary, ESC recommended that we revisit the inclusion of railroads in the comparator set. In responding to this query, we:

- examine the arguments the ESC and Frontier Economics raised concerning our consideration of the railroads comparators.
- summarise and conclude on our comparator companies analysis.

Our commentary on the ESC/Frontier Economics' arguments

The ESC in its Interim Commentary recommended that "the port investigate further whether the characteristics of those railroad firms warrant their inclusion in the overall comparator sample."[223] The ESC argued that the North American and Canadian

[223] ESC (2019). Interim commentary – Port of Melbourne tariff compliance statement 2019-20, 16 December, p.26.

railways are not in the same industry as the port, are not land-lord operators, and operate in a different jurisdiction to the port; therefore, they are not good direct comparators of the port.[224]

We disagree with the ESC on this issue, and consider that our approach is consistent with a well accepted approach applied by regulators and financial practitioners. Specifically, as demonstrated in Table 1, it is a well accepted approach for Australian regulators to consider comparator firms from other industries and use international comparators, so long as the comparators are exposed to similar levels of systematic risk. Relevantly, the analysis of whether firms are exposed to similar levels of systematic risks is based on a range of characteristics including market, regulatory, and operational characteristics of the firms.

The ESC's view was informed by a Frontier Economics report it commissioned.[225] Frontier Economics view is that "the question of the inclusion of railroads ultimately reduces to whether these comparators are likely to face risks that are sufficiently similar to those faced by the Port," a statement with which we concur.[226] As part of its own first principles analysis, Frontier Economics considered a more comprehensive set of risk drivers which we have summarised in

Table 29.

Table 29 Summary of systematic risk factors for Class I railroads considered by Frontier Economics

Factor	Frontier commentary	Synergies assessment of impact on BEE's systematic risk relative to railroads
Extent of competition facing railways	Frontier Economics concluded that PoM faces little competition. In contrast, other regulators have found that North American railroads face significant competition for intermodal traffic, and more limited competition for bulk freight. Frontier Economics described competition exposure for railroads as being to a "significant degree", whereas PoM's exposure was only considered to be to a "minor degree"	↓ Decreases the BEE's systematic risk exposure relative to Class I railroads
Cost structure / Operating leverage	Railroad operations of rolling stock have a higher proportion of operating costs to fixed costs compared to below rail (track only) operations. This reduces railroad operating leverage relative to the BEE, because the BEE will have a lower proportion of incremental or avoidable cost associated with increased or reduced activity and consequently the	↑ Increases the BEE's systematic risk exposure relative to Class I railroads

224 ESC (2019), pp. 25-26.

225 Frontier Economics (2019). Issues in cost of capital estimation for the Port of Melbourne – Prepared for the Essential Services Commission, 12 December.

226 Frontier Economics (2019), p.12.

Factor	Frontier commentary	Synergies assessment of impact on BEE's systematic risk relative to railroads
	BEE's earnings will be relatively more affected by activity levels.	
Freight composition	US railroads handle a materially greater proportion of bulk freight than containerised (intermodal) freight compared to PoM. This raises the issue of whether there are differences in systematic risk between bulk and container freight businesses. Frontier Economics uses the contrasting examples of Pilbara railways transporting iron ore and railways that transport agricultural products to illustrate how bulk freight can be either high or low risk. Frontier Economics concludes that the impact on risk cannot be resolved without further investigation of each railway's particular characteristics.	Uncertain, although some of the issues raised by Frontier Economics actually reflect a combination of both product-related and competition-related considerations.
Contracting arrangements	Frontier Economics understands there is likely to be considerable variation in terms and conditions offered to US railroad customers. PoM's current charges are predominantly traffic-based without long-term contracts. This provides less revenue certainty in the event of economy downturns/upturns.	↑ Increases the BEE's systematic risk exposure relative to Class I railroads

Source: Adapted from Frontier Economics report for the ESC (pp.14-15)

Consequently, the only possible risk driver that Frontier Economics has identified as having the potential to lower the BEE's exposure relative to Class I railroads is the degree of competitive pressure. This contrasts with the passage in its "Key Findings" table, which states that *most* risks are higher than for the BEE:[227]

> Our analysis suggests there is evidence that North American railroads are not reasonable comparators to the Port. The nature of risks appears quite different, with most risks being higher than the Port.

Competition among Class I railroads has historically been a key point of contention for Australian economic regulators when considering these comparators for the WA rail networks, ARTC, the NSW Rail Access Undertaking, and Queensland Rail. These are summarised in Table 30.

Table 30 Australian regulatory commentary on Class I railroads

Regulator	Position on competitive pressures facing Class I railroads
ERA	Overseas rail operators would possess a higher level of systematic risk, relative to an Australian railway operator, given that American and Canadian railway operators were expected to face higher degrees of competition from alternative forms of transportation such as roads
ACCC	North American railways may have higher market risk [compared to ARTC] because they often compete with one another due to parallel infrastructure. Despite this, on balance the ACCC considers that North American and other overseas rail operators' asset betas (average 0.7) generally support ARTC's argument for an asset beta of 0.65 for its Interstate Rail Network.
IPART	The equity beta of US Class 1 railroads is high (0.93) because the regulation of the US Class 1 railroads is non-constraining and a substantial portion of their revenues is subject to competition from other

227 Frontier Economics (2019), p.3.

Regulator	Position on competitive pressures facing Class I railroads
	railroads and other forms of transport. As a result, stranding risk is higher and revenues are sensitive to the economic cycle.
QCA	Class 1 railroads face competitive pressure from parallel lines and alternative modes of transport. This enhances the level of counterparty risk, as customers have the ability to move their business from one Class 1 railroad operator to a competing operator. Class 1 railroads are generally not subject to a comprehensive regulatory regime that buffers their cash flows. This is to be expected given they face competitive pressure from parallel lines and alternative modes of transport

Source: Various regulatory decisions ERA, September 2015, final decision, Review of the method for estimating the Weighted Average Cost of Capital for the Regulated Railway Networks, p. 148; ACCC, April 2008, draft decision, 2008 ARTC Interstate access undertaking, p. 155; IPART, July 2014, final report and decision, NSW Rail access undertaking – review of the rate of return and remaining mine life, p. 17; QCA, April 2019, Draft Decision, Queensland Rail's 2020 Draft Access Undertaking, pp. 147-148.

Although Australian regulators have observed that Class 1 railroads face competitive pressures, the key issue is whether these characteristics result in railroads facing a similar degree of systematic risk as that applicable to the BEE in its provision of Prescribed Services.

The various commentaries emphasise two aspects of competition that regulators and practitioners have focused on: railroads competing with one another; and railroads competing with other modes of transportation. To understand this competitive position more fully, we examined the literature on competition faced by Class 1 railroads.

Since the passage of the Staggers Act in 1980, many US railroads have merged. The number of Class I railways has declined over the past 40 years from 41 to five: the Burlington Northern Santa Fe (BNSF) and Union Pacific Southern Pacific (UPSP) in the west, CSX and Norfolk Southern (NS) in the east, and the Kansas City Southern (KCS) in the center. Both horizontal ("parallel") and vertical ("end-to-end") mergers were part of this consolidation.

The last round of mergers was in the 1990s when the number of major competitors reduced from four to two in the west (with BN combining with ATSF in 1995 and UP combining with SP in 1996), and from three to two in the east (with CSX and NS carving up the assets of Conrail in 1998).[228] On the Canadian side, Canadian railway shipping has remained divided between two transcontinental carriers, the Canadian National (CN) and Canadian Pacific (CP) railways. These mergers have led to significant concentration in the US rail industry.

A 2014 paper by the US Department of Agriculture reported that:[229]

228 Russell Pittman, May 2009, Railway Mergers and Railway Alliances: Competition Issues and Lessons for Other Network Industries, Economic Analysis Group Discussion Paper.

229 United States Department of Agriculture (2014). Railroad Concentration, Market Shares, and Rates, February, p.1 Accessed from: https://www.ams.usda.gov/sites/default/files/media/Railroad%20Concentration%2C%20Market%20Shares%2C%20and%20Rates.pdf

> Since the passage of the Staggers Act in 1980, many railroads have merged. The market share of Class I railroads has increased since then, while the number of Class I railroads has fallen to only seven. Through railroad mergers, rail-to-rail competition has been reduced, railroad market power has increased, and rail costs have fallen by over half in real terms. Over much of this period, most of these reduced costs were passed on to shippers as savings through lower rates. Since 2004, however, average rail rates per ton-mile for all commodities have climbed 36 percent, negating some of the savings over the period.

This report echoed the findings of an earlier 2006 paper by the US Government Accountability Office (GAO), which observed that:[230]

> Concerns about competition and captivity remain as traffic is concentrated in fewer railroads. GAO's analysis of limited available measures indicates that the extent of captivity appears to be dropping, but the percentage of traffic traveling at rates substantially over the threshold for rate relief has increased. Also, some areas with access to only one major railroad have higher percentages of traffic traveling at rates above the threshold. These findings may reflect reasonable economic practices by the railroads or a possible abuse of market power. GAO's analysis is limited by available data and proxy measures but suggests that shippers in selected markets may be paying excessive rates, meriting further inquiry and analysis.

Overall, the evidence appears to be mixed as to whether Class I railroads are exposed to competition across the balance of their operations. There are areas where they do compete with other railroads and with road transport, but there also appear to be significant portions of the North American rail network where only one railroad operates or where one railway is significantly advantaged over alternatives.[231] This is not unlike the position the PoM faces for many, but by no means all, of its trade – a significantly advantaged position relative to alternatives for a significant portion of activity.

Moreover, there is an internal inconsistency in Frontier Economics' arguments regarding the competitive pressure faced by Class I railroads. On the one hand, Frontier Economics

[230] US Government Accountability Office (2006). Freight Railroads - Industry Health Has Improved, but Concerns about Competition and Capacity Should Be Addressed, p.2. Accessed from: https://www.gao.gov/assets/260/252473.pdf

[231] See for example, an assessment of Union Pacific's market power (https://www.forbes.com/sites/erikkobayashisolomon/2017/03/23/what-does-a-monopolist-look-like-it-looks-like-union-pacific-unp/#46b20b8793db). Additionally, Canadian grain traffic is subject to revenue cap regulation by the Canadian Transportation Agency. This accounts for about 16-17% of revenue for these businesses. Holding all else constant, this would have a dampening effect on the systematic risk exposure of these comparators. Refer: https://www.otc-cta.gc.ca/eng/qa-revenue-cap-transportation-western-grain.

notes that "North American railroads face significant competition for intermodal traffic, and more limited competition for bulk freight."[232]

According to US Department of Transportation, of all rail freight,[233] 91 percent is bulk commodities, such as agriculture and energy products, automobiles and components, construction materials, chemicals, coal, equipment, food, metals, minerals, and paper and pulp. The remaining 9 percent is intermodal traffic which generally consists of consumer goods and other miscellaneous products.[234] This is likely to reflect subtly different characterisations to those used in Australia.

Frontier Economics recognised that "the freight composition of US railroads contains a materially greater proportion of bulk freight than containerised (intermodal) freight" compared to PoM and noted that bulk freight is the predominant revenue source for US & Canadian railroads.[235] However, since bulk freight is the predominant revenue source and there is limited competition for bulk freight, then railroads overall would be exposed to limited competition and not a 'significant degree of competition' as claimed by Frontier Economics.

On this basis, it would be logical to conclude that overall Class I railroads face some degree of competition (just as PoM or the BEE is exposed to competition from other Australian ports). However, contrary to arguments put forward by regulators and Frontier Economics, they do not appear to be exposed to a significant degree of competition. This can be attributed to the high degree of market concentration and customer captivity.

Therefore, having regard to a range of characteristics (including but not limited to the competitive environment), we retain our view that freight railroads (in particular, North American Class I railroads) belong in a comparator set, and indeed, reflect some of the most relevant comparators to the PoM, despite having lower operating margins (which will tend to exert a dampening effect on beta). This is due to their freight-focussed business model, which produces similar exposures in demand to economic activity, strong market position and capital intensity. In particular, the Class I railroads have similar demand drivers to ports with significant volume exposure driven by economy-wide economic conditions and have high fixed capital costs (although relatively not as high as PoM).

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232 Frontier Economics (2019), p.14.

233 This is not necessarily restricted to Class I rail freight; however, in practice other railroad classes are smaller entities and tend to "feed" Class I traffic.

234 https://railroads.dot.gov/rail-network-development/freight-rail/freight-rail-overview

235 Frontier Economics (2019), pp.14-15.

Similarities between the BEE and railroads in regard to competitive pressures and other risk factors are explained further in our first principles analysis of PoM's systematic risk profile (see Attachment D). Rather than placing less weight on the US Class I railways, we believe that they are in fact a closer comparator to the BEE than several of the entities in the Marine Ports and Services classification.

Conclusion on our comparator companies analysis

In summary, the accumulation of evidence strongly supports the position that Class I railroads are appropriate comparators for the BEE, especially when faced with a limited ports comparator set. The ESC and Frontier Economics' analysis has identified only one systematic risk driver that would cause the BEE to have lower systematic risk exposure, namely competitive pressures. Based on regulatory practice, we consider systematic risk assessment requires consideration of a range of factors. Even then, evidence from North America indicates that Class I railroads still possess material market power, especially in regions with only one operator.

Taken together with the various factors that Class I railways exhibit that:

- increase the BEE's systematic risk profile relative to Class I railroads (e.g. contracting arrangements, operating leverage),
- better reflect the BEE's systematic risk profile relative to landlord ports (e.g. the absence of significant property-based revenue),

we consider that it is appropriate for railroads to be afforded significant weight in PoM's comparator sample. Given the paucity of genuinely relevant landlord port comparators, the inclusion of railroads is necessary to accurately approximate the systematic risk profile of the BEE.

On this basis, we have retained Marine Ports and Services firms and railroads in our comparator set. We consider that the comparator set remains sufficiently robust without airports included.

7.3.2 Use of international comparators

The assumption of an Australian-domiciled BEE is reasonable given PoM is a Melbourne-based entity with no operations or revenue streams outside of Australia. However, when deriving a WACC estimate for an Australian entity, the practical reality is that there are generally insufficient Australian listed entities to derive robust asset beta and gearing estimates. Informing our assessment of the systematic risk of the BEE by reference to entities not domiciled in Australia reflects this practical reality.

In its 2018 interim commentary, the ESC identified a number of drawbacks with the use of international firms for deriving beta estimates. In particular, the ESC had considered that:[236]

- international beta estimates will reflect the industry composition of the particular index against which the firm's returns are being compared, and this may differ from Australia; and
- returns for other market portfolios may reflect varying degrees of leverage as well as differences in taxation and bankruptcy arrangements in other countries.

As discussed above, a well accepted approach amongst Australian regulators to address these concerns is to source comparators from similar nations to minimise the impact of these factors and to place significant weight on them, particularly where there is a dearth of relevant Australian comparators. For example, in considering whether to source comparators from particular countries, IPART has regard to whether the firm's sovereign government bond and equity markets are sufficiently deep and liquid and has excluded some firms operating in China, Russia and some African companies.[237] These considerations mirror those that FTSE incorporates into its "Quality of Markets Matrix" for defining country classifications (see next section).

As discussed in Section 7.2.3, the use of a sample comprising international comparators is a well accepted approach among regulators and our approach conforms with it.

Our approach

In the 2019-20 TCS we investigated possible metrics that could be employed to further refine the range of countries that we rely upon to inform PoM's beta and gearing, and we applied the FTSE (Financial Times Stock Exchange) country classifications. These country criteria are used in a wide array of global index funds, and also frequently appear in media reports and academic literature.[238] This is likely to be a more robust and informative classification than the OECD/non-OECD split that we have used for illustrative purposes in previous submissions.

FTSE assesses countries against a "Quality of Markets Matrix", which has five key components:

- GNI per capita

236 ESC, October 2018, Interim Commentary – Port of Melbourne tariff compliance statement 2018–19, pp.68–69.

237 IPART, April 2019, Draft report, NSW Rail Access Undertaking – Review of the rate of return and remaining mine life, p. 24.

238 See Attachment G for further discussion.

- Dealing Landscape and Brokers
- Custody and Settlement
- Regulation
- Derivatives.

These components are further broken down into disaggregated criteria (see Attachment G). These include various quality indicators such as market liquidity, stock market oversight, whether equity and foreign exchange markets are free and "well-developed", level of transaction costs, and brokerage quality. As stated above, IPART also considers whether the firm's sovereign government bond and equity markets are sufficiently deep and liquid.

Markets are then assigned a rating of "Pass", "Restricted" (partial failure) or "Not Met" on each of these factors. Countries are then categorised into Developed, Advanced Emerging, Secondary Emerging, or Frontier, based on how many of these criteria are met. For the analysis that follows, we restrict our attention to those countries that appear in the Developed category. This category is most likely to mitigate the drawbacks of international comparators that the ESC highlighted in its 2018 interim commentary.

The FTSE classifications are not the only possible way of splitting up the comparator sample. The S&P Dow Jones Broad Market Indices (BMI) are an alternative classification system (similarly split into Developed, Emerging and Frontier). However, use of the S&P Developed BMI instead of the FTSE Developed series would result in exactly the same sample based on the comparators available for PoM.

Further information on the FTSE approach is provided in Attachment G of this report.

Conclusion on use of international comparators

There is a tradeoff between the size of the comparator sample and the extent of filtering that is undertaken to refine it. Here, however, there is not a sufficient number of Australian based listed entities to inform a beta assessment of PoM. There is no realistic option but to draw on international comparators, which is a well accepted approach in regulatory and finance spheres.

We have minimised the risk of incorporating less comparable international comparators by filtering on the basis of the quality of the relevant capital market where such entities are listed. This is consistent with regulatory practice. As a cross-check in Section 7.5.3, we present 5-year and 10-year beta estimates based on having regard to a broader selection of countries, and this also supports an asset beta of 0.70.

We note that in its 2019 interim commentary, the ESC acknowledged that we have addressed some of its concerns from the previous 2018 interim commentary. In particular, the ESC observed that "the port is now seeking comparators drawn from developed economies similar to Australia."

We now turn to a consideration of the industry classification systems.

7.3.3 Comparators sample identification process

In the 2019-20 TCS submission, we used the Global Industry Classification Standard (GICS) to draw our sample comparator companies for the industries we considered relevant, i.e. Marine Ports and Services and Railroads.

In the 2019 interim commentary, the ESC acknowledged that the GICS is a "reputable industry classification."[239] Nevertheless, the ESC also noted that there are other classification systems including the Bloomberg Industry Classification System (BICS), the Thomson Reuters Business Classification (TRBC) system and the Industry Classification Benchmark (ICB) system. The ESC's preliminary view was that we should investigate whether we have omitted relevant comparators that ought to be included in its sample. The ESC recommended that we revisit the choice of industry classification system.

As discussed in Section 7.2.4 the use of a reputable industry classification system to draw the sample of comparators is a well accepted approach among regulators. Hence, our approach to identifying the comparators sample from GICS – a reputable classification system, is a well accepted approach.

Nevertheless, it is possible that reliance on more than one industry classification system can yield a wider range of possible comparators. We therefore consider Frontier Economics' suggestions in the context of the assembly of our comparative set, an issue to which we now turn as follows:

- we examine Frontier Economics' arguments for recommended inclusions to our comparators sample
- we examine Frontier Economics' arguments for recommended exclusions from our comparators sample
- we summarise and conclude on our sample of comparator companies.

[239] Interim commentary, p.26.

Our commentary on ESC/Frontier Economics' recommended inclusions

Frontier Economics combined four classification systems (i.e. BICS, GICS, ICB and TRBC) and eventually identified 14 comparator firms in the Marine Ports and Services category from an initial sample of 1,030 firms from the combined systems.

Five of these 14 comparators featured in the Synergies sample for the 2019-20 TCS, while 9 did not. However, of these 9, Frontier Economics recommended only three for our consideration: [240]

- Marsden Maritime Holdings
- Ocean Wilsons Holdings
- Global Ports Holding.

In our view, none of these firms should be incorporated into our comparator set.

Global Ports Holding did not have sufficient observations to generate a 5-year beta estimate, having been listed only in May 2017. Therefore, it is not clear why Frontier Economics recommended it.

Key attributes of Marsden Maritime Holdings and Ocean Wilsons Holdings are listed in Table 31.

Table 31 Frontier Economics' recommended additions to the ports sample

Firm	Synergies analysis
Marsden Maritime Holdings	Marsden Maritime Holdings has a 50% stake in the Northport facility at Marsden Point. Although it is a New Zealand comparator, we have concerns about its inclusion on qualitative grounds. Northport is a bulk cargo port dedicated almost exclusively to logs and other forestry products, with very limited container traffic. Its other business areas are property holdings and marinas, which are of little relevance to the BEE. It has also been identified as a possible replacement container port to Auckland, although whether it will do so is speculative. However, the Port of Tauranga (which forms part of our comparator set) is a joint venuture partner for the development of this facility. At present, Marsden Maritime Holdings has a market capitalisation of less than US$200 million, which makes it ineligible for our comparator set.
Ocean Wilsons Holdings	Ocean Wilsons Holdings operates in Bermuda and Brazil, and provides towage, lighterage contracting, stevedoring and warehousing. However, its subsidiaries are also involved in offshore oil and gas support services, construction, shipbuilding and agricultural merchanting. Therefore, it is not immediately apparent that this aligns with the BEE's prescribed services. In addition to this, Ocean Wilsons Holdings is listed in the UK, whereas its operations are in Bermuda and Brazil. Consequently, the UK stock market may not be reflective of economic

240 P.23 of Frontier Economics report. Frontier Economics did not comment on the other six firms. However, we note that two have insufficient or missing data (Xinghua Port Holdings and China Infrastructure & Logistics Group Lt/CIG Yangtze Ports PLC), one is heavily diversified into logistics services, engineering and port/property development activities (PYI Corporation Limited), and three were statistically insignificant in our estimation (Bremer Lagerhaus-Gesellschaft AG, South Port New Zealand Limited and Mercantile Ports and Logistics Limited).

Firm	Synergies analysis
	conditions in these other countries (in contrast to Hong Kong, China and Singapore, where there is likely to be closer correlation between markets).

Source: Synergies analysis, Frontier Economics

In addition to Marsden Maritime Holdings' low market capitalisation, the overview of the two firms in Table 31 is symptomatic of holding companies. Frontier Economics also acknowledged that "a holding company could be excluded on the basis of diversified subsidiaries."[241] Indeed, Marsden Maritime Holdings as a holding company is involved in a diverse range of activities that may cause them to diverge significantly from the BEE in its provision of prescribed services. Moreover, the Port of Tauranga (which forms part of our comparator set) is a joint venture partner for the development of the container facility (if it occurs). As such, not only is Marsden Maritime Holdings a poor comparator, but incorporating would over-represent it in our sample.

Similarly, Ocean Wilsons Holdings is a holding company that is involved in a diverse range of activities. Moreover, Ocean Wilsons Holdings is listed in the UK, whereas its operations are in Bermuda and Brazil, and there is no reason that the UK market would be correlated with economic activity in either Bermuda or Brazil.

Therefore, we disagree that these firms should be included in the BEE's comparator set.[242] We considered, and rejected these firms when identifying our comparator set and remain of the view that they do not helpfully inform the systematic risk of the BEE.[243] We maintain our view that they should not be included in the comparator set.

While Frontier Economics presents arguments against the inclusion of rail entities, it did propose a number of additional rail entities for our consideration, these being Gold Bond Group, Pioneer Railcorp and Getlink SE.

In our view, none of these comparators are suitable for inclusion in the comparator set. Table 32 sets out our reasons for this view, which in summary are:

- Gold Bond Group's market capitalisation is below US$200 million.
- Pioneer Railcorp has been delisted since July 2019
- Getlink SE's main business operations are predominantly passenger-oriented, which contrasts with the predominantly freight-focused nature of the BEE.

241 Frontier Economics (2019), p.18.

242 Previously, these companies also had statistically insignificant betas, but as at March 2020, they are now significant.

243 In fact, these firms were detected via our sample section process using GICS despite the ESC's concerns that we may have excluded relevant comparators by our sole reliance on GICS. Indeed, Frontier Economics' analysis recommended no new comparators that were not already listed under the GICS Marine Ports and Services category.

Table 32 Frontier Economics' recommended additions to the rail sample

Firm	Synergies analysis
Gold Bond Group	Synergies has previously excluded this comparator due to its status as a holding company. In addition to this, it has frequently been situated below our statistical significance thresholds, although at present its t-statistic and R^2 are above the required levels. When examining holding companies, caution needs to be exercised that these comparators are capturing relevant underlying business activities and not being unduly influenced by other diversified exposure. The Global Industry Classification Standards (GICS) classify this firm under Marine Ports and Services, although Frontier Economics' filtering procedure has assigned it to the rail sector, because it has both rail and port exposure. Gold Bond Group currently has a market capitalisation of less than US$200 million and is therefore ineligible for the comparator set.
Pioneer Railcorp	This company was acquired in July 2019 and is no longer listed.
Getlink SE	Getlink is the manager of the Channel Tunnel between the UK and France. It derives only 12% of its revenue from Europorte, its private rail freight operator subsidiary.[244] The remaining 88% of revenue is derived from its Eurotunnel segment, which is dominated by shuttles for passengers and their vehicles, along with truck shuttles. Getlink states that shuttle services generate 58% of group revenue. The significant exposure to passenger traffic means that including Getlink in PoM's sample would appear to be inconsistent with the ESC's previous guidance about entities that derive only a small proportion of revenue from freight (e.g. airports) having different demand drivers from freight. Therefore, we disagree that this firm should feature in the BEE's comparator sample.

Source: Bloomberg, Synergies analysis of company reports

We consider that an appropriate railroads comparator set for PoM consists of North American Class I railroads.

As such, for both the rail and port sectors, there appears to be considerable overlap across these various classification systems, and placing sole reliance on GICS has not overlooked any relevant comparators and therefore has no meaningful bearing on the ultimate comparator set outcome.

Our commentary on ESC/Frontier Economics' recommended exclusions

Frontier Economics also recommended the exclusion of 6 comparators that we had included in our comparator set on the basis that the companies were not identified during the course of its investigations.

This led Frontier Economics to conclude that Synergies may have incorrectly included them in the sample for PoM.

244 Getlink SE (2019). 2019 universal registration document, p.6.

Given the adoption of the market capitalisation threshold (refer Chapter 4), we agree that three of the 6 companies, Dongbang Transport Logistics, Rinko Corporation and Sakurajima Futo Kaisha, should be excluded on the basis of market capitalisation threshold classification (rather than the reasons put forward by Frontier Economics).[245]

We address the remaining companies (Qube Holdings, Hamburger Hafen und Logistik and Dalian Port) as follows.

Qube Holdings was excluded by Frontier on the basis that it was classified as a logistics company. Whilst Qube provides logistics-based services, it:

- Owns half of Patrick Stevedoring
- Operates port shuttles between container parks and container terminals at ports
- Owns 100% of Australian Amalgamated Terminals (terminal operator for the import and export of motor vehicles and general cargo)
- Owns 100% of Prixcar – motor vehicle import storage and pre-delivery and inspection service provider
- Operates general and bulk stevedoring services across Australia.

Patrick and Ports and Bulk divisions account for 60% of Qube Holdings revenue and over 90% of Qube's revenue is earned in Australia.[246] Road and rail logistics are specifically focused on imported and exported goods through ports where they occupy very significant land holdings at ports.

Accordingly, Qube is exposed to demand shocks that most closely resemble those encountered by the BEE. In particular, volumes handled by Qube largely mirror those that pass through PoM and other Australian ports, particularly containers and cars. As there is no listed comparator that so closely resembles PoM's demand profile, Qube is, in our view, an important inclusion for the BEE's comparator sample. Whilst Qube operates in more competitive markets than PoM, it enjoys significantly lower operating leverage. As such, other than the fact that Qube operates in more competitive markets than the BEE, every other characteristic suggests that Qube's asset beta would be lower than the BEE.

245 It was specifically on the recommendation of the ESC that we relaxed this market cap restriction for the 2018-19 TCS. At the time, we acknowledged that it was an open question whether entities of this size could accurately reflect the risk profile of the BEE (given that size and asset intensity are key considerations).

246 https://qube.com.au/wp-content/uploads/2019/08/FY-19-Full-Year-Results-Presentation.pdf

Synergies ECONOMIC CONSULTING

Hamburger Hafen und Logistik was excluded by Frontier on the basis that it was classified as a logistics company. However, Hamburger Hafen und Logistik is a major container terminal handling company operating predominantly at the port in Hamburg, the third largest container port in Europe. Hamburger Hafen und Logistik handled over 7.5 million TEU last year. 93% of Hamburger Hafen und Logistik's revenue was sourced from its container and intermodal business. Logistics and real estate comprised the remaining 7% of revenue.[247]

Frontier Economics removed Dalian Port on the basis that its country of security (ISIN) was listed as China (which is not FTSE Developed). It is clearly a port with a freight mix that sufficiently resembles the BEE for it to be included. Whilst Dalian Port operates in China , it is listed in Hong Kong (which falls within the FTSE developed category), and there is sufficient integration between the Hong Kong and Chinese economies for it be to included in our comparator set.[248]

On the basis of this evidence, we believe that, with the exception of the comparators with market capitalisation of less than US$200 million, the remaining comparators (Qube Holdings, Hamburger Hafen und Logistik, and Dalian Port) should be retained in order to establish a comparator set that appropriately reflects the risks faced by the BEE in its provision of Prescribed Services.

Frontier Economics also provided commentary on specific firms in our rail comparator sample. Frontier Economics distinguished between Aurizon Holdings and the rest of the Class I railroads that comprise the sample. Frontier Economics agreed with our assessment that certain features of Aurizon's coal business meant it carried different systematic risk from other freight railways or ports.[249] On this basis, and given that Aurizon earns only a small share of revenue from its intermodal containerised business, Frontier Economics concluded Aurizon is not an obvious or close comparator to the BEE. We agree with this assessment, especially with Aurizon exiting the intermodal market.

247 https://bericht.hhla.de/geschaeftsbericht-2019/

248 It is not clear from Frontier Economics report whether the country of operation or listing is relevant for the purposes of assessing inclusion in the comparator set. If the countries are to be inferred from ISINs, then Ocean Wilsons Holdings (one of Frontier Economics' recommended additions), would need to be excluded because its ISIN is listed as Bermuda (as is COSCO Shipping Ports, which like Dalian Port, is listed in Hong Kong, and was included by Frontier Economics). Therefore, we recommend that the country of listing is a more robust basis on which to determine the country for the purposes of assessing possible inclusion in the comparator set.

249 Frontier Economics (2019), p.8.

7.3.4 Conclusion on our final sample of comparator firms

Our final comparator set for the 2020-21 TCS, consisting of ports and railroads is presented in Table 33.[250] As discussed in the following sections, we have removed companies with a market capitalisation of less than US$200 million (as at 31 March 2020).

Table 33 BEE comparator set for 2020-21 TCS

PORT COMPARATORS (7 firms)	
Qube Holdings	Australia
Port of Tauranga	New Zealand
Hamburger Hafen und Logistik	Germany
China Merchants Ports Holding Company	Hong Kong
COSCO Shipping Ports	Hong Kong
Dalian Port	Hong Kong
Hutchison Port Holdings Trust	Singapore
RAILROAD COMPARATORS (6 firms)	
CSX Corporation	United States
Kansas City Southern	United States
Norfolk Southern Corporation	United States
Union Pacific Corporation	United States
Canadian National Railway Company	Canada
Canadian Pacific Railway	Canada

Note: Frontier Economics recommended the exclusion of the following comparators: Qube Holdings, Hamburger Hafen und Logistik, and Dalian Port. Firms with a market capitalisation of less than US$200 million have been removed from the comparator set. Genesee and Wyoming has been delisted and no longer features in the railroad comparator set.

Source: Bloomberg

Having arrived at a comparator set, the final issue in relation to reliance for the purposes of beta estimation revolves around the statistical reliability of beta estimates.

250 We have excluded three companies (Global Ports Investments, Logistec Corporation and Eurokai GmbH) from the comparator set on firm-specific grounds, despite their market capitalisations all exceeding US$200 million. Firstly, Global Ports Investments is listed in the UK, although it operates ports in Finland, Estonia and Russia. Consequently, the UK stock market may not be reflective of economic conditions in these other countries. In addition to this, there were also a number of days in 2019 and 2020 where the stock did not trade at all. Secondly, we have continued to exclude Logistec Corporation, which we had previously excluded on the basis of statistical insignificance. While its beta is now significant, and its market capitalisation exceeds US$200 million, upon further inspection, the business derives 40% of its revenue from environmental services, which are not relevant to the BEE's Prescribed Services. Third, we have continued to exclude Eurokai, which we had also previously excluded due to statistical significance. Over the sample period, there are entire weeks where the stock does not trade at all. This is corroborated by Incenta's liquidity analysis, which shows that Eurokai is clearly an outlier in terms of liquidity (Incenta (2020) Estimating the Port of Melbourne's equity beta, A report for the Port of Melbourne). Neither Logistec nor Eurokai were recommended by Frontier Economics.

7.3.5 Statistical diagnostics

In its 2018 commentary, the ESC was concerned that the exclusion of firms with negative and/or statistically insignificant betas may impart upward bias on PoM's beta estimate. Specifically, the ESC had observed that the level of statistical confidence in the beta estimates (as measured by the standard errors) did not change over the range of beta values.

In our 2019-20 TCS submission, we demonstrated that, contrary to the ESC's conclusion, the statistical confidence of the beta estimates does change over the range of beta values. There are firms with low betas that are statistically significant, and there are firms with low betas that are not significant.

Accordingly, our 2019-20 TCS submission maintained that filtering betas on the basis of statistical significance is an important consideration when inferring the systematic risk of the BEE from comparators. This criterion ensures that we are not inadvertently including firms with statistically "noisy" returns, where disruptive firm-specific events are causing their returns to fluctuate out of sync with the broader market.

In its 2019 interim commentary, the ESC recommended that we revisit our approach to excluding low significance comparators. The ESC's concern was that our statistical filtering rules may introduce an upward bias to our estimates. In particular, both the ESC and Frontier Economics argued that low beta estimates will have low R^2 values, even if the estimates are highly precise.

In Section 7.2.5 we demonstrated that the application of statistical filtering and diagnostic tests for beta estimates is a well accepted approach for both regulators and financial practitioners. Moreover, applying these diagnostics represents a well accepted approach for statistical inference more generally. None of those sources raise concerns about upward bias as argued by the ESC and Frontier Economics. Hence, our approach is consistent with this practice.

Nevertheless, we recognise that statistical filtering is an ongoing source of contention with the ESC. We note that the each firm we considered should not be included because of statistical filtering also would be excluded by the adoption of a market capitalisation threshold of US$200 million. The adoption of a market capitalisation threshold is a well accepted approach by Australian regulators, even if regulators do not always stipulate an explicit threshold (see Section 7.2.6). Apart from the widespread practice amongst regulators, the reasons for adopting a market capitalisation were outlined in Chapter 4. The adoption of a market capitalisation threshold results in all identified comparators meeting the statistically significant t-statistics and R^2 values.

We acknowledge that a low level of statistical reliability may not inviolate an entity from being considered as part of a comparator set. Our concern is that little or no weight should be given to a beta estimate that does not meet standard tests of statistical reliability that underpin conventional statistical inference.

In summary, our view is that statistical significance filtering forms part of a well accepted approach for inferring the systematic risk for a BEE (or a corresponding entity in financial practice) from a comparator set. However, the statistical significance filtering we have employed has no impact on the final comparator set once a market capitalisation threshold filter is adopted.[251] The same beta sample emerges with or without statistical filtering.

7.4 Beta estimation

7.4.1 Approach to estimating asset betas

Betas have been estimated based on five years of monthly (and weekly) returns, regressed against the relevant domestic share market index using Ordinary Least Squares. We eliminated any firms with a market capitalisation of less than US$200 million as well as any companies from countries that are not FTSE Developed.[252]

The resulting equity betas were de-levered to produce an asset beta using the Brealey-Myers approach as follows:

$$\beta_e = \beta_a * (1 + D / E)$$

Where

βe = equity beta

βa = asset beta

D = proportion of debt within the assumed capital structure

E = proportion of equity within the assumed capital structure

251 As at March 2020, only 1 FTSE Developed comparator (South Port New Zealand) has a statistically insignificant beta. However, Frontier Economics did not recommend that this company be included in PoM's comparator sample. Bremer Lagerhaus-Gesellschaft AG also had a statistically insignificant beta, but it is excluded on the basis of its beta being negative.

252 In Section 7.5.3, we present beta estimates that include firms from these countries.

7.4.2 Beta estimates

The average gearing levels for each business were calculated using annual data over the five-year period (using the ratio of long-term debt to market value of equity). The resulting asset betas are shown in Table 34.

Table 34 BEE comparator set beta estimates for 2020-21 TCS

Comparator firm	5-year monthly asset beta	5-year weekly asset beta	10-year monthly asset beta	10-year weekly asset beta
PORT COMPARATORS (7 firms)				
Qube Holdings	1.13	1.01	1.02	0.63
Port of Tauranga	0.60	0.64	0.60	0.93
Hamburger Hafen und Logistik	0.79	0.64	0.76	1.08
China Merchants Ports Holding Company	0.77	0.74	0.80	0.91
COSCO Shipping Ports	0.44	0.42	0.71	0.97
Dalian Port	0.70	0.58	0.65	0.68
Hutchison Port Holdings Trust	0.49	0.49	0.54	0.80
Ports average asset beta	**0.70**	**0.65**	**0.73**	**0.68**
Ports median asset beta	**0.70**	**0.64**	**0.71**	**0.63**
RAILROAD COMPARATORS (6 firms)				
CSX Corporation	0.94	0.91	0.95	0.93
Kansas City Southern	0.80	0.85	0.93	1.08
Norfolk Southern Corporation	1.09	0.90	0.97	0.91
Union Pacific Corporation	0.91	0.92	0.88	0.97
Canadian National Railway Company	0.55	0.70	0.51	0.68
Canadian Pacific Railway	0.72	0.80	0.75	0.80
Railroads average asset beta	**0.84**	**0.84**	**0.83**	**0.90**
Railroads median asset beta	**0.85**	**0.87**	**0.90**	**0.92**
OVERALL AVERAGE ASSET BETA	**0.76**	**0.74**	**0.77**	**0.78**
OVERALL MEDIAN ASSET BETA	**0.77**	**0.74**	**0.76**	**0.80**

Note: Asset beta estimates are as at March 2020. Frontier Economics recommended the exclusion of the following comparators: Qube Holdings, Hamburger Hafen und Logistik, and Dalian Port. Firms with a market capitalisation of less than US$200 million have been removed from the comparator set. Genesee and Wyoming has been delisted and no longer features in the railroad comparator set.

Source: Bloomberg, Synergies analysis

Over 5 years, the average (median) asset beta for the full sample is 0.76 (0.77) using monthly estimates, while using weekly estimates, the average and median is 0.74. Over 10 years for monthly data, the average asset beta is 0.77 while the median is 0.76; using weekly data, the average (median) is 0.78 (0.80). Therefore, the updated empirical evidence across 5-year and 10-year windows remains consistent with an asset beta of at least 0.70. Moreover, when using 5-year and 10-year monthly data, an asset beta of 0.70 is justified solely on the basis of the ports comparators before taking railroads into consideration.[253] An asset beta of at least 0.75 represents a figure that can also be supported by this data and sits at the upper end of our range.

7.4.3 First principles assessment

In our view, reliance on average or median asset beta measures of this comparator set is conservative, at least for the port comparators, when account is taken of a first principles assessment (refer Attachment D), a summary of which is contained in Table 35.

253 Indeed, depending on the weight ascribed to Class I railroads, it is not unreasonable to suggest that an asset beta of 0.85 could form the upper end of the range.

Table 35 First principles analysis of the characteristics of PoM and comparator industries

Risk factor	Port of Melbourne	Marine ports and services	Class 1 railroads	Impact on PoM's systematic risk relative to comparators
Nature of the product/ nature of the customer	Predominantly import-oriented, and majority of trade handled is containerised (80% of revenue FY18), which is driven by factors that have a direct correlation with GDP.	Similar market exposure to container freight trade, albeit with limitations due to issues of comparability with the BEE: Port comparators earn revenue from wider range of services (e.g. property leasing that is significantly less affected by movements in economic activity) Stevedores have similar market exposure, although typically operate in multiple jurisdictions	Freight-focussed business model, Handle relatively more bulk freight than containerised (intermodal) freight than PoM.	Class I railroads exhibit the most similar systematic risk exposure to the BEE
Pricing structure/ contracting environment	PoM's charges are predominantly traffic-based without long-term contracts. This provides less revenue certainty in the event of economy downturns/upturns.	Stevedores – contracts with shipping lines of 1-3 years duration Ports – traffic based with no contracts; long term property leases	Contracts are of varying durations	Increases the BEE's systematic risk exposure relative to Class I railroads
Market power (competition environment)	Subject to some competition from other ports, although the degree of contestability differs both by cargo type and by destination.	Terminal operators experience a more intense competitive environment than landlord ports Ports – similar to BEE	Overall Class I railroads face a degree of competition (just as PoM or the BEE is exposed to competition from other Australian ports). However, they do not appear to be exposed to a significant degree of competition, which can be attributed to the high degree of market concentration and customer captivity.	Ports – similar market power to BEE Class I railroads exhibit market power but are in a more competitive environment than BEE Stevedores are in a more competitive environment than BEE
Form of regulation	Regulated (price cap form regulation, which is not cost based and has a long re-set period). Regulatory framework does not provide PoM with a stable revenue stream and does not provide any meaningful protection against volume and cost risks.	Not regulated	Class 1 railroads are subject to very limited regulatory intervention.	BEE does not gain benefit of stability afforded by regulation. Similar systematic risk exposure relative to Class I railroads

Growth options	PoM, is likely to undertake a number of capital projects to maintain / upgrade existing assets as well as expand the Port's capacity to service Victoria's increasing freight demand.	Growth options vary depending on locations	Growth options vary depending on locations	Not determinative
Operating leverage	PoM has a relatively high fixed cost base due to the inherently capital intense nature of the business. Additionally, PoM is subject to fixed fees which are unrelated to actual port services or costs. As fixed costs, these obligations add to PoM's operating leverage. Prescribed Services do not include property revenue that reduces operating leverage	Terminal operators generally have lower operating leverage (lower fixed capital costs and higher variable costs within their total cost base) than a landlord port, such as PoM	Railroad operations of rolling stock have a higher proportion of operating costs to fixed costs compared to below rail (track only) operations. This reduces railroad operating leverage relative to the BEE, because the BEE will have a lower proportion of incremental or avoidable cost associated with increased or reduced activity and consequently the BEE's earnings will be relatively more affected by activity levels.	BEE's systematic risk exposure higher than all comparators

The key findings of our first principles analysis are that:

- the BEE is likely to have an asset beta that exceeds the average asset beta of the Marine Ports and Services members of the comparator set, due to:
  - Those entities with an asset beta that is lower than average can readily be reconciled as presenting lower systematic risk than the BEE:
    - Port of Tauranga is export focused, with container and non-container volumes materially exceeding imports (the Port of Tauranga is the largest export port in New Zealand by TEU with approximately 38% of total export volumes). Moreover, the port is vertically integrated into stevedoring and transport operations, suggesting a relatively lower operating margin than the BEE, and it also earns significant revenue from property [254]
    - COSCO Holdings and Hutchinson Port Holdings have significant international diversification in their operations – this international diversification serves to reduce the asset beta relative to the BEE. This is because these companies' earnings will be influenced by the economic circumstances of numerous countries (other than the country of listing), whereas the BEE's entire operations are limited to a single geographic location
  - the Prescribed Services of the BEE being narrowly defined to exclude property related revenue, which increases the likely asset beta relative to the landlord ports contained in our comparator set.
- US Class I railways form an important and highly relevant comparator for the BEE

This assessment is supported by our cross checks.

7.5 Asset beta cross-checks

We have considered three cross-checks in order to evaluate the robustness of the beta estimate emerging from our comparator set for the BEE:

- industry beta estimates from Professor Aswath Damodaran;
- beta estimates for transport business from independent expert reports; and

[254] https://www2.deloitte.com/content/dam/Deloitte/nz/Documents/icp/nz-en-2019-Ports-and-Freight-Yearbook.pdf

- beta estimates from non-FTSE Developed countries to demonstrate the impacts of country filtering.

7.5.1 Industry beta estimates from Professor Aswath Damodaran

For our first cross-check on the beta estimates resulting from the comparator set, we have investigated industry beta estimates from Professor Aswath Damodaran, a globally recognised Professor of Finance at the Stern School of Business at New York University.[255] Professor Damodaran publishes industry beta estimates for 96 sectors. The industry beta estimates most relevant to the BEE are the Transportation sector and the Railroads sector.[256] Damodaran's estimates, as at January 2020, are shown in Table 36.

Table 36 Damodaran industry beta estimates

Industry	Number of firms	Asset beta estimate
Transportation	265	0.74
Transportation (Railroads)	52	0.81

Note: Industry betas are available for the US, Europe, Japan, Emerging Markets, or Global. Because there are no specific beta estimates available for Australia or Asia-Pacific, we have relied on the global estimates. A full list of the companies used to generate the beta estimate can be found here: http://www.stern.nyu.edu/~adamodar/pc/datasets/indname.xls. Professor Damodaran does not publish sub-industry beta estimates for Transportation (ports).

Source: Professor Aswath Damodaran

Damodaran's estimate of 0.74 for the transportation sector is identical to our unrounded beta estimate for the BEE based on a combined sample of ports and railroads. In addition, Damodaran's estimate for the railroads sector aligns closely with our five- and ten-year estimates from our identified railroads comparator set. Overall, these industry-wide cross-checks affirm the robustness of our beta estimate for the BEE.

7.5.2 Transport beta estimates from independent expert reports

Independent expert reports for the Australian transport sector sector have been relatively infrequent in recent years. However, the independent expert reports prepared by Grant Samuel for Toll and Asciano, first introduced in Section 7.2.4, provide another relevant reference point for the risks faced by the BEE in its provision of prescribed services.

Asciano's beta range was informed by:

- Rail Transport (consisting predominantly of Class I railroads and Aurizon);

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[255] Professor Aswath Damodaran also proposed the Damodaran (2013) DDM model used by IPART to calculate the MRP.

[256] Damodaran, A. (2020). Levered and unlevered betas by industry - global. Available from: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datacurrent.html#discrate [Accessed 7 April 2020].

- Container Port Operators (such as Hamburger Hafen und Logistik and Hutchison Port Holding Trusts, which feature in our beta sample for the BEE);
- Diversified and Bulk Ports (which included Port of Tauranga, China Merchants Port Holding Company and Dalian Port); and
- Freight and Logistics (which included Qube).

Grant Samuel did not specify a comparator set in the report for Toll.

In both reports, Grant Samuel estimates a range for the equity beta, rather than the asset beta. Using the Brealey-Myers levering formula and Grant Samuel's gearing assumptions, Table 37 derives the implied asset beta range for each of the business divisions within each company. In the case of Toll, Grant Samuel reported Toll's actual equity beta, but ultimately adopted a lower beta range of on the basis of other peer group comparators. With the exception of Asciano's Pacific National (PN) business, for which Grant Samuel assigned a lower bound of 0.675, (noting that the bulk of PN's revenue is sourced from coal) all other beta ranges exceeded our beta estimate for the BEE of 0.70.

Table 37 Grant Samuel transport beta estimates

Company	Business Division	Equity beta	Gearing	Implied asset beta
Asciano	Pacific National (PN)	0.9-1.0	15%-25%	0.675-0.85
	Patrick Terminals & Logistics (T&L)	1.0-1.1	15%-25%	0.75-0.935
	Patrick Bulk & Automotive Services (BAPS)	1.0-1.1	10%-20%	0.80-0.99
Toll	Assumed equity beta	1.0-1.1	20%-25%	0.75-0.88
	Toll's actual equity beta	1.5+ (as reported by Grant Samuel)	20%-25%	1.125-1.20+

Note: The implied asset beta has been derived using the Brealey-Myers formula
Source: Grant Samuel

This data reaffirms that our asset beta range estimate of between 0.70 and 0.75 for the BEE is likely to be conservative. The contribution of these estimates compared to the Damodaran estimates is that they relate directly to entities who, until recently, operated in specifically in the Australian transport sector.

7.5.3 Beta estimates for firms from non-FTSE developed countries

Table 38 demonstrates the impact on the beta estimate for the BEE presented if firms from non-FTSE Developed countries are included. The estimated asset beta of 0.70 remains robust to the inclusion of these companies.

Table 38 Beta estimates for firms from non-FTSE developed countries

Firm	Sector	Country	FTSE classification	5-year monthly beta	5-year weekly beta	10-year monthly beta	10-year weekly beta
Piraeus Port Authority	Marine Ports and Services	Greece	Advanced Emerging	0.42	0.47	0.53	0.48
Thessaloniki Port Authority	Marine Ports and Services	Greece	Advanced Emerging	0.38	0.40	0.50	0.43
Sociedad Matriz SAAM	Marine Ports and Services	Chile	Secondary Emerging	0.69	0.42	0.76	0.47
Luka Koper	Marine Ports and Services	Slovenia	Frontier	0.77	0.83	0.85	0.68
Wilson Sons	Marine Ports and Services	Brazil	Advanced Emerging	0.45	0.25	0.38	0.24
ADSEZ	Marine Ports and Services	India	Secondary Emerging	1.09	1.21	0.89	1.04
Asian Terminals	Marine Ports and Services	Philippines	Secondary Emerging	0.38	0.17	0.59	0.33
International Container Terminal Services	Marine Ports and Services	Philippines	Secondary Emerging	0.87	0.51	0.83	0.61
DP World	Marine Ports and Services	UAE	Secondary Emerging	0.24	0.36	0.28	0.29
Alexandria Containers & Goods	Marine Ports and Services	Egypt	Secondary Emerging	1.14	0.75	0.92	0.70
Container Corporation of India Limited	Railroads	India	Secondary Emerging	1.14	1.01	0.92	0.80
Non-FTSE Developed Average				0.69	0.58	0.68	0.55
Non-FTSE Developed Median				0.69	0.47	0.76	0.48
Overall average with non-FTSE Developed firms added to sample				**0.73**	**0.67**	**0.73**	**0.68**
Overall median with non-FTSE Developed firms added to sample				**0.74**	**0.67**	**0.76**	**0.68**

Source: Synergies analysis, FTSE, Bloomberg

7.6 Conclusion: asset beta for PoM

In conclusion:

- we have used a well accepted approach to form a comparator set from which to estimate an asset beta for the BEE

- we have used a well accepted approach to estimate the asset beta for the BEE
- the empirical evidence supports an asset beta estimate of at least 0.7 and an upper bound of at least 0.75
- the first principles analysis (refer Attachment D) suggest that PoM's systematic risk:
  - is at least as high as the average of the Marine Ports and Services members of the comparator set.
  - the systematic risk profile of the BEE shares many similarities with Class I railroads;
- an asset beta of at least 0.7 is consistent with the most recent regulatory review of a similar freight business in Australia, Arc Infrastructure, which on a first principles basis, could be expected to have lower systematic risk than PoM.[257]
- an asset beta of at least 0.7 is also consistent with our three cross checks.

Overall, we consider that an asset beta value of 0.7 (from a range of 0.70 to 0.75) represents a conservative assessment.[258]

[257] ERA (2019). 2018 and 2019 weighted average cost of capital for the freight and urban rail networks, and the Pilbara Railways, 22 August.

[258] The upper limit of the range may increase if greater weight is ascribed to Class I railroads.

8 Capital structure

Chapter overview
We have retained our assumed capital structure for PoM of 30% gearing from the 2019-20 submission. This remains within the range of transport regulatory decisions, and evidence from listed comparators indicates no material movement in gearing levels.

8.1 Introduction

The Pricing Order requires the cost of debt and equity to be distinguished. This in turn requires the weighting of equity and debt in the rate of return calculation to be established. The purpose of this chapter is to identify the weighting of equity and debt in the rate of return calculation, that is, an appropriate long-term target gearing ratio for the BEE based on domestic and international entities with comparable risks, and having regard to relevant regulatory precedent for comparable firms. We first consider relevant background on the factors affecting the capital structure for a BEE. Then we turn to regulatory precedent to consider the range of capital structure outcomes regulators have adopted for entities in the transport sector. We then turn to an analysis of the range of gearing levels maintained by comparable entities. Against this backdrop we consider the ESC commentary before setting out our conclusions.

8.2 Background

In a perfect capital market, finance theory provides that the valuation of a firm is unaffected by its capital structure. A higher proportion of debt in the capital structure will increase the weight placed on the return on debt (which is lower than the return on equity), but this is offset by an increase in the required return on equity resulting from the higher leverage. However, in practice, the assumptions underpinning a perfect capital market do not hold and as such capital structure can have valuation impacts. Clearly, this is relevant to a consideration of the capital structure applying to a BEE.

The assessment of capital structure (or gearing) in the WACC calculation is therefore based on an assessment of an 'optimal' long-term target capital structure for the BEE given its risk profile and the industry within which it operates.

To achieve consistency with the Pricing Order requires the selection of a benchmark gearing ratio that would apply to an efficient benchmark firm in the same industry with the same risk profile as the provision of Prescribed Services by the PoM. However, in practice we see numerous and sometimes disparate factors affecting the capital structure adopted by firms within the same industry (for example, different levels of cash flow variability, financing strategies, investment needs, owner preferences, tax treatments and so on).

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Consequently, it is reasonable to determine a range to assess the efficient financing of a benchmark entity before choosing a point estimate from within the range based on a qualitative assessment of PoM's risk profile. To inform this range for PoM we begin by looking at relevant regulatory precedent followed by evidence from comparable entities.

8.3 Regulatory precedent

The underlying principle Australian regulators consider is to apply a benchmark capital structure (gearing) that would apply to an efficient benchmark entity in the same industry with the same risk profile. In that respect, Australian regulators consider gearing levels from an appropriate set of comparator firms, which is typically drawn from (or very similar to) that considered for beta analysis.[259] For instance:

- the ERA, in its 2019 WACC decision, recognised the differing risk profiles of Western Australian railways and used separate benchmarks for gearing specific to each type of regulated rail network's infrastructure and operations. For Arc Infrastructure and Public Transit Authority, the ERA used the same comparator set as the one used for beta assessment.[260]
- The QCA, in determining an appropriate capital structure for Queensland Rail, considered that regulated energy and water businesses and toll roads were likely to be the best comparators, which was also the comparator set the QCA used for beta analysis.[261]

Regulatory gearing decisions are based on an 'optimal' long-term target for the regulated entity given its risk profile and the industry within which it operates. This is reflected in relatively stable gearing ratios once established. A similar approach is also used by regulators overseas.

Under this benchmark approach, the regulated entity's actual gearing level is given limited (and perhaps no) weight. This is consistent with the objective of incentive regulation, which bases costs on efficient benchmark targets (or the BEE). The gearing assumption also influences the notional credit rating assumption used to estimate the return on debt.

[259] We acknowledge the assessment of gearing is based on business risk, which is related to the volatility of earnings, and is broader than systematic risk which is relevant to beta assessment because business risk also includes non-systematic risk (e.g. stranding risk).

[260] ERA (August 2019), p 14.

[261] QCA (February 2020), Queensland Rail's 2020 Draft Access Undertaking, final decision, p 39.

Accordingly, a well accepted approach in identifying an appropriate gearing level for the BEE is to consider gearing levels of comparator firms (typically drawn from the comparator used for beta analysis), which we have adopted in our report.

Australian regulators' gearing assumptions for transport entities have been informed by analysis of internationally comparable companies. For instance:

- the ERA, in the 2019 rail WACC final determination, noted a lack of suitable domestic comparators; therefore, its benchmark sample included international companies from the United States of America, Canada and New Zealand.[262]
- IPART, in respect of the 2019 NSW rail access undertaking, noted that there were only a few listed pure-play freight rail infrastructure firms, and so used a comparator set which included North American Class I railroads. IPART considered the same comparator set for beta and gearing analysis.[263]

Such an approach is also frequently observed in regulatory determinations overseas. Accordingly, we consider this to be a well accepted approach, which we have adopted in our report. Table 39 shows recent regulatory decisions relating to the regulated Australian transport sector.

Table 39 Recent Australian regulatory gearing decisions for transport entities

Company	Regulator	Year	Gearing Ratio
Queensland Rail	QCA (Rail)	2020	40%
NSW Rail Access Undertaking	IPART (Rail)	2019	45%
Dalrymple Bay Coal Terminal	QCA (Ports)	2010 & 2016	60%
Aurizon Network	QCA (Rail)	2018	55%
ARTC Interstate Rail Network	ACCC (Rail)	2008 & 2018	50%
Public Transport Authority - passenger	ERA (Rail)	2019	50%
Arc Infrastructure (formerly Brookfield Rail) - freight	ERA (Rail)	2019	25%
The Pilbara Infrastructure – iron ore	ERA (Rail)	2019	20%
V/Line	ESC (Rail)	2012	50%
Pacific National	ESC (Rail)	2012	50%
Vic Track	ESC (Rail)	2012	50%
Metro Trains Melbourne	ESC (Rail)	2011	55%
ARTC (Hunter Valley Coal Network)	ACCC (Rail)	2011 & 2017	52.5%

Source: Synergies, various regulatory decisions.

262 ERA (August 2019), final determination, 2018 and 2019 WACC for the freight and urban networks and the Pilbara Railways, p 14.

263 IPART (July 2019), final report, Rate of return and remaining mine life, p 9.

Table 39 lists entities which are subject to varying forms of regulation, some of those entities are not directly comparable to PoM in terms of their risk profile.

For example, for entities subject to a cost-based regulatory framework with a revenue cap and take-or-pay contracts that provide very stable revenues and lower business risk, higher levels of gearing can be sustained. Consequently, the Dalrymple Bay Coal Terminal (DBCT), which is subject to such an environment, has highest observed gearing level in the sample at 60% (debt to total value).

Similarly, Aurizon Network's regulatory regime provides a revenue cap with a high level of revenue stability and lower business risk. Aurizon Network's assumed gearing is at 55%.

In contrast, PoM's regulatory framework does not provide it with a stable revenue stream and as a consequence, PoM is exposed to higher business risk, so neither DBCT nor Aurizon Network are appropriate comparators for PoM (Appendix D compares the risk profiles of DBCT and PoM).

For this reason, we do not consider the average gearing level of 46% in Table 39 is an appropriate benchmark for PoM. Rather, we expect PoM's gearing level to be closer to the lower end of the range due to the relative higher levels of cash flow volatility faced by PoM.

Table 39 shows that, for rail entities that do not operate under regulatory revenue caps, gearing assumptions have generally been lower, including the lowest of 20% for the dedicated iron-ore terminal operated by The Pilbara Infrastructure.

In the context of the BEE, we consider the three most relevant regulatory gearing assumptions are for:

- ARTC's interstate freight network, which currently assumes 50 per cent gearing
- Arc Infrastructure's freight network, which currently assumes 25 per cent gearing
- The Pilbara Infrastructure – iron ore, which currently assumes 20 per cent gearing

The ERA's most recent review of the WACC to apply to Arc Infrastructure, completed in 2019, included an updated review of the gearing levels for a set of comparator firms.[264] Its sample included the US Class I railways, as well as a small number of other firms

[264] ERA (2019). Final determination – 2018 and 2019 weighted average cost of capital for the freight and urban networks, and the Pilbara railways, 22 August.

(including Aurizon Holdings). The ERA concluded that the current evidence supported the continuation of a benchmark gearing level for Arc Infrastructure of 25%.[265]

Similarly, in its 2019 rail WACC determination, the ERA maintained a gearing ratio of 20% for Pilbara railways on the basis that the relevant comparator set's average gearing increasing from 18% in 2015 to 22% in 2018 was not a sufficient change to warrant an increase in the benchmark gearing level.[266]

In its 2018 decision for ARTC's interstate freight network, the ACCC maintained its gearing ratio assumption for ARTC of 50 per cent. In doing so, it referenced recent regulatory decisions as well as its analysis in the previous 2008 Interstate Access Undertaking. The gearing levels of ARTC's sample of firms across the rail, trucking and shipping industries examined at the time were generally higher in the pre-GFC environment than currently observed. However, the average capital structure of the 12 rail companies in ARTC's survey was 27% debt, with the most levered firm holding only 47% debt.[267]

In our view PoM's gearing should be closer to Arc Infrastructure's 25% and The Pilbara Infrastructure's 20% than ARTC's 50% because the comparator set considered for Arc Infrastructure and the Pilbara Networks (US railroads) have a risk profile more comparable to that of PoM. Indeed, the BEE for the Prescribed Services does not enjoy the take or pay protection afforded to Arc Infrastructure through its long term contracts. As discussed in Chapter 7 and Attachment D, PoM has shown over time that its trade levels are particularly exposed to fluctuations in economic activity, which supports lower gearing levels for the BEE providing Prescribed Services.

In summary, recent regulatory evidence continues to indicate a very broad range of benchmark gearing ratios, ranging from 20% to 60%. Given the BEE's risk profile, its gearing sits at the lower end of this range.

8.4 Gearing range of comparable companies

Determining the appropriate target gearing level is inherently imprecise but is helpfully informed by an analysis of the range of gearing levels maintained by comparable entities. Attachment H contains our comparator set that emerged from the process for the beta assessment, which we consider in more detail in Chapter 7, and categorises the sample by:

265 ERA (2019), p.19.

266 ERA (2019), p.15, 18-19.

267 ACCC (2008). Australian Rail Track Corporation access undertaking – Interstate Rail Network, Final decision, July, p.158.

- Sector
- FTSE classification

Attachment H contains the gearing ratios for each company in the comparator set. As we assume that the BEE maintains an investment grade credit rating, our consideration of comparator firms for the purposes of the gearing level for the BEE is confined to those entities with an investment grade credit rating.

8.4.1 Empirical evidence

In determining an appropriate gearing ratio for PoM, it is a well accepted approach to analyse empirical evidence from relevant comparator firms, being the entities that we have also used to estimate beta for the return on equity calculation (refer Chapter 7). Additionally, we have also examined the gearing levels of privatised Australian ports.

Gearing ratios and the latest available credit ratings for the entities comprising our comparator set that are rated by ratings agencies as being investment grade or better are contained in Table 40.

Table 40 Companies in our sample with investment grade ratings (9 entities)

Company	Country	OECD	Sector	Moody's Credit Rating	S&P Credit Rating	Gearing
China Merchants Port Holding Company	Hong Kong	No	Marine Ports and Services	Baa1	BBB	32%
Port of Tauranga	New Zealand	Yes	Marine Ports and Services	-	A-	4%
Hutchinson Port Holdings Trust	Singapore	No	Marine Ports and Services	Baa1	A-	57%
Canadian National Railway Company	Canada	Yes	Railroads	A2	A	12%
Canadian Pacific Railway	Canada	Yes	Railroads	-	BBB+	20%
CSX Corporation	US	Yes	Railroads	Baa1	BBB+	24%
Kansas City Southern	US	Yes	Railroads	Baa2	BBB	20%
Norfolk Southern Corporation	US	Yes	Railroads	Baa1	BBB+	22%
Union Pacific Corporation	US	Yes	Railroads	Baa1	A-	16%

Source: Moody's

Amongst companies in our sample with an investment grade rating, the median gearing level is 20% and the average gearing level is 23%. Average and median gearing by industry sector for the sample with an investment grade rating is summarised in Table 41.

Table 41 Gearing averages and ranges by sector for investment grade entities (9 entities)

	Overall Average	Overall Median	Overall Minimum	Overall Maximum
Full Sample	23%	20%	4%	57%
	Sector Average	**Sector Median**	**Sector Minimum**	**Sector Maximum**
Marine Ports and Services	31%	32%	4%	57%
Railroads	19%	20%	12%	24%

Source: Bloomberg

In comparison, as demonstrated in Attachment H, for the full sample of comparable companies (i.e. whether or not investment grade) the median gearing ratio was 22% and the average gearing ratio was 25%—which are marginally higher than those for the sample with an investment grade rating. This suggests that our overall position of a 30% gearing for PoM is reasonable. We now consider the gearing levels of privatised Australian ports.

8.4.2 Privatised Australian ports

Regulators have at times expanded the comparator set to inform the capital structure assessment for the BEE. Here, the gearing of recently privatised ports also provides a relevant benchmark, while recognising initial gearing levels may not be reflective of longer term gearing levels depending on many factors, including reported earnings growth.

Further, gearing levels of privatised ports are reflective of the risk profile of the total port business, including lower risk property assets. This means that the gearing levels of privatised ports could be expected to be higher than the gearing level pertaining to the BEE which only provides Prescribed Services (as defined for PoM). This is because the Prescribed Services have less revenue stability than a port entity with a significant share of revenue being earned from more stable property assets. Table 42 presents the acquisition gearing from Australian port privatisations other than Flinders Ports. It shows an average initial gearing ratio in excess of 40% for these privatisations.[268]

[268] Flinders Ports was omitted from the sample on account of it being privatised in 2001 and data about its gearing levels at privatisation was not available.

Table 42 Acquisition Gearing Ratios for Australian Ports

Port	Acquisition Value ($ million)	Acquisition Debt (drawn) ($ million)	Acquisition Gearing
Port of Brisbane (2010)	2,100	847	40%
Port Botany / Kembla (2013)	5,070	2,010	40%
Port of Newcastle (2014)	1,750	800	46%
Average			42%

PoM's acquisition gearing ratio is in line with these precedents, recognising that these privatised gearing ratios relate to the whole port entity rather than the narrower range of port channel and berthing-related services that are covered by the Prescribed Services definition and as such can maintain higher gearing levels.

8.4.3 Assessment

Debt levels assumed by Australian regulators for regulated transport entities range from 20% for the Pilbara railways up to 60% for Dalrymple Bay Coal Terminal (DBCT). The higher gearing levels attributed to DBCT reflects the fact that it is not exposed to material revenue variability.

Amongst companies in our sample with an investment grade rating, the median gearing level is 20% and the average gearing level is 23%. The average acquisition gearing from Australian port privatisations (other than Flinders Ports) is just in excess of 40%.

Our proposed gearing ratio of 30% for the BEE sits comfortably within these ranges. We now turn to a consideration of the ESC's commentary on past TCS submissions.

8.5 ESC commentary on proposed capital structure for BEE

Although the ESC's 2019 interim commentary did not provide any specific guidance on gearing, the 2018 interim commentary reiterated the ESC's earlier commentary that the majority of regulatory transport decisions in Australia have assumed benchmark gearing levels between 50% and 60%. Based on this, the ESC noted that regulators have tended to use lower asset betas in combination with higher gearing levels than that assumed by Synergies for the BEE.[269]

The well accepted practice is that gearing levels for the BEE should focus on sound financial principles. Regulated transport businesses with higher gearing levels are normally subject to revenue cap regulation and have some form of contractual protection to confer relative cash flow stability. Regulatory precedent supports lower levels of

269 ESC, October 2018, Interim Commentary – Port of Melbourne tariff compliance statement 2018-19, pp 61–62.

gearing for entities with less cash flow stability, including a gearing of 20% for the Pilbara railways.

Our proposed gearing ratio of 30% falls easily within this regulatory range. It is consistent with the well accepted approach of informing gearing levels for the BEE by reference to the application of sound financial principles to determine where in the range provided by relevant comparators the BEE should sit.

8.6 Conclusion

The very nature of a gearing range is that a reasonable value may fall anywhere within a range.

Considering relevant market evidence, we maintain our view that a gearing range of between 20% and 40% is appropriate for the efficient benchmark port entity. The considerations that inform this view are as follows:

- The range set by gearing levels for our comparator sample with investment grade ratings and privatised Australian ports on acquisition is between 20% and 42%.
- Despite the ESC's previous observation that the majority of transport regulatory decisions assign gearing ratios between 50% and 60%, the more relevant regulatory precedent relates to Arc Infrastructure and Pilbara railways which have gearing levels of 25% and 20% respectively.
- This range is consistent with the point estimate recommended by Incenta from its mechanistic averaging across the comparator set it determined.[270]

We have retained a gearing level of 30% for the BEE, which represents the mid-point of the gearing ratios for the investment-grade listed companies of 20% and the gearing ratios for the privatised ports of 42% (after rounding to the nearest 5%).

Both the range and the point estimate for a BEE may change over time in response to several factors.

[270] Incenta (2020) Estimating the Port of Melbourne's equity beta, p 7.

9 Estimating the return on debt

Chapter overview		
2020-21 submission	**2019-20 submission**	**Comments**
Risk-free rate: 0.90%	Risk-free rate: 1.96%	The risk-free rate has again been calculated as a 20-day average on 10-year Australian Government bond yields, an approach frequently adopted by economic regulators.
DRP: 4.04% **Debt raising costs: 0.10%** **Return on debt: 5.04%**	DRP: 3.18% Debt raising costs: 0.10% Return on debt: 5.24%	The return on debt continues to be calculated using a trailing average methodology. For the 2020-21 estimate, a 70% weighting is placed on the initial 2017 on-the-day estimate, a 10% weighting on the 2018 on-the day estimate, a 10% weighting on the 2019 on-the-day estimate, and a 10% weighting on the 2020 on-the-day estimate. Each year, 10% of the weighting on the 2017 on-the-day estimate will be refreshed with the prevailing on-the day estimate for the given year. As we document in this chapter, support among regulators for the trailing average methodology remains comprehensive. Our position on debt raising costs is unchanged.

9.1 Introduction and background

The Pricing Order provides no guidance regarding estimation of the return on debt beyond it being one or a combination of well accepted approaches. Furthermore, the ESC has not made specific reference to our chosen methodology in any of its commentary. In simple terms, the return on debt calculation is the sum of the risk-free rate and an estimate of the debt risk premium consistent with the risk profile of the benchmark efficient entity.

This approach is well accepted in financial markets and by economic regulators in Australia and internationally, underpinned by the concept of credit spreads reflecting credit and liquidity risks associated with government and corporate bonds. A credit spread is the difference in yield (return to the investor) between two bonds of similar maturity but with different credit quality due to the different underlying risks associated with each bond. The difference in yields between a long-term government bond (assumed to be the risk-free rate) and an equivalent term corporate bond is an example of the credit spread concept.

The return on debt calculation can be expressed as follows:

$$R_d = R_f + DRP + DRC$$

Where:

Rf = risk-free rate

DRP = debt risk premium

DRC = debt raising costs

An allowance for debt raising costs could be included in the cashflows of the benchmark entity as an opex item rather than included in the return on debt formula.

In applying the above return on debt formula, there are several underlying assumptions that are required including in regards to:

- risk-free rate
- notional credit rating assumption
- term to maturity
- debt management approach
- method used to estimate the debt risk premium (DRP)
- assumed debt raising costs.

Each of these parameters is estimated in the sections below after we have summarised well accepted methodologies regarding estimation of the return on debt.

9.1.1 Implications of ESC commentary for return on debt

The ESC interim commentaries have not examined PoM's approach to the return on debt in detail. In regard to the trailing average methodology, the ESC's expectation in the 2018 interim commentary was that, "having now adopted such an approach, the port would not revert to the on-the-day approach."[271] This is indeed the case, with our approach for the 2020-21 WACC estimate being a continuation of the trailing average adopted since 2018.

This year, the trailing average calculation places a 70% weighting on the 2017 return on debt estimate, a 10% weighting on the 2018 return on debt estimate, a 10% weighting on the 2019 return on debt estimate, and a 10% weighting on the 2020 return on debt estimate. With each subsequent year, 10% of the 2017 weighting will be refreshed with the prevailing return on debt estimate.

This approach is being adopted on the basis of its stability (i.e. lower volatility over time), and because it is more consistent with the debt management practices of a benchmark efficient entity. It is also in line with our approach to other WACC parameters, which, where possible, are based on long-term averages. This methodology is also consistent with the approach currently in use by the AER.

Our methodology for calculating the 2020 on-the-day estimate used in the trailing average calculation is unchanged from last year's submission.

[271] ESC (2018), p.13.

9.2 Well accepted methodologies

Given the CAPM is intended to reflect expectations as of the day of analysis, it is theoretically correct to base the risk-free rate on the prevailing yield on the date of the valuation. This means that the return on debt is based on prevailing rates, set over a very short averaging period prior to the point at which prices are reset. It then remains fixed during the regulatory period, with the regulated business managing the risk of interest rate movements.

However, problems may occur if there is a spike in yields on-the-day that the rate is applied. It is therefore now common regulatory practice to average the rate over a short horizon, which typically ranges from between ten and forty days, noting that over such a short horizon the choice of averaging period is likely to be of little consequence. The Independent Pricing and Regulatory Tribunal (IPART) in NSW is the only Australian regulator that has looked at longer term averages, which it does in conjunction with short term estimates.

Until relatively recently, Australian regulators always applied an 'on-the-day' approach to estimate the return on debt.

Other economic regulators have now accepted the trailing average approach, including the ESC in regard to Melbourne Water, which allowed an immediate transition but based on a data series that excluded the 'GFC years' (2008-09 to 2012-13). This approach emanates from the recognition that in practice, a more efficient debt management strategy may be to maintain a staggered debt maturity profile and progressively refinance debt through time. This in turn means that the return on debt set in the WACC will therefore reflect the cost at which debt was raised or refinanced historically, resulting in a return on debt that reflects historical rates. The trailing average approach involves 'averaging in' a portion of the prevailing return on debt each year.

The ERA has also accepted the trailing average approach in recent gas network decisions,[272] although based on a 'hybrid' approach, allowing an immediate transition for the DRP and a ten-year transition for the base rate.[273]

272 Refer: ATCO Gas Australia, Dampier to Bunbury Pipeline.

273 The rationale for this is that the benchmark efficient entity can use swap transactions to hedge the base rate component of its return on debt at each regulatory reset. However, it cannot similarly hedge the DRP.

In its recent decision for SA Water, the Essential Services Commission of South Australia (ESCOSA), determined that it will immediately transition to this approach in the first year of its new regulatory control period.[274]

The AER has also now transitioned to a trailing average approach as explained in its Rate of Return Guideline.[275] The 2012 rule changes made by the AEMC allowed for the return on debt to be estimated based on one of: the trailing average approach; the current on-the-day approach; or a hybrid of the two. In its 2013 Rate of Return Guideline, the AER determined that its preferred approach is the trailing average. It has employed a simple averaging approach, which means that each year, one-tenth of the prevailing ten-year bond yield would be 'averaged in' to the return on debt estimate.[276] This means that the regulated return on debt, and hence tariffs, will vary throughout the period.[277] The AER also determined that this must be implemented over a ten-year transition period.[278]

The only Australian regulator that has explicitly rejected the trailing average approach is the Queensland Competition Authority (QCA). However, the QCA's stance towards the trailing average appears to have become more favourable in the UT5 Final Decision for Aurizon:[279]

> The QCA is open to considering alternative regulatory benchmarking debt management approaches (for example a trailing average approach) in future assessments.

It is also informative to consider evidence from regulators overseas in regard to how they determine the appropriate cost of debt. A number of regulators adopt a trailing average methodology.

The NZCC has previously used a prevailing average (i.e., an on the day approach). However, in its 2016 Input Methodologies Review, the NZCC announced that it would

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274 ESCOSA (2016). SA Water Regulatory Determination 2016, Final determination, June. In making this conclusion, ESCOSA noted that over the previous ten years, there would have been an immaterial difference had there been a gradual transition to the trailing average compared to the on-the-day approach.

275 AER (2013a), p.28.

276 We would consider that a more effective approach would be to adjust the changes in the benchmark debt balance, as this recognises the lumpy capital expenditure profiles that are typical of regulated businesses, that is, in a year when capital expenditure is high, more weight would be given to the prevailing return on debt in that year.

277 Alternatively, they could be adjusted via a 'true up' mechanism at the end.

278 This is seen as particularly relevant at the current time given the recent contraction in debt margins, that is, the estimate that would be produced using the 'on-the-day' approach would be lower than the trailing average, which would reflect the significant expansion in debt margins following the global financial crisis.

279 Queensland Competition Authority (2018). Aurizon Network's 2017 draft access undertaking, Decision, December, p.77.

move to a five-year historical averaging approach for the debt premium. This change applies only to the debt premium, and a prevailing average will be retained for the risk-free rate. In explaining this change of methodology, the NZCC observed that:[280]

> Firms can be exposed to any difference between the debt premium paid at the time they issue debt and the debt premium determined during the averaging window prior to the setting of the WACC.

Whereas in Australia most regulators employ data from Bloomberg and/or the RBA, the NZCC constructs a pool of publicly traded corporate bonds that are comparable to the regulated entity in question. The NZCC allows for debt issuance costs of 0.20%.

In the UK, Ofgem bases its cost of debt on Markit iBoxx Non-Financial corporate bond market indices, and applies a 10-year trailing average. The Competition and Markets Authority has regard to evidence from yields and spreads on sterling-denominated corporate bonds issued by energy firms in the UK, along with evidence from spreads on UK corporate bonds more generally.

9.2.1 Synergies' assessment

The application of a long-term trailing average approach is more likely to approximate the debt management practices of an entity that has been subject to deterministic price regulation for a long period, but this does not invalidate the application of the on-the-day approach. This is because a regulated entity could choose to adopt a debt management practice that reflects the on-the-day approach.

Indeed, the Australian energy regulatory framework recognises that the return on debt can be estimated based on either the on-the-day approach or the trailing average approach or a hybrid of the two. This is left to the discretion of the regulated entity notwithstanding the AER's current preference for the trailing average approach.

In the context of the benchmark port entity, we consider that the choice between these approaches should reflect the preferences of the Port Licence Holder. This is because a return on debt for a benchmark efficient entity can be estimated under both the on-the-day and trailing average approaches. Consequently, this year we have continued the transition to a trailing average approach, placing a 70% weighting on the 2017 return on debt estimate, a 10% weighting on the 2018 return on debt estimate, a 10% weighting on the 2019 return on debt estimate, and a 10% weighting on the 2020 return on debt estimate.

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280 New Zealand Commerce Commission. (2016). Input methodologies review decisions – Topic paper 4: Cost of capital issues, 20 December, para. 138.

9.3 Risk-free rate

As noted in Chapter 6, we have applied an updated estimate of the risk-free rate based on a twenty-day average of the ten-year Commonwealth Government bond yield as at 31 March 2020.

The resulting estimate is 0.90 per cent (annual effective).

9.4 Notional credit rating assumption

A common starting point for the notional credit rating assumption is BBB, or minimum investment grade. The most common notional credit rating assumption applied to regulated entities in Australia is either BBB or BBB+.

It is noted that in practice, this distinction often has no practical consequence given most regulators have estimated the BBB/BBB+ DRP from the broader BBB corporate bond category, which reflects BBB-, BBB+ and BBB bonds.[281]

It is also appropriate that the credit rating assumption used for the DRP should be consistent with the gearing assumption.

In Australian regulatory practice, the adoption of an investment grade credit rating for an efficient benchmark entity has not been contentious.

9.5 Term to maturity

Consistent with our risk-free rate calculation for the return on equity, we have assumed a ten-year term to maturity for BBB bonds, the longest available tenor (with appropriate liquidity) in an Australian context.

There are currently two robust data series available with the relevant bond yield information, Reserve Bank of Australia (RBA) and Bloomberg. These series are discussed further in Section 9.7 below.

9.6 Debt management approach

The options that have been adopted by Australian regulators are as follows:

- Risk-free rate based on the 10-year Commonwealth bond yield plus debt margin calculated using the prevailing cost of funds based on a short averaging period close to commencement of the regulatory period.

[281] The exceptions to this are the QCA and the ERA, who both employ their own 'bespoke' in house approaches to estimate the DRP.

- Risk-free rate based on the 10-year Commonwealth bond yield plus debt margin calculated using a moving 10-year historical trailing average.
- Some form of hybrid approach, which is based on a 10-year rolling average of the debt risk premium on 10-year corporate bonds added to the 5-year swap rate prevailing close to commencement of (first) regulatory period.

The issue of the best approach to estimating the return on debt is likely to be determined by the debt management strategies of many regulated entities subject to deterministic price setting arrangements. The BEE test does not undermine this approach – rather, the question is what the cost of debt would be for the BEE given its debt management approach so long as it is consistent with an outcome that what would be expected in a workably competitive market, which will be the case across a range of debt management strategies on account of the efficiency of debt markets.

In the case of the benchmark port entity, similar to last year, we consider that a trailing average approach to estimating the return on debt is appropriate, as this methodology is more reflective of the debt management practices of a benchmark efficient entity.

The remainder of this chapter outlines how we have calculated the 2020 on-the-day return on debt estimate, before detailing how we have weighted this estimate in our trailing average calculation.

9.7 Debt risk premium (DRP)

The DRP is estimated based on the difference between the yield on ten-year BBB corporate bonds and the risk-free rate (averaged over the same twenty-day period).

The key issue is the data source and methodology used to estimate the ten-year BBB corporate bond yield. The majority of Australian regulators use an independent third party data source, being either Bloomberg's BVAL series or the RBA's bond yields for non-financial corporates, with the exception of the ERA. The ERA employs their own in-house methodology that applies an econometric approach.

We continue to hold the view that the use of an independent third-party data sources that are reputable and robust represents a well accepted approach.

In its October 2015 decision for Telstra, as well as its April 2017 decision for the ARTC Hunter Valley Access Undertaking (HVAU), the ACCC applied an average of Bloomberg and RBA estimates. Synergies adopted the same approach for the ARTC

Interstate Access Undertaking. In response, the ACCC considered that this approach to calculating the DRP was appropriate.[282]

As we elaborate below, the AER will now apply an average of three third-party data sources (RBA, Bloomberg and now Thomson Reuters) under its new Rate of Return Instrument. Our initial assessment of this change in approach is that it is unlikely to lead to materially different return on debt estimates.

9.7.1 RBA series

There are two issues that need to be addressed in the use of the RBA's data:

- *single day end of month estimate*: as the estimates are currently only produced on the last day of each month, there is a risk that this day was 'atypical' or influenced by a one-off event or perturbation in the market. This can be addressed by taking an average of the most recent three month-ends (January, February and March), which has been done previously by the AER[283];
- *average tenor less than ten years*: as noted above, to the extent that the 'ten year' estimate reflects an average bond tenor of less than ten years, it is not a ten year estimate. Accordingly, it should be extrapolated to a ten-year estimate. We have done this by using all of the RBA's data (i.e. the three, five, seven and ten-year estimates) to approximate the slope of the RBA's yield curve.

9.7.2 Bloomberg BVAL curves

Bloomberg provides estimates of BBB-rated Australian corporations under its Bloomberg Valuation service, also referred to as 'BVAL'. The BVAL curves use a proprietary algorithm to derive bond prices which are then used to construct a yield curve. The inputs to the BVAL models include direct observations of bond prices through trading and historical tracking of the bond compared to comparable firms if there is thin data available for the given security. Another method used to address thin trading is that the data can be supplemented using the historical correlation of price movements with observed comparable bonds.

282 ACCC (2018). Draft decision. p.133

283 AER (2014a). Ausgrid, Endeavour Energy, Essential Energy, ActewAGL, Transitional Distribution Determination, 2014-15, April; AER (2014b). Transgrid, Transend, Transitional Transmission Determination, 2014-15, March.

9.7.3 Other sources of third-party evidence on the DRP

In its 2018 Rate of Return Guideline review, the AER considered the merits of incorporating data from Thomson Reuters and S&P Global in its return on debt estimate. The AER opted to include Thomson Reuters data, but chose not to rely on data from S&P Global for the purpose of its current instrument.

For the purpose of our update, we have not used Thomson Reuters data to inform the return on debt estimate for PoM. As demonstrated by the AER's analysis, the difference in estimated yields with and without the Thomson Reuters data is virtually indistinguishable. It is difficult to ascertain whether this tendency will persist in the future, but our assessment is that its omission or inclusion is unlikely to have any systematic or material impact on the estimate.

9.8 Debt raising costs

The debt risk premium reflects a premium for credit and liquidity risk. However, it does not include any allowance for the actual costs of raising debt. In practice, an efficient benchmark port entity will incur transaction and administration costs in raising and managing its debt.

9.8.1 Regulatory precedent

PwC has undertaken market research of Australian debt raising transaction costs, which have been applied in an Australian energy economic regulation context.[284] Incenta has subsequently applied PwC's findings in recent energy regulatory processes. PwC's study built on earlier work undertaken by Allen Consulting Group.[285] We regard this collective body of work prepared in an Australian regulatory context to provide the most authoritative evidence of debt raising costs for Australian corporates based on surveys and interviews with legal firms, banks and credit rating agencies that are involved in the corporate bond raising process.

PwC noted that during the past decade a benchmark of 12.5 basis points per annum (bppa), representing direct costs of debt raising, was developed and applied by several Australian regulators. However, from 2004 the AER applied a methodology based on empirical observations of direct debt raising costs, which resulted in lower benchmark

284 PwC (2013).

285 Allen Consulting Group (2004). Debt and equity raising transaction costs, Final report, December.

values in the range of 8 to 10 bppa depending on the size of the regulated network business.[286]

PwC's breakdown of direct debt transaction costs is as follows:

- Legal counsel – Master program – legal costs for the preparation of a Master Program, which becomes the base document for multiple issuances over 10 years;
- Legal counsel – Issuer's – legal fees for the preparation of documents under the Master Program;
- Credit rating agency – Initial credit rating – a fee to establish the credit rating;
- Credit rating agency – Annual surveillance – a rating agency fee for the maintenance of the credit rating each year;
- Credit rating agency – Up front bond issue – a fee charged by the rating agency when a new bond is issued;
- Registrar – Up front – an initial set-up fee charged by a bond registry organisation;
- Registrar – Annual – the annual fee charged by the registry service; and
- Investment bank's out-of-pocket expenses – the fees charged by the agents of a bank for travel, accommodation, venue hire, printing etc.

We consider this full list is relevant for the total benchmark transaction costs that would be prudently incurred by the BEE required to re-finance the debt component of the Prescribed Services capital base over each regulatory period. Using the above cost components, PwC derived an estimate for total debt raising transaction costs for Australian bond issues, based on the standard issue size ($250 million) and benchmark term to maturity (10 years), of 10 bppa. This estimate combines the base arrangement fee with 'other' costs in terms of an equivalent bppa. Accordingly, 10 bppa has been added to our return on debt estimate.

Recent regulatory decisions reinforce an allowance around this level. For instance, the ERA has previously allowed for debt issuing costs of 0.125%. However, in its Final Determination for its rail WACC review, it decreased this allowance to 0.10%.[287]

[286] PwC (2013), p.6.

[287] ERA (2019), p.34.

9.9 Cost of debt estimates

We consider that both the RBA and Bloomberg data series represent an independent, credible and reliable data source for return on debt estimation purposes.

The different samples used for each series is likely to provide valuable information on the level of and movements in BBB bond yields. This suggests that using an average of two comparable series is likely to be a superior approach to choosing just one where there are no substantive methodological grounds to favour one series over the other.

Consequently, we consider calculating an average of the RBA and BVAL series is appropriate in estimating the cost of debt for the efficient benchmark port entity.

Assuming a risk-free rate of 0.90% and debt raising costs of 10 bppa gives an on-the-day cost of debt estimate for the benchmark efficient port entity of 3.42%. Table 43 sets out this calculation.

Table 43 2020 on-the-day cost of debt calculation

Averaging period	RBA	Bloomberg	Average
BBB DRP based on 20 days to 31 March 2020	2.68%	2.16%	2.42%
Risk-free rate based on 20 days to 31 March 2020	0.90%	0.90%	0.90%
Debt raising costs	0.10%	0.10%	0.10%
2020 on-the-day cost of debt	**3.68%**	**3.16%**	**3.42%**

Source: RBA, Bloomberg, Synergies calculations

This 2020 on-the-debt estimate is then used as an input in the trailing average calculation, as displayed in Table 44.

Table 44 Trailing average cost of debt calculation

Time period	Estimate	Weighting
2017 on-the-day cost of debt	5.45%	70%
2018 on-the-day cost of debt	4.58%	10%
2019 on-the-day cost of debt	4.21%	10%
2020 on-the-day cost of debt	3.42%	10%
Cost of debt	**5.04%**	

Note: Assuming a risk-free rate of 0.90% and debt raising costs of 0.10%, this implies a DRP of 4.04%

Source: RBA, Bloomberg, Synergies calculations

Given a risk-free rate of 0.90%, and debt raising costs of 10 bppa, a cost of debt of 5.04% implies a DRP of 4.04%, which is higher than the 2019 DRP estimate of 3.18%, owing mainly to the lower risk-free rate.

10 Gamma

Chapter overview		
2020-21 submission	**2019-20 submission**	**Comments**
0.33	0.25	Our gamma estimate for 2020-21 is based on a one-third weighting to the gamma value widely applied by finance practitioners as evidenced by surveys and independent expert reports (zero value), and a two-thirds weighting to the equity ownership approach (0.50 value). The equity ownership approach estimate of 0.50 reflects recent regulatory decisions.

10.1 Background

This chapter outlines our methodology for determining gamma, which is based on a combination of two well accepted approaches. We begin by providing an overview of the parameter and key issues involved in its estimation, before considering the various approaches to gamma that exist among financial practitioners and regulators. From this we identify well accepted approaches to gamma, and demonstrate how our proposed approach for the BEE is based on a combination of these well accepted approaches. We then set out a series of cross-checks that reinforce the appropriateness of our point estimate for the BEE. We also respond to ESC commentary where relevant (noting that Frontier Economics' terms of reference for gamma were more limited relative to other WACC parameters).

10.1.1 Overview

While gamma is not explicitly mentioned in the Pricing Order, the required pre-tax nominal WACC necessitates an estimate of its value (if any) when converting the post-tax cost of equity to a pre-tax cost of equity. Gamma (γ) represents the value of imputation credits to investors in the BEE, where some part of corporate tax paid by this entity can be claimed as a tax credit against personal income tax (or as a refund if the imputation credits received exceed tax payable).[288] To the extent it can be accessed by investors, it forms part of the assumed equity return to investors.

Under a dividend imputation system, corporate tax paid prior to the distribution of dividends can be credited against the tax payable on the dividends at a shareholder level. In other words, corporate tax is a prepayment of personal tax withheld at a company level. Under Australia's dividend imputation system, only domestic shareholders can avail themselves of imputation credits.

Gamma is the product of two inputs:

[288] Refer: https://www.ato.gov.au/uploadedFiles/Content/IND/downloads/Refund-of-franking-credits-instructions-and-application-for-individuals-2019.pdf

- the proportion of tax paid that has been distributed to shareholders as franking credits (the distribution rate); and
- the value an investor places on $1 of franking credits, referred to as the value of distributed franking credits (often referred to as theta or the utilisation rate).

Gamma must take a value between zero and one depending on the assumptions made in regards to the distribution rate and theta.

Imputation credits are only available in respect of company tax paid on income subject to Australian taxation. For gamma to equal one, all income must be domestically taxable. What is clear is that different shareholders value franking credits differently, depending on whether they are foreign or domestic, which determines whether their credits can be redeemed.[289]

If the shareholder is an Australian taxpayer, then they are subject to Australian personal income tax and can offset the prepayment of this tax at the corporate level against their own personal liabilities. If they are not subject to Australian personal income tax, such as non-residents and tax-exempt individuals or entities, then the company tax paid cannot be offset, and no additional value is therefore derived. In other words, the value of gamma to such shareholders is zero.

10.1.2 Key Issues

As discussed in Chapter 2 of our report, the Pricing Order requires that the WACC be determined on a pre-tax nominal basis. This requires tax to be incorporated in the pre-tax nominal WACC formula which, in turn, requires an assumption to be made regarding the value of gamma and assumed required pre-tax return on equity. However, the Pricing Order provides no guidance regarding determination of this value, other than that it must be derived using one or a combination of well accepted approaches.

As elaborated in the next section, several well accepted approaches to estimating gamma exist in regulatory, financial practitioner and academic contexts. Even among Australian economic regulators, a wide range of gamma values are currently applied.

10.2 Approaches to estimating gamma

The value of gamma continues to be contentious and in broad terms can be estimated using the following approaches:

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289 ATO (2019). Dividends paid or credited to non-resident shareholders. Available from: https://www.ato.gov.au/Forms/You-and-your-shares-2019/?page=13 [Accessed 25 May 2020].

- the equity ownership approach (non-market approach), which uses the proportion of Australian equity held by Australian residents (given only domestic investors can utilise franking credits) to estimate the utilisation rate;
- taxation statistics (non-market approach), using statistics drawn from the Australian Taxation Office on the utilisation of franking credits (this estimates gamma directly, without the need to distinguish between the utilisation and distribution rates);
- market value studies, which seek to ascribe the value that investors place on theta using techniques such as dividend drop-off studies (i.e. comparing pre and post-dividend share prices);
- approaches adopted by finance practitioners; and
- approaches endorsed by academics in peer-reviewed financial literature.

10.2.1 Equity ownership approach

The equity ownership approach estimates the value-weighted proportion of domestic investors in the Australian equity market. Specifically, it informs the value of theta, and the distribution rate is usually estimated separately.

The equity ownership approach assumes an investor that is eligible to fully utilise imputation credits they receive has a utilisation rate of 1 (i.e. they gain 100 percent of the "value" of the imputation credits); whereas an investor that is ineligible to redeem imputation credits has a utilisation rate of 0 (i.e. they gain no "value" from the imputation credits). However, this approach will overstate gamma if there are reasons why individual eligible investors value imputation credits at less than their nominal dollar value.[290]

In practice, the equity ownership approach can be considered to be only an indirect estimate of theta. It will successfully account for non-resident effects, but will not capture any other reasons why imputation credits may be valued at less than their face value. This is likely to be one of the reasons why gamma estimates based on the equity ownership approach tend to be higher than those based on market approaches, as well as other non-market approaches (such as the taxation statistics approach).[291]

[290] For instance, the "45-day rule" requires investors to hold shares for 45 days to be eligible for imputation credits. Refer: https://www.ato.gov.au/Forms/You-and-your-shares-2019/?page=10

[291] Energy Networks Austalia (2018). AER review of the rate of return guideline – Response to draft guideline, 25 September, p.156.

The predominant concern is that the equity ownership approach overlooks various reasons why even domestic investors may not value credits at their full face value (such as the 45 day rule), causing the approach to provide at best an upper bound for gamma, rather than a point estimate.[292]

Queries have been raised previously on the integrity of the data underpinning the equity ownership approach. Virtually all gamma approaches are subject to some form of uncertainty in relation to data, but the risks of poor data are heightened if full weight is placed on a single approach, as the AER has done in its 2018 Rate of Return Instrument.

10.2.2 Taxation statistics approach

The taxation statistics approach is a non-market approach that employs data from the Australian Tax Office (ATO) to calculate the proportion of imputation credits that are actually redeemed by investors. While also an example of a non-market approach, the advantage of the taxation statistics approach is that it estimates directly the proportion of imputation credits redeemed.

Previously, concerns have been raised by regulators regarding the quality of the ATO data. For instance, the ERA has stated previously that:[293]

> The Authority does not place much weight on the estimate, or on its ability to inform a point estimate of the utilization rate, given concerns about the robustness of the taxation data used for estimating the utilization rate.

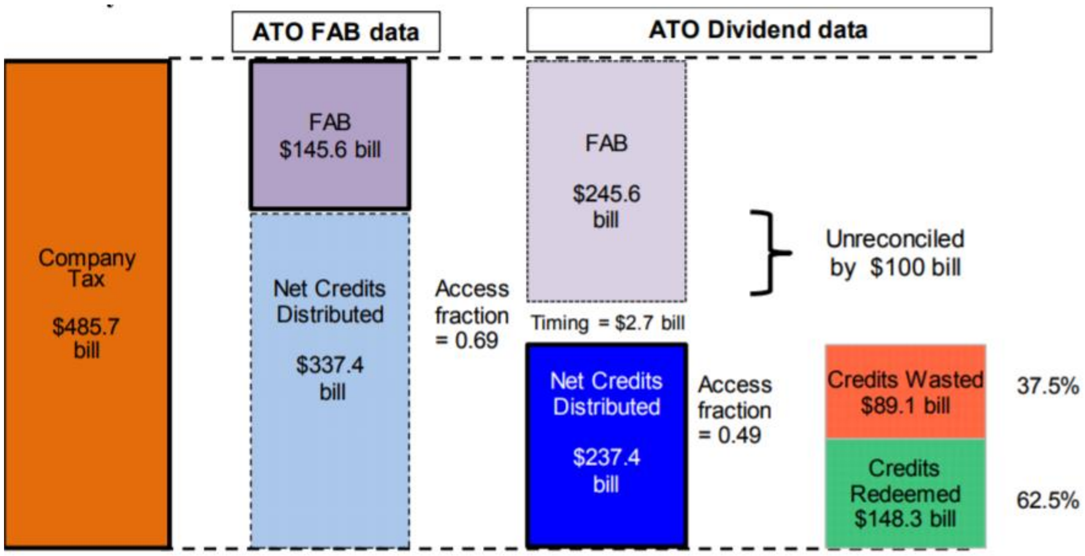
One drawback of taxation statistics is that, while the approach is capable of estimating gamma directly, it offers two quite disparate estimates of the distribution rate. The issue can be observed visually in Figure 17, taken from Hathaway (2014), the most recent report of which we are aware on taxation statistics.[294] What this diagram shows is that the two methods (based on franking account balance FAB data and dividend data respectively) imply materially different distribution rates (or access fractions, to use Hathaway's terminology) of 0.49 and 0.69, respectively.

[292] Energy Networks Austalia (2018), p.141.

[293] ERA (2015), pp.207-208.

[294] Hathaway, N. (2014). Franking credit redemption ATO data 1988 to 2012, Capital Research, October.

Figure 17 Visual representation of ATO tax flows, 2004-2012



Note: FAB stands for Franking Account Balances.

Data source: Hathaway (2014)

Professor Lally, in a submission accompanying the AER's final decision, believes the difference can be attributed at least in part to the following phenomenon:[295]

> The ATO data includes firms that made profits and thereby generated credits but then made losses and liquidated without distributing the credits. Such firms would tend to have low distribution rates and, as with unlisted firms, would not be suitable for estimating the distribution rate for the BEE.

This explanation is not implausible, but it is unclear whether this factor alone is sufficient to explain the substantial difference in gamma values between the taxation statistics (0.31) and ABS equity ownership approaches (0.585).

As gamma is the product of the distribution rate and the theta, this would suggest that reliance on ATO data is problematic, and regulators would be justified in minimising its emphasis. We agree that estimates of the two components of the gamma estimate are still necessary (theta and the distribution rate). For example, to adjust the MRP estimate for imputation yields, an estimate of theta is required. The key issue here is the divergence between the value of imputation credits as measured by taxation statistics.

However, as far as the determination of gamma is concerned, only the orange section (Company Tax) and the green section (Credits Redeemed) are relevant inputs.

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295 Lally, M. (2018). The estimation of gamma: Review of recent evidence, 14 December, p.9.

The equation for gamma in terms of credits created, distributed and redeemed is expressed below:

> Gamma = (Credits redeemed/Credits distributed) * (Credits distributed/Credits created)

Mathematically, Hathaway explains that this expression simplifies to:

> Gamma = (Credits redeemed/Credits created)

This means that for the purpose of estimating gamma, the taxation statistics approach does not actually depend on an estimate of the distribution rate, adding to the robustness of the estimate.

In December 2017, Hathaway addressed concerns about the conflicting estimates of the distribution rate, stating that:[296]

> The Company Tax item is the total company tax collected by the ATO during the relevant period and the Credits Redeemed item is the total amount of credits redeemed via the filing of personal tax returns. These two data items are 100% reliable as they are figures that relate directly to ATO collections. There is no reason to question the ATO's records of the amount of corporate and personal tax it has collected.

As a consequence, a reliable estimate of gamma is provided by the following:

> Gamma = (Credits redeemed = $148.3 billion) / (Company tax = $485.7 billion) = 0.31

Because tax statistics from the ATO offer a direct estimate of the actual amount of credits redeemed by taxpayers, an estimate of gamma derived from this approach already provides an upper bound on the estimate of gamma.[297] This is because the taxation approach assumes that all imputation credits are valued at their full face amount. For this reason, the equity ownership approach is actually made redundant; it is, in effect, the upper bound of the upper bound for gamma.[298]

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296 Hathaway, N. (2017). Letter to Energy Networks Australia, 12 December, p.1.

297 Frontier Economics (2017). Estimating gamma within the regulatory context – Final report prepared for Aurizon Network, September, p.43.

298 Whilst Hathaway's most recent report used data only up until 2012, the resulting estimate of gamma based on taxation statistics is close to our gamma point estimate of 0.33 for the BEE.

10.2.3 Dividend drop-off (market value) studies

Market value studies seek to ascribe the value that investors place on theta using techniques such as dividend drop-off analysis (which compares pre- and post-dividend share prices).

An updated gamma estimate prepared by Cannavan and Gray (2017) that applies the methodology accepted by the Australian Competition Tribunal in 2011 continues to support a theta value of 0.35 and hence a gamma value of 0.25 (assuming a 70% distribution rate).[299] Market evidence from dividend drop-off studies informs IPART's gamma estimate, with IPART making specific reference to the Cannavan and Gray (2017) paper in substantiating its decision to retain a gamma estimate of 0.25.[300]

The ESC suggested in its 2018 interim commentary that "Synergies overlooked other studies that would support theta estimates that are higher than the value of 0.35 it relies on."[301] Commenting on a 2011 dividend drop-off study by SFG, of which the Cannavan and Gray (2017) study is an updated analysis, the Australian Competition Tribunal concluded in a 2011 decision that:[302]

> No other dividend drop-off study estimate has any claims to be given weight vis-à-vis the SFG report value.

Accordingly, we have followed the guidance of the Tribunal in our selection of dividend drop-off studies on which to rely.

Cannavan, Gray and Hall (2019) introduce incremental methodological enhancements to the dividend drop-off literature by simultaneously estimating the value of imputation credits and the value of cash dividends.[303] A fully franked dividend consists of two components: the cash dividend and the value of the attached imputation credit. The authors argue that, in effect, it is misleading to interpret the value of imputation credits under the assumption that cash is fully valued. This necessitates the joint estimation of the value of imputation credits and cash dividends.

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299 Cannavan, D. and Gray, S. (2017). Dividend drop-off estimates of the value of dividend imputation tax credits. Pacific-Basin Finance Journal, 46, pp.213-226.

300 IPART (2018a), p.83.

301 ESC (2018). Interim commentary, p.76.

302 Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 38.

303 Cannavan, D., Gray, S. & Hall, J. (2019). The market value of dividend imputation credits implied by futures prices. Working paper.

Cannavan, Gray and Hall (2019) estimate that the value of a distributed imputation credit (i.e. theta) is worth -0.12 to 0.17 of face value under the current tax regime.[304] The authors find that a dollar of cash is valued by the market at somewhere between 88 cents and 98 cents in the dollar. Assuming a cash value of 88 cents implies that distributed imputation credits are worth between 0.04 and 0.17. If a cash value of 98 cents is applied, then distributed imputation credits are worth between -0.12 and 0.00. Both of these ranges suggest a value for theta less than the 0.35 currently associated with market value studies by IPART, and well below the utilisation rate applied by regulators such as the AER, ERA and QCA (using non-market approaches).

In addition, Cannavan, Gray and Hall (2019) estimate the value of imputation credits over three distinct tax regimes in Australia:

- the “pre-45-day” regime (referring to the introduction of the 45-day trading rule on 1 July 1997, which requires investors to hold shares for 45 days to be eligible for imputation credits);
- the “post-45-day/pre-rebate” regime (the period after the 45-day rule was introduced but before the cash rebate regime that began on 1 July 2000, whereby investors could receive a rebate for credits even if not paying tax); and
- the current regime (which comprises both the 45-day rule and the cash rebate).

Holding all else constant, this comparison of regimes reveals that the introduction of the 45-day trading rule led to a reduction in the value of imputation credits, while the introduction of the cash rebate increased the value of credits.

The significance of these findings extends beyond market approaches to gamma. This is because the findings corroborate the argument that non-market methodologies, such as the equity ownership approach, overstate gamma, since these approaches overlook reasons why even domestic investors may not be able to redeem credits. In response to this hypothesis, economic regulators such as the AER have argued that it is implausible that there is any material group of Australian investors who hold Australian stocks for less than 45 days around ex-dividend dates, because the penalty from doing so (forgoing the credit) is large.[305] Nevertheless, using market-driven comparison of imputation credit values before and after this policy change, Cannavan, Gray and Hall (2019) show that the impact is not immaterial.

[304] The negative lower bound implies that investors incur a cost, rather than derive a benefit, from imputation credits.

[305] AER (2018). Rate of return instrument – Explanatory statement, December, p.362

It is true that the estimation of theta under market-based approaches is not without controversy (with measurement and estimation issues arising in part because of the restricted window of analysis). However, all other WACC parameters are set having regard to market values, consistent with providing returns consistent with attracting capital to a BEE. Moreover, given the PMA regulatory objective to allow the Prescribed Services provider the opportunity to recover a return commensurate with the risks involved, it seems appropriate that the value for imputation credits should be informed by the approaches applied in the workably competitive market for infrastructure finance.

10.2.4 Financial practitioner approaches to gamma

There is substantial evidence from financial markets that imputation credits are not considered by independent experts in a valuation context. In surveys of financial practitioners, those who assign a non-zero value to gamma are overwhelmingly in the minority.

In Section 10.3.2, we present a wide range of evidence from Australian financial practitioners about the value they adopt for imputation credits, and their rationale for doing so.

10.2.5 Approaches to gamma in academic literature

Academic literature also strongly indicates that the gamma for a security should be zero in an Australian context. This is because the marginal investor is most likely to be foreign; therefore, an investor in the BEE would be unable to utilise any accrued imputation credits. We now turn to a consideration of some of the key findings of this literature.

Cannavan et al. (2004) infer the value of imputation tax credits from the prices of derivative securities in Australian retail markets. Their findings are consistent with non-residents being marginal price-setting investors in large Australian firms. They argue that a company's cost of capital is not affected by a dividend imputation system.[306] Thus, if an international investor derives no value from imputation credits a company must produce the same return for a marginal stockholder irrespective of the existence of an imputation system. Feuerherdt et al. (2010) extend the analysis to Australian hybrid

306 Cannavan, D., Finn, F. and Gray, S. (2004). The value of dividend imputation tax credits in Australia. Journal of Financial Economics, 2, pp.167-197.

securities, also finding evidence consistent with a price-setting investor placing no value on franking credits.[307]

Lajbcygier and Wheatley (2012) test whether equity returns are related to imputation credit yields. They find no evidence that the provision of imputation tax credits lowers the return investors require on equity.[308] Furthermore, using a general equilibrium model, they demonstrate that if the domestic market is small relative to the foreign market, which is the case for Australia, the impact of imputation credits on the domestic equity premium is negligible.

In the SL CAPM, equity markets are presumed to be segmented between domestic and foreign markets to determine the cost of equity for regulated firms. In this sense, imputation-eligible domestic investors make portfolio decisions based on with-imputation credit returns, while ineligible foreign investors make decisions based on without-imputation credit returns. In an open economy, such as Australia, which represents a small proportion of global equity, the returns will be determined largely by the expectations of foreign investors.

Siau, Sault and Warren (2015) employ discounted cash-flow valuation models to assess whether imputation tax credits are capitalised into Australian stock prices. They uncover no clear evidence that imputation credits influence the level of stock prices.[309] This reinforces the notion that credits are not valued by the marginal investor, who in the context of Australia is likely to be an international investor.

Gray and Hall (2006) explicitly derive the relationship between the value of franking credits (gamma) and the MRP. With a specific emphasis on Australian regulators, they demonstrate that the typical parameter estimates adopted in practice are incompatible with this mathematical relationship.[310] If internal consistency within the cost of equity model is to be restored, then at least one of the parameter values needs to be modified. To restore internal consistency, the authors propose that setting gamma equal to zero is the most straightforward way of achieving this. The advantage of this approach is that no further assumptions are required about the magnitude of dividend yields.

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307 Feuerherdt, C., Gray, S. and Hall, J. (2010). The value of imputation credits on Australian hybrid securities. International Review of Finance, 10(3), pp.365-401.

308 Lajbcygier, P. and Wheatley, S.M. (2012). Imputation credits and equity returns. Economic Record, 88(283), pp.476-494.

309 Siau, K.S., Sault, S.J. and Warren, G.J. (2015). Are imputation credits capitalised into stock prices? Accounting and Finance, 55, pp.241-277.

310 Gray, S. and Hall, J. (2006). Relationship between franking credits and the market risk premium. Accounting and Finance, 46, pp.405-428.

Additionally, the authors cite two surveys in support of their findings. Firstly, Truong, Partington and Peat (2005) surveyed 356 listed Australian firms on their corporate finance practices: 85 per cent of respondents indicated that they made no adjustment for the value of franking credits.[311]

Additionally, Lonergan (2001) conducted a review of expert valuation reports, finding that 42 of 48 (88 per cent) used the CAPM for their cost of equity calculations without making any adjustments for dividend imputation.[312] Of the six reports that did incorporate it, only one was able to assign any non-negligible value to the company on the basis of franking credits. Although some time has passed since these surveys, there is little indication that these key sentiments have changed.

In summary, academic research analysing market data indicates strong support for placing no value on imputation credits. The literature bases this on the assumption that in open capital markets like Australia, the marginal investor will be an international investor who gains no value from imputation credits and hence whose expected return on equity is not affected by the operation of the Australian tax imputation system.

We use academic evidence as a cross-check on our point estimate of gamma for the BEE.

10.2.6 Estimating the distribution rate

The distribution rate is the proportion of tax paid that has been distributed to shareholders as franking credits. Historically among Australian economic regulators, it was common to estimate the distribution rate using market wide indicators such as cumulative payout ratios, which used ATO franking account balance data to measures changes in the stock of franking credits held by companies. More recently though, several regulators have transitioned to an approach by which the distribution rate is calculated based on the top 20 or top 50 firms listed on the ASX (see Section 10.3).

Where the value of theta is assumed to zero (as is the case of the financial practitioner and academic approaches), the assumed distribution rate is arbitrary, because the resulting gamma will be equal to zero irrespective of the distribution rate.

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311 Truong, G., Partington, G. and Peat, M. (2008). Cost-of-capital estimation and capital budgeting practice in Australia. Australian Journal of Management, 33(1). Available from: https://www.aer.gov.au/system/files/Attachment%2010-4%20Gamma%20Supporting%20Documents%20-%2018.%20Truong%2C%20Partington%20and%20Peat%20%27Cost-of-Capital%20Estimation%20and%20Capital%20Budgeting%20Practice%20in%20Australia%20-%201%20June%202008.pdf [Accessed 25 May 2020].

312 Lonergan, W. (2001). The disappearing returns: Why imputation has not reduced the cost of capital. Journal of the Securities Institute of Australia, Issue 1 Autumn, pp.8-17. Available from: https://search.informit.com.au/documentSummary;dn=200109613;res=IELAPA [Accessed 25 May 2020] – note that this article is paywalled.

10.3 Well accepted approaches to gamma

In attempting to identify well accepted approaches to gamma, we have reviewed relevant finance industry evidence (particularly from independent and expert reports and practitioner surveys) and Australian regulatory practice. We have also had regard to the findings of peer-reviewed academic literature as a cross-check on our findings in relation to practitioners and regulators. This is consistent with our overarching position on the definition of well accepted applied across our WACC calculations. This review reveals a range of well accepted approaches to the assessment of gamma.

10.3.1 Well accepted approach amongst regulators

This section discusses the approaches that Australian economic regulators have adopted when determining a value for gamma.

Australian regulatory precedent has been a highly contested area with ongoing disagreement over the value of imputation credits in the hands of investors. Consequently, there are several approaches that have been applied in Australian regulatory practice. This has been reflected in a large range of gamma values from 0.25 to 0.585 that have been adopted by Australian regulators in recent years.

In its Final Gas Rate of Return Guidelines, the ERA repeated earlier comments that:[313]

> Experts differ in their interpretation of the best approach to estimating gamma in the regulatory setting. This is particularly the case for the value of the utilisation rate.

Table 45 provides an overview of the gamma approaches and positions that are currently adopted by Australian regulators. In the sections that follow, we provide more detailed commentary on specific approaches to the distribution and utilisation rates.

[313] ERA (2018). Final Gas Rate of Return Guidelines, p.256.

Table 45 Gamma positions adopted by Australian regulators

Regulator	Distribution rate	Utilisation rate / theta	Gamma	Justification provided by regulator
IPART	0.70	0.35	0.25	Arrived at under a specific review of gamma concluded in 2012[314] and re-affirmed in its 2018 WACC methodology review. In 2018, IPART considered that there was insufficient evidence to adopt a different value of gamma at this time. It maintained its view that dividend drop-off studies are currently the best method to estimate the market value of gamma.[315] IPART's view on the equity ownership method was that the main assumption of the method (that domestic investors take full advantage of imputation credits while foreign investors are unable to take any advantage of them) provided a point of reference, but was imprecise, and may tend to overestimate the use of imputation credits. Further, domestic ownership ratios fluctuate considerably over time, and are quite different for listed equities as compared to all (listed and non-listed) equities. In the case of ATO taxation statistics, IPART observed that while this method also has its limitations, it tends to produce gamma estimates that are lower than those from the equity ownership method, because it does not make such imprecise assumptions about the behaviour of investors. No direct reference to the distribution rate in the 2018 methodology review. However, IPART notes that it has adopted 0.25 since 2012, after ACompT adopted 0.70 for the distribution rate. For theta, IPART directly cites Cannavan and Gray (2017), which reports a theta of 0.35; this indirectly confirms the distribution rate of 0.70.
AER	0.90	0.65	0.585	Final 2018 Rate of Return Instrument relied exclusively on equity ownership approach, in contrast to draft guidelines, which still placed "some reliance" on taxation statistics and "limited reliance" on dividend drop-off studies (see discussion below). The distribution rate is now based exclusively on Dr Martin Lally's estimate of the distribution rate based on the top 50 ASX firms. Previously, the AER placed primary reliance on the cumulative payout ratio approach (based on ATO data), with some regard to Lally's approach. The AER in its decision for TransGrid (one of the last before the 2018 instrument came into effect), previously referred to the cumulative payout ratio approach as "widely accepted." It typically resulted in a distribution rate around 0.7.
ERA	0.90	0.60	0.50	To estimate the utilisation rate, the ERA relies on the equity ownership approach to determine the percentage of domestic investors in the Australian equity market.[316] The utilisation rate is estimated for all Australian equity from the national accounts of the ABS. The ERA's view was that ATO data (i.e. taxation statistics) should not be applied to all aspects of the imputation system. The ERA considered that was confirmed by opinions expressed by the ATO. ERA also estimates the distribution rate based on the ASX top 50 (as per AER). Note that ERA rounds final gamma estimate from 0.54 to 0.50.
QCA	0.88	0.55	0.484	The QCA considers that the appropriate estimate of the utilisation rate should be based on the equity ownership of Australian listed companies (not all equity, as per AER and ERA). On the other hand,

314 IPART (2012). Review of imputation credits (gamma), Research – Final decision, March.

315 IPART (2018). Review of our WACC method, Final report, February.

316 ERA (2019). 2018 and 2019 weighted average cost of capital for the freight and urban networks, and the Pilbara railways, 22 August, p.77-78.

Regulator	Distribut-ion rate	Utilisati-on rate / theta	Gamma	Justification provided by regulator
				the QCA does not consider the taxation statistics approach to be reliable.[317] The distribution rate is based on the Lally approach (although only the top 20 firms are used).
ACCC	0.88 (implied)	0.60 (implied)	0.50	This was applied in the draft ARTC Interstate Access Undertaking in December 2018. No explicit distribution / utilisation rates were mentioned, but the decision was largely influenced by the AER's 2018 draft guidelines (because the AER's final Rate of Return Instrument had not been released at the time of the ACCC's most recent WACC determination).[318]
ICRC	0.7 (implied)	0.6 (implied)	0.40	As per May 2018 final decision for Regulated Water and Sewerage Services Prices 2018-23. ICRC agreed with the AER and QCA approaches that prevailed as at the time of the decision (May 2018, prior to the latest AER Rate of Return instrument).[319] Decision does not stipulate distribution / utilisation rates, but does rely predominantly on AER precedent (as of May 2018)
OTTER	0.7 (implied)	0.6 (implied)	0.40	As per the May 2018 final decision for the Water and Sewerage Price Determination Investigation. OTTER based this estimate on the AER's position at the time of the decision, determining that the current best estimate of gamma for a business operating in Australia (as at May 2018) was 0.4. No explicit reference to chosen distribution / utilisation rates, but cites AER research as "current best estimate" (as of May 2018)
ESC	0.80 (implied)	0.6 (implied)	0.50	The ESC has not provided its rationale in recent water decisions, other than noting in its most recent Guidance Paper that this was consistent with its previous review.[320] In the previous October 2011 Guidance on Water Plans, the ESC rounded from 0.48 to 0.50.[321] The ESC stated that this was consistent with its 2008 and 2009 reviews, which in turn referred to the preceding review (which does not appear to be available on the ESC's website).
ESCOSA	Not specified	Not specified	0.50	As per 2016 Final Decision for SA Water. As noted by Frontier Economics in its report for the ESC, ESCOSA has indicated that it will review its approach in SA Water's 2020 price review. The March 2020 draft decision has accepted SA Water's proposal to retain a gamma of 0.50. Limited justification provided. 2020 and 2016 decisions refer back to 2013 determination, which in a WACC summary table simply attributes the gamma value to "regulatory precedent."[322] No clearly specified values for the utilisation and distribution rates.
MIDPOINT	**0.80**	**0.35 (market)** **0.60 (non-market)**	**0.25 (market)** **0.49 (non-market)**	

Note: The average distribution rate is 0.81 (noting ESCOSA is excluded from this average), which is very similar to the midpoint estimate (the median is 0.84). The average and median utilisation rate / theta for non-market approaches is 0.60 (same as the midpoint)

Source: Various regulatory decisions, Synergies analysis

317 QCA (2018). Aurizon Network's 2017 draft access undertaking - Appendices, December.

318 ACCC (2018). Australian Rail Track Corporation's 2018 Interstate Access Undertaking, 20 December.

319 ICRC (2018). Regulated water and sewerage services prices 2018–23 – Final report, May, p.127.

320 ESC (2016). 2018 water price review – Guidance paper, November, p.50.

321 ESC (2011). 2013 water price review – Guidance on water plans, October, p.66.

322 ESCOSA (2013). SA Water's water and sewerage revenues, 2013/14-2015/16 – Final determination – Statement of Reasons, May, p.145.

Changes over time in regulatory approaches to gamma

In the draft decision for the 2018 rate of return guidelines, the AER considered that available evidence suggested a utilisation rate (theta) of approximately 0.6. In coming to this position, the AER explained that it placed:

- "Significant reliance" upon the equity ownership approach, which suggested a range for the utilisation rate estimate of 0.6 to 0.7 for all equity;
- "Some reliance" upon taxation statistics, which suggested an estimate for the utilisation rate of 0.61 based on dividend data for all equity;
- "Limited reliance" upon implied market value studies, which suggested a range for the utilisation rate estimate of 0 to 0.5. In particular, the adjusted estimate from SFG's dividend drop off study suggested a utilisation rate of 0.4.[323]

Relying on this evidence base, combined with a distribution rate of 0.88, the AER applied a gamma of 0.50 in its draft guidelines (which the ACCC in turn relied upon in its 2018 draft decision for the ARTC interstate access undertaking). In the final decision for the Rate of Return Instrument though, there were subtle but important changes in the AER's methodology that caused the utilisation rate to increase from 0.60 to 0.65 (which, by extension, contributed to the overall increase in gamma from 0.5 to 0.585), among other issues, such as a different rounding policy.

The Independent Panel reviewing the AER's draft guidelines recommended that the AER "adopt a proactive approach to improving the quality and relevance of dividend drop off studies."[324] Meanwhile, the Independent Panel also remarked that if the AER felt confident in the ABS data underpinning the equity ownership approach, then the need to explore an alternative would be reduced.

Ultimately, the Independent Panel recommended that the AER explain more clearly how SFG's 2016 dividend drop off study estimate of 0.4 actually informed the overall utilisation rate of 0.6 (given its "limited reliance"). Elsewhere, the Independent Panel recommended that the AER explain more clearly why it did not consider a utilisation

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323 The AER explained that the SFG dividend drop off study is one "common" type of implied market value study that was adopted by most businesses, who previously proposed a theta of 0.35 based on the study. However, the AER considered that, to the extent they are relied upon at all, implied market value studies need to be adjusted for incorrect estimates of the post-company pre-personal tax value of cash dividends. Accordingly, advice from John Handley and Martin Lally concluded that SFG's dividend drop off study should instead be interpreted as an estimate of 0.4. This is why the AER's value from dividend drop off studies differs from the value used by IPART (0.35).

324 Independent Panel (2018). Review of the Australian Energy Regulator's rate of return draft guidelines, 7 September, pp.51-52.

rate higher than 0.6 in the draft decision. Specifically, the Independent Panel observed that:[325]

> If the AER had no regard for ATO data [taxation statistics] and DDO studies, the choice of the utilization rate would be clear – the ABS data shows a range of 0.6 to 0.7 and the most recent estimate is 0.65. It is questionable whether the inclusion of two additional sources, each of which is described in the Explanatory Statement as deserving of lesser weight, is sufficient justification for choosing an estimate at the lower end of the range, especially when one of the lesser weight estimates (the DDO at 0.4) appears to be implausibly low compared to the preferred estimate (ABS) [equity ownership approach].

Taking these comments into consideration, the AER decided in its final Rate of Return Instrument in December 2018 that utilisation rate estimates from implied market studies and ATO taxation statistics do not warrant an adjustment to the estimate. In other words, the AER's final decision put no reliance (neither "some" nor "limited") on taxation statistics or dividend drop-off studies. This is an important departure from its 2018 draft guidelines, as well as other decisions made since the 2013 guidelines, which still gave consideration (albeit without explicit weights) to taxation statistics and market value studies.

The developments over time in the ERA's approach to gamma have followed a similar pattern. Having previously based its earlier gamma estimate of 0.4 on a combination of the equity ownership approach, taxation statistics and dividend drop-off studies, the ERA now informs gamma exclusively by reference to the equity ownership approach.

These developments have important implications for the interpretation of the approaches used by ICRC and OTTER, who follow the AER's previous stance on gamma prior to the 2018 Rate of Return Instrument. While these regulators have historically relied heavily on AER analysis and research, at this point in time it remains unknown whether they will now move into alignment with the AER's new position on gamma at their next WACC reviews. OTTER's next determination for TasWater is not due until 2021, while ICRC's next review for Icon Water will take place in 2023. Consequently, at the time of writing, these regulators continue to assign "some" and "limited" reliance, respectively, to taxation statistics and dividend drop-off studies.

325 Independent Panel (2018). Review of the Australian Energy Regulator's rate of return draft guidelines, 7 September, p.56.

Distribution rate approaches

Until approximately 2018, when both the AER and ERA published new rate of return guidelines, most regulators opted for a value in the vicinity of 0.70 (the QCA was the only regulator to assume a distribution rate above 0.8). Regulators such as the AER and ERA placed primary reliance on the cumulative payout ratio approach (based on ATO data), with some regard to Lally's approach based on the top 20 or top 50 firms on the ASX. In fact, the AER in its decision for TransGrid (one of the last WACC determinations before the 2018 instrument came into effect), previously referred to the cumulative payout ratio approach as "widely accepted." It typically resulted in a distribution rate around 0.7.

Since 2018 though, and in response to the criticism that limiting the sample to the top 20 firms is incompatible with the BEE, the AER and ERA have begun to apply the Lally 50 firms approach, which bases the distribution rate on the top 50 firms on the ASX.

Concerns have been raised by stakeholders such as Energy Networks Australia (ENA) that both the AER and ERA have now placed full weight on Lally's approach to calculating the distribution rate based on the top 20 or top 50 firms on the ASX, with no weight placed on ATO-based data.[326] The issues with this approach using top ASX-listed firms include:

- The 50 firms (previously 20) are not appropriate comparators for the BEE because the top 50 ASX firms are dominated by banks, resources companies and health care companies – although this argument has been made in relation to energy networks, it also appears that there are few firms similar to PoM's BEE in the top 50 firms;
- The methodology relies on the use of franking account balances – this is one of the main criticisms of the taxation statistics approach (because it may be difficult to track the flow of imputation credits through franking accounts over time), which is no longer relied upon by the AER; and
- The distribution rate for listed firms can be distorted by the presence of foreign profits – this causes issues with applicability to PoM's BEE, which provides prescribed services exclusively in Australia.

This analysis led the AER to increase its estimated distribution rate to 0.9 (90%), with the ERA doing likewise in its final rail WACC guidelines.[327] Even with this extended dataset,

326 Energy Networks Australia (2018). AER review of the rate of return guideline – Response to draft guideline, 25 September, p.140.

327 AER (2018). Rate of return instrument – Explanatory statement, December, p.16; ERA (2019). 2018 and 2019 weighted average cost of capital for the freight and urban networks, and the Pilbara railways, 22 August, p.78.

it is still unclear whether there are sufficient firms in this sample that are comparable to the BEE for PoM, such that they could inform its distribution rate.

As explained in

Table 45, the challenge with identifying an explicit estimate of the distribution rate for the BEE is that, in several instances, an economic regulator refrains from explicitly identifying the distribution rate and theta estimates that they use to reach an overall gamma estimate.

In any case, the fact that the distribution and utilisation rates are cited less frequently than the overall gamma estimates demonstrates that an approach of drawing on regulatory precedent on the overall gamma estimate (rather than separately considering regulatory precedent on distribution and utilisation rates or constructing a gamma estimate from 'bottom up' estimates of the distribution and utilisation rates) is in fact the most commonly applied approach in Australian regulatory precedent.

10.3.2 Well accepted approach amongst finance practitioners

In financial markets, there is substantial evidence that imputation credits are not assigned any value by independent experts in a valuation context. In surveys of financial practitioners, those who assign a non-zero value to gamma are overwhelmingly in the minority.

Independent expert valuations

The ESC's 2019 interim commentary did not provide any further analysis of our reliance on independent expert valuations, nor did it address our responses to the ESC's guidance in this area from the 2018 interim commentary. Thus, for context, we have presented our analysis and responses from our previous report issued last year, supplemented by new evidence from Grant Samuel, Deloitte and KPMG that reinforces the notion that a well accepted approach to the determination of gamma among financial practitioners is to assign no value to imputation credits.

In the 2018 interim commentary, the ESC raised an observation from the Australian Competition Tribunal, which was that valuation experts may choose to assign no value to imputation credits on the basis that it is difficult to reliably estimate their value, not because these experts believe that they have no value.[328] This does not align with the evidence that we have uncovered to date. Most prominently, Grant Samuel has stated unequivocally on multiple occasions (see reports cited in this section) that it does not

[328] Essential Services Commission (2018). Interim Commentary, p.76.

believe that Australian equity prices incorporate a value for franking credits, nor does it believe that gamma adjustments are made by asset acquirers, as shown below.

It is acknowledged that Deloitte has raised concerns about the diverse views on imputation credit valuation.[329] However, this does not imply that Deloitte would have assigned a non-zero value to gamma if there was a dominant approach to calculating it. If an independent expert were to genuinely believe that imputation credits held significant value, it would not be prudent to assign no value to gamma whatsoever, simply because there are differing views on calculating the parameter. Instead, a more measured approach would be to have regard to the most well-accepted methodologies (or at least a range of the most well-accepted), combining these in a way that gives appropriate weight to each approach based on its merits.

The ESC then goes on to reference a market practice survey (Truong, Partington and Peat, 2005, which we have cited in previous reports and have done so again above), which finds that some valuation experts (15%) assign value to imputation credits. In our view, this survey reinforces that the weight of evidence is that imputation credits are not valued by the vast majority of independent experts. In a review of market evidence on the cost of equity for Aurizon, Ernst and Young find that "there is no evidence that market practitioners (i.e. independent experts) take information on imputation credits into account in estimating required rates of returns."[330]

In response to a 2014 AER draft decision for TransGrid, Grant Samuel wrote that:[331]

> We have always made it clear in our reports that we do not believe that day to day market prices of Australian equities incorporate any particular value for franking credits attached to any future income stream and we have never made any adjustment for dividend imputation (in either the cash flows or the discount rate) in any of our 500 plus public valuation reports.

Furthermore, in a 2015 Independent Expert's Report for Asciano, Grant Samuel puts forward the perspective of financial markets, arguing that:[332]

> The evidence gathered to date as to the value of the market attributes to franking credits is insufficient to rely on for valuation purposes. The studies that measure the value attributed to franking credits are based on the immediate value of franking

[329] Refer commentary from Deloitte cited below.

[330] Ernst and Young (2016). Market evidence on the cost of equity, 22 November, p.28.

[331] Grant Samuel (2015). Response to AER draft decision, 12 January, p.5.

[332] Grant Samuel (2015). Independent Expert's Report, Asciano, 30 September, p.315.

> credits distributed and do not address the risk and other issues associated with the ability to utilise them over the longer term. More importantly, Grant Samuel does not believe that such adjustments are widely used by acquirers of assets at present.

Grant Samuel expanded further on its gamma position in an October 2019 independent expert report for Bellamy's Australia. It observed that:[333]

> While acquirers are attracted by franking credits, there is no clear evidence that they will actually pay extra for a company with them.

This observation has significant implications for achievement of the regulatory objectives in the PMA. Specifically, this phenomenon among acquirers indicates that a WACC with a non-zero gamma may not promote efficient investment in the provision of prescribed services if it is insufficient to attract ongoing investment.

Moreover, Grant Samuel stressed in its report for Bellamy's that imputation credits are not a company asset, in that they could be readily released for a cash sum that all shareholders can receive.[334] Not only may they be of little or no value to some shareholders, but Grant Samuel stated that some categories of shareholders could even be worse off in situations such as those involving a capital loss on disposal of shares.[335] This is consistent with the results in Cannavan, Gray and Hall (2019), which indicated the lower bound for the value of imputation credits could actually be negative in some cases.[336] Grant Samuel did acknowledge that imputation credits may have value to some shareholders but argued that they do not affect the underlying value of the company itself.[337] In our view, Grant Samuel's stance strongly implies that imputation credits do not have value for the marginal price-setting investor, who is central to the determination of firm value.

Deloitte points to the lack of conclusive evidence on the value of imputation credits:[338]

> We have not adjusted the cost of capital or the projected cash flows for the impact of dividend imputation due to the diverse views as to the value of imputation credits and the appropriate method that should be employed to calculate this value. Determining the value of franking credits requires an understanding of shareholders' personal tax profiles to determine the ability of shareholders to use franking credits

[333] Grant Samuel (2019). Independent Expert's Report, Bellamy's Australia, 30 October, p.59.

[334] Grant Samuel (2019), p.59.

[335] Grant Samuel (2019), p.59.

[336] Cannavan, Gray and Hall (2019), p.1.

[337] Grant Samuel (2019), p.59.

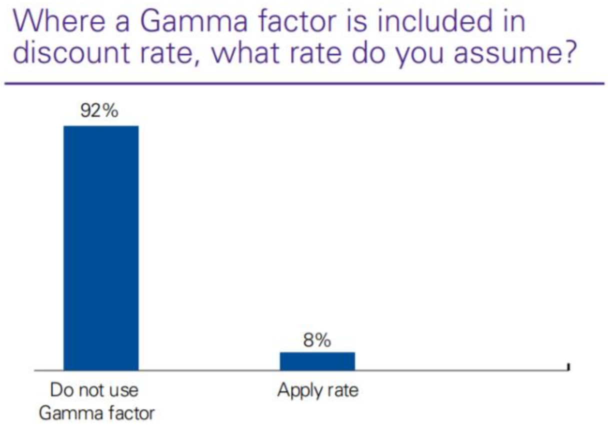
[338] Deloitte (2015). Independent Expert's Report, Energy Developments Limited, 3 September, p.63.

to offset personal income. Furthermore, the observed EMRP already includes the value that shareholders ascribe to franking credits in the market as a whole. In our view, the evidence relating to the value that the market ascribes to imputation credits is inconclusive.

Financial practitioner surveys

Market surveys are also valuable in understanding the approach of financial practitioners to the valuation of imputation credits. The KPMG 2019 Valuation Practices Survey examined the practices of 59 respondents in relation to the treatment of imputation credits.[339] Firstly, as shown in Figure 18, 92% of practitioners surveyed did not incorporate a gamma factor into the discount rate. This aligns with the views set out in independent expert reports (summarised above) and reaffirms unambiguously that the well accepted approach to gamma among financial practitioners is to apply no value to imputation credits.

Figure 18 KPMG Valuation Practices Survey 2019, gamma

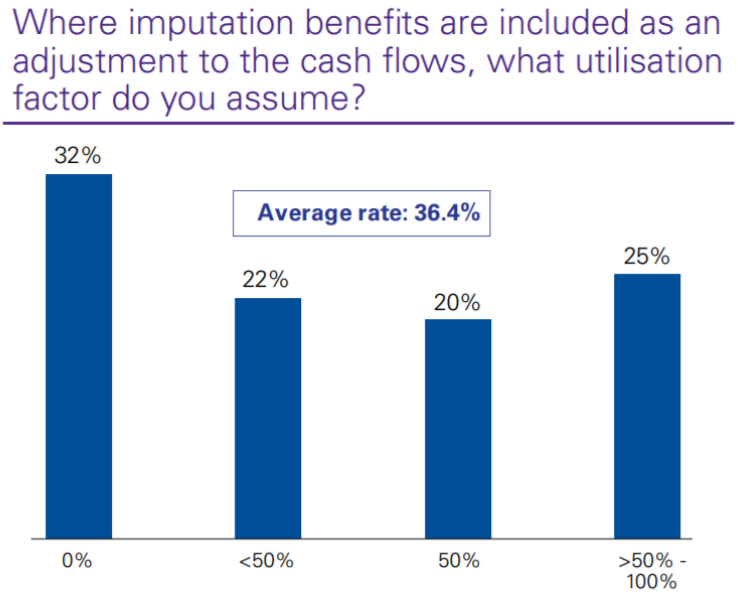


Data source: KPMG Valuation Practices Survey 2019

Figure 19 shows that the average rate applied was 36.4% (i.e. a theta of 0.364), which approximately coincides with the theta of 0.35 based on dividend drop-off studies, and which informs IPART's gamma methodology. Figure 19 also makes clear that the proportion of financial practitioners who adopt a theta value in the range implied by non-market approaches (approximately 0.55 to 0.65 based on current regulatory precedent) are very much in the minority.

339 KPMG (2020). What's it worth? – KPMG Valuation Practices Survey 2019.

Figure 19 Range of utilisation rates used if non-zero gamma is applied



Note: The gamma values in this figure are expressed as percentages rather than as decimals (e.g. 50.0% corresponds to a gamma of 0.50).

Data source: KPMG Valuation Practices Survey 2019

Overall, the evidence from independent expert reports and valuation surveys highlights the discord between financial practitioners (who represent the relevant workably competitive financial market whose disciplines the regulatory regime is seeking to replicate) and economic regulators regarding the value of imputation credits. Only a small minority of financial practitioners adopt a non-zero value for gamma, and of those who do, very few apply a value consistent with heavy or complete reliance on non-market methodologies, such as the equity ownership approach.

International investor interests in Australian transport and energy infrastructure

Further to the findings of academic studies discussed in this chapter, this section focusses on the resident and non-resident investor shares of equity held in major Australian transport and energy infrastructure.

Table 46 below shows only the proportion of Institutions & Strategic Holders & Individuals/Insiders. Equity from domestic manager/listed companies has been allocated fully to the domestic category even though some capital may have been foreign – there is no way to discern this from the source data.

Table 46 Proportion of equity ownership – Institutions & Strategic Holders & Individuals/Insiders

		Data		Proportion of Institutions and Strategic Holders & Individuals / Insiders	
Company	Ticker	Domestic	Foreign	Domestic	Foreign
Qube Holdings	ASX:QUB	23%	21%	52%	48%
Port of Tauranga	NZSE:POT	56%	2%	96%	4%
Aurizon Holdings	ASX:AZJ	23%	31%	42%	58%
Sydney Airport	ASX:SYD	21%	23%	48%	52%
Auckland International Airport	NZSE:AIA	21%	24%	48%	52%
Transurban	ASX:TCL	19%	22%	46%	54%
Atlas Arteria	ASX:ALX	22%	40%	36%	64%
Spark	ASX:SKI	20%	32%	39%	61%
APA Group	ASX:APA	21%	16%	57%	43%
Min		**19%**	**2%**	**36%**	**4%**
Max		**56%**	**40%**	**96%**	**64%**
Median		**21%**	**23%**	**48%**	**52%**
Average		**25%**	**23%**	**52%**	**48%**

Source: Capital IQ data as at 20 May 2020

Table 46 indicates the significant proportion of foreign equity ownership of Australian transport and energy infrastructure.

Table 47 presents a similar picture for unlisted infrastructure transactions since 2015 (based on InfraDeals data).

Table 47 Proportion of equity ownership – Unlisted infrastructure transactions

Transaction	Sub-Sector	Date	Equity Providers	Domestic	Foreign
WestConnex	Toll Road System (Green & Brownfield)	Oct-18	Transurban, CPPIB, AustralianSuper, ADIA	71%	29%
Loy Yang B	Generation	Dec-17	Alinta (Chow Tai Fook Enterprises Limited)	0%	100%
NSW Endeavour Energy	Distribution	May-17	Macquarie Infrastructure, AMP (REST), bcIMC, QIA	57%	43%
DUET	Distribution	Apr-17	CKI	0%	100%
Alinta Energy	Utility	Mar-17	Chow Tai Fook Enterprises Limited	0%	100%
NSW Ausgrid	Distribution	Dec-16	AustralianSuper, IFM	100%	0%
GRail	Rail	Dec-16	G&W, Macquarie Infrastructure	49%	51%
Port of Melbourne	Ports	Oct-16	Future Fund, CIC, OMERS, NPS, CalPERS, GIPA, QIC	31%	69%
Asciano (Pacific National)	Rail	Aug-16	GIP II, CPPIB, CIC, GIC, bcIMC	0%	100%
Asciano (Ports)	Ports	Aug-16	Qube, Brookfield, GIC, bcIMC, QIA	50%	50%

Transaction	Sub-Sector	Date	Equity Providers	Domestic	Foreign
AirportLinkM7	Roads	Apr-16	Transurban, AustralianSuper, ADIA	88%	13%
Pacific Hydro	Renewables	Jan-16	China State Power Investment Corporation	0%	100%
NSW TransGrid	Transmission	Dec-15	Spark, Hastings, CDPQ, ADIA, Wren House	35%	65%
Iona Gas Storage	Energy	Dec-15	QIC, QSuper	100%	0%
Median				**43%**	**57%**
Average				**47%**	**53%**

Note: Fund managers have been classified based on the location of their head office where their underlying investor details are confidential.
Source: InfraDeals

The data in Table 46 and Table 47 highlights at least 50% foreign ownership of major listed and unlisted infrastructure assets in Australia. In these circumstances, it is clear foreign investors unable to access any value from imputation credits are likely to be influential.

It is acknowledged that domestic shareholders derive benefits from dividend imputation. However, in a valuation context, these shareholders are inframarginal – they do not set the relevant price for an infrastructure asset. Academic evidence (which we have deployed as a cross-check on the overall gamma estimate for the BEE) suggests that prices for large Australian assets (such as infrastructure) are set by foreign investors and the valuation of imputation credits for these investors is zero. Put another way, the available evidence does not support the notion that the marginal investor in an efficient Australian benchmark entity is anything but a foreign investor who places no value on imputation credits. Given the relevant workably competitive market in which the BEE raises funds for investment is a global capital market, the implication drawn from this source of evidence is that the gamma for PoM should be zero.

10.3.3 Conclusion on well accepted approaches

The evidence gathered in this chapter illustrates that there is more than one well accepted approach to estimating gamma.

The majority of Australian regulators give primary weight to the equity ownership approach, although several approaches are applied to estimate theta. IPART is the only Australian regulator to currently rely on dividend drop-off studies.

Amongst finance practitioners, there is substantial evidence that imputation credits are not assigned any value by independent experts in a valuation context. In surveys of financial practitioners, those who assign a non-zero value to gamma are overwhelmingly in the minority. It is clear that a well accepted approach to gamma among financial practitioners is to apply no value to imputation credits.

We recognise that recent Tribunal and Court decisions have not found error with recent AER and ERA regulatory decisions.[340] In our view, this falls short of the conclusion drawn in the ESC's Interim Commentary that gamma has been "settled by other recent regulatory processes." It is clear that those decisions were found to be validly made under their relevant statutory regime. These decisions simply demonstrate that regulatory precedent establishes a well accepted approach to the valuation of gamma. It is also the case that other approaches (such as those presented in this chapter) could be equally valid under those regimes.

10.4 Our approach to gamma

10.4.1 Determining a combination of well accepted approaches

The value of gamma continues to be highly contentious and in broad terms can be estimated using the following approaches:

- By reference to the practice of financial markets, where there is substantial evidence that imputation credits are assigned no value by independent experts in a valuation context; and
- By reference to approaches evidenced in regulatory decisions, such as the equity ownership approach, which is the proportion of Australian equity held by Australian residents (given only domestic investors can utilise franking credits), and the taxation statistics approach using data drawn from the Australian Taxation Office on the utilisation of franking credits (to the extent that some Australian regulators such as ICRC and OTTER still implicitly have regard to this alternative non-market approach given their reliance on the AER's approach to gamma prior to the 2018 Rate of Return Instrument).

These well accepted approaches establish a range of possible values for gamma, and there is no clear empirical method for setting the weights that should be applied to the respective approaches in order to derive an appropriate overall gamma outcome for the BEE.

Evidence from independent experts and financial practitioners participating in market-wide surveys clearly shows that the overwhelming majority of these practitioners do not adjust the required return on equity for the value of imputation credits. Moreover, this evidence originates from a context that is directly relevant to the estimation of the WACC

[340] See, for example: Federal Court of Australia, Australian Energy Regulator v Australian Competition Tribunal (No 2) [2017] FCAFC 79, May 2017; Application by DBNGP (WA) Transmission Pty LTd [2018] ACompT 1, 16 July.

for the BEE: namely, the workably competitive market for infrastructure finance. That being said, we also acknowledge that a significant proportion of the evidence available to substantiate this approach could be considered indirect in nature.

For instance, while we consider that the KPMG Valuation Practices Survey is of sufficient sample size to be robust and representative of the Australian financial market, the reasoning behind practitioners' stated position is not always revealed, or is summarised only at a high level (although the more detailed commentary from independndent expert reports partly addresses this shortcoming of available surveys). In contrast, regulatory approaches afford greater transparency and are usually subject to extensive consultation processes and/or independent panel reviews. Accordingly, we have placed more weight on regulatory precedent than on the practice of financial markets.

Having regard to the advantages and disadvantages of each methodology, and considering compliance with clause 4.1.1(a) of the Pricing Order, we have calculated gamma based on a weighted combination of these well accepted approaches. Specifically, we have given regulatory decisions double the weighting of finance practice. This translates to a one-third weighting to a value of zero based on the approach of financial practitioners, and a weighting of two-thirds to non-market approaches (for which we have applied a value of 0.50 based on the midpoint of gamma values from regulators using this approach). This results in a gamma value of 0.33.

Previously, we placed a weighting of one-third on market approaches (as applied by IPART), and a weighting one-third on non-market approaches (as applied by the AER, ERA, QCA and other Australian regulators), for a combined weighting of two-thirds on Australian regulatory precedent. We continue to place a weighting of two-thirds on regulatory precedent, but we have replaced the one-third weighting on market approaches with an additional one-third weighting on non-market approaches. While we maintain there is merit to applying a market approach to the estimate of gamma for the purposes discussed above, we also recognise that it is currently given material weight by only one regulator. As such, market value (dividend drop-off) studies no longer inform the point estimate for gamma; rather, they have been retained as a cross-check on the overall gamma outcome, in conjunction with academic theory on the value of imputation credits.

Our estimate of gamma for the BEE is summarised in Table 48.

Table 48 2020-21 gamma estimate for the BEE

Approach	Gamma estimate	Weighting
Financial practitioners	0.00	33.3% (one-third)
Regulatory precedent (equity ownership) approach)	0.50	66.6% (two-thirds)

Approach	Gamma estimate	Weighting
OVERALL GAMMA ESTIMATE	**0.33**	

Source: Synergies analysis

10.4.2 ESC interim commentary on gamma

In this section, we address the ESC's feedback (both from 2019, and also 2018 where relevant) in relation to our treatment of regulatory evidence on gamma, in light of recent regulatory developments. The ESC's 2019 interim commentary on gamma was less detailed than the 2018 interim commentary. As such, throughout the chapter we have retained references to the 2018 interim commentary (and our subsequent responses) for context.

The main issues raised in the ESC's 2019 interim commentary, and our responses, are summarised in Table 49. Frontier's terms of reference for gamma were limited to a factual table summarising which Australian regulators adopt market approaches, and which Australian regulators adopt non-market approaches.[341] We agree with the factual accuracy of that table (which largely replicated Table 32 in last year's report), so we focus predominantly on the ESC's commentary.

Table 49 Main issues raised in 2019 interim commentary

ESC 2019 interim commentary	Synergies response
The ESC's initial view was that it considers PoM's conclusion that there is no justification 'at this point in time' for increasing the weight on non-market approaches to be selective. The ESC considered that the high weighting on the market approach relative to the non-market approach does not align with recent regulatory decisions and sentiment.	We have responded to this comment by using the market approach as a cross check. We apply twice the weight to the equity ownership approach than we do to finance practice.
The ESC maintained its preliminary view that the utilisation approach, and not the market value approach, to estimating gamma is the well accepted approach when setting gamma within the context of an economic regulatory regime. The ESC's initial view was that the port should consider reviewing the appropriateness of its use of market-based approaches to estimating gamma in preparing future tariff compliance statements.	Our investigation of contexts relevant to the estimation of the rate of return for the BEE (especially economic regulation as well as practitioners in financial markets) shows that there is more than one well accepted approach to estimating gamma. For this reason, our estimate of gamma is based on a combination of well accepted approaches, giving most weight to the equity ownership approach. We do not consider that the non-market approach is the only well accepted approach to gamma as the ESC has claimed, especially considering widespread financial practitioner user of a zero gamma and the diversity of approaches adopted by regulators. In fact, considering the relevant context for the BEE involves the disciplines of the workably competitive market for infrastructure finance, a market value approach is fit-for-purpose, and, while it no longer informs our point estimate, we have employed it as a cross-check. We also note that IPART, which continues to adopt a market value approach and has done so since 2012, reached a similar position after extensive

341 Frontier Economics has been a strong advocate of market-based approaches to gamma in other regulatory processes.

ESC 2019 interim commentary	Synergies response
	consultation and detailed consideration of relevant material before re-affirming its approach.
The ESC's preliminary view was that PoM should revisit the appropriateness of the distribution rate used in its estimate of gamma in light of recent regulatory decisions	A challenge with identifying an explicit estimate of the distribution rate for the BEE is that, in several instances, an economic regulator refrains from explicitly identifying the distribution rate and theta estimates that they use to reach an overall gamma estimate. In any case, the fact that the distribution and utilisation rates are cited less frequently than the overall gamma estimates demonstrates that an approach of drawing on regulatory precedent on the overall gamma estimate (rather than separately considering regulatory precedent on distribution and utilisation rates or constructing a gamma estimate from 'bottom up' estimates of the distribution and utilisation rates) is in fact the most commonly applied approach in Australian regulatory precedent..

Source: ESC 2019 interim commentary, Synergies analysis

Issues from the 2018 interim commentary

In the 2018 interim commentary, the ESC considered that we had misrepresented current regulatory sentiment by stating that regulators' positions on gamma remain mixed. With the AER opting for a gamma value of 0.585, the regulatory range for gamma in Australian regulatory practice is now between 0.25 and 0.585. (This range is unchanged since PoM's previous WACC submission in May 2019). On this metric alone, the current value of gamma in the regulatory setting is indeed mixed. Moreover, in its Final Gas Rate of Return Guidelines, the ERA repeated earlier comments that:[342]

> Experts differ in their interpretation of the best approach to estimating gamma in the regulatory setting. This is particularly the case for the value of the utilisation rate.

In the 2018 interim commentary, reference was made to determinations from the Office of the Tasmanian Economic Regulator (OTTER) and the Independent Competition and Regulatory Commission (ICRC). The ESC remarked that "while not explicitly referring to this value themselves, the AER's approach has been adopted" by these regulators.[343] However, the decisions the ESC cites actually opted for a gamma of 0.4, which is not the value the AER has proposed to adopt. The decisions by the OTTER and ICRC were actually published before the AER released its December 2018 Rate of Return Instrument, so it is unclear whether these regulators will in the future endorse the modifications that the AER's has made to its determination of gamma.

342 ERA (2018). Final Gas Rate of Return Guidelines, p.256.

343 ESC (2018). Interim commentary, p.75.

10.5 Cross-check – IPART and academics

We employ two cross-checks to examine the appropriateness of our gamma estimate for the BEE:

- Dividend drop-off studies (the market approach currently used by IPART); and
- Estimates of gamma from peer-reviewed financial academic literature.

10.5.1 Dividend drop-off (market value) studies

Given the importance of being able to attract equity for investment consistent with the objectives of the PMA, it follows that weight should be given to the practices of financial experts in the workably competitive market for infrastructure finance.

In Section 10.3, our appraisal of Australian regulatory precedent revealed that IPART is the only Australian regulator to currently give material weight to dividend drop-off studies (whilst noting that the current OTTER and ICRC approaches, in giving weight to the AER's pre-2018 gamma position, still place "limited reliance" on this method). Despite this methodology being less widely accepted among Australian regulators, dividend drop-off studies can nevertheless serve as a valuable cross-check on the overall gamma outcome. The primary advantage of dividend drop-off studies is that they are based on actual movements in market prices, and for this reason they are a reasonably objective, data-driven cross-check on the divergent regulatory and practitioner methodologies.

IPART currently estimates a gamma of 0.25 based on dividend drop-off studies. This is materially below our proposed gamma estimate of 0.33. Holding all else constant, a higher gamma results in a lower pre-tax cost of equity for the BEE. This also demonstrates that our estimate of gamma sits well within the current regulatory range of gamma values applied in Australia.

10.5.2 Academic evidence on gamma

The evidence of ownership of major Australian infrastructure assets and recent transactions in the sector demonstrates that the relevant price setting investor is a foreign investor. As detailed in Section 10.2.5, it is well-accepted in the academic literature that the gamma for a security should be zero where the marginal investor is foreign (as is likely to be the case in the Australian context). This in turn explains why a gamma of zero is appropriate for the BEE under the Pricing Order.

Therefore, in addition to demonstrating that our estimate of gamma for the BEE is likely to be conservative, this evidence also provides the theoretical underpinning for the well accepted approach that we observe financial practitioners adopting in practice. This theoretical corroboration, whilst not necessarily determinative in its own right, endorses the views expressed by independent expert commentary, as well as the opinions expressed in the aggregated results of market-wide surveys, where precise explanations for a chosen gamma approach may not be fully visible.

10.6 Conclusion

On the balance of the evidence, the issue of the valuation of imputation credits turns on the relative weightings that should be assigned to the well-accepted approaches to gamma. In our view, the achievement of the regulatory objectives under the PMA, and the requirements of clause 4.1.1(a) of the Pricing Order, necessitates approaches that embraces assessments of the value of imputation credits from the finance community, in conjunction with regulatory approaches to gamma.

The proportional weights assigned to these well-accepted approaches recognises the methods of valuing utilisation credits that have emerged in an Australian regulatory context, while also giving appropriate emphasis to the overwhelming views of Australian financial practitioners as persistently reported by survey respondents, and as elucidated in comprehensive independent expert commentary.

As recommended by the ESC, we have given closer consideration to a gamma estimate based on separate estimates of the utilisation and distribution rates. Our review has highlighted that some regulators have not provided explicit disaggregations into utilisation and distribution rate estimates. However, when viewed across all relevant regulatory precedent, we have shown our approach of focusing on overall gamma estimates for well-accepted approaches gives a virtually identical result to a bottom-up method that estimates the utilisation and distribution rates separately.

On these grounds, we consider a gamma value of 0.33 for the BEE, which results from a combination of well-accepted approaches to gamma, is consistent with the Pricing Order. Our cross-checks imply that this estimate is likely to be at the upper end of the range of values (hence lowering the required return on equity) that would likely be applicable to the BEE when seeking to raise capital from investors in the workably competitive market for infrastructure finance.

Finally, whilst not a cross-check, we note that the gamma value we have adopted falls within the upper half of the range suggested by the ESC's 2019 Interim Commentary.[344]

344 Interim commentary - Port of Melbourne tariff compliance statement 2019-20, p1

11 Proposed WACC estimate for BEE

The purpose of this chapter is to present the values of the key components of our pre-tax nominal WACC estimate of 8.93% for the BEE.

We also demonstrate that this WACC estimate satisfies the three-stage assessment approach set out by the ESC to assess the compliance of PoM's WACC estimate with the Pricing Order.

11.1 Changes since 2019-20 TCS submission

The changes to our return on equity and debt estimates since the 2019-20 TCS submission reflect changes in market-based parameter values (e.g. risk-free rate, MRP, DRP), changes in the approach to the determination of certain parameters (e.g. MRP and gamma), as well as a change in the weightings given to each of the return on equity models. Our asset beta and gearing value assumptions remain unchanged.

11.1.1 Return on equity calculation

The methodologies used to calculate our pre-tax return on equity estimate of 10.60% are discussed in Chapters 5, 6 and 7 of our report. The underlying input parameter values are presented in Table 50.

Table 50 SL CAPM post-tax cost of equity

Parameter	Estimate
Risk-free rate	0.90%
Gearing	30%
Asset beta	0.7
Equity beta	1.0
MRP	7.57%
Post-tax SL CAPM cost of equity	8.47%

Source: Synergies analysis

Pre-tax return on equity

Given the Pricing Order requires that the WACC estimate be expressed in pre-tax nominal terms, the following formula grosses up the post-tax Re for the gamma-adjusted corporate tax to generate a pre-tax Re:

$$\text{Pre-tax Re} = \text{Post-tax Re} / (1 - t * (1 - \gamma))$$

Where

t = corporate tax rate = 0.3

γ = gamma = 0.33 (refer Chapter 10 of our report)

Substituting the parameter values into the above formula:

Pre-tax Re = 8.47% / (1 – 0.3 * (1 - 0.33)) = 8.47% / 0.8

Pre-tax SL CAPM Re = 10.60%

Therefore, our estimate of the pre-tax return on equity for the benchmark port entity based on the SL CAPM is 10.60%.

11.1.2 Return on debt calculation

The underlying components of our return on debt estimate of 5.04% are discussed in Chapter 9 of our report.

11.1.3 WACC estimate

The Pricing Order confers important discretions on the Port Licence Holder in relation to the cost of capital. In forming our views on a compliant cost of capital, we have had the benefit of the ESC's Interim Commentary on past TCS submissions[345] and the publication of the ESC's Statement of Regulatory Approach.[346] This has led to refinements in our approach over time.

Our pre-tax nominal WACC estimate of 8.93% and its underlying components are presented in Table 51. For the 2020-21 TCS, we have maintained an estimate for the asset beta of at least 0.7 and the upper end of the range of at least 0.75. We have adopted an MRP point estimate of 7.57% by placing a 70% weighting on the Ibbotson MRP (6.42%), a 15% weighting on the Wright MRP (10.74%), and a 15% weighting on DDMs (9.75%).

[345] ESC (2019), Interim commentary - Port of Melbourne tariff compliance statement 2019-20, ESC (2018), Interim commentary - Port of Melbourne tariff compliance statement 2018-19, ESC (2018), Interim commentary - Port of Melbourne tariff compliance statement 2017-18.

[346] ESC (2020) Statement of Regulatory Approach – version 2.0; ESC (2017), Statement of Regulatory Approach.

Table 51 WACC estimate for PoM

	2017-18 TCS	2018-19 TCS	2019-20 TCS	2020-21 TCS
Risk-free rate	2.81%	2.74%	1.96%	0.90%
Capital structure	30%	30%	30%	30%
Gamma	0.25	0.25	0.25	0.33
Corporate tax rate	30%	30%	30%	30%
CAPM Parameters				
Ibbotson MRP	6.53%	6.56%	6.48%	6.42%
Wright MRP	9.01%	8.86%	9.54%	10.74%
Dividend Discount Models (DDMs)	-	-	8.56%	9.75%
Ibbotson MRP weighting	*50%*	*50%*	*50%*	*70%*
Wright MRP weighting	*50%*	*50%*	*25%*	*15%*
DDMs weighting	*0%*	*0%*	*25%*	*15%*
Weighted MRP	7.77%	7.71%	7.77%	7.57%
Asset beta	0.70	0.70	0.70	0.70
Equity beta	1.00	1.00	1.00	1.00
SL CAPM	13.66%	13.48%	12.55%	10.60%
Debt beta	0.00	0.00	0.00	0.00
Debt risk premium	2.54%	2.53%	3.18%	4.04%
Debt raising costs	0.10%	0.10%	0.10%	0.10%
Return on debt (pre-tax)	5.45%	5.37%	5.24%	5.04%
Pre-tax nominal WACC	**11.54%**	**11.52%**	**10.46%**	**8.93%**

11.1.4 Return on equity cross-checks

We have estimated the Black CAPM return on equity as a cross-check on the SL CAPM return on equity estimate. As detailed in Attachment K, the pre-tax return on equity using the Black CAPM is identical to the SL CAPM (10.60%) assuming an asset beta of 1.0.[347]

We have also estimated the FFM return on equity as a cross-check on the SL CAPM return on equity estimate. As detailed in Attachment K, the pre-tax return on equity using the FFM is 11.77%.

[347] If an asset beta of 0.75 (equity beta of 1.07) is adopted, the Black CAPM pre-tax return on equity estimate would be 10.87%, which sits below the SL CAPM pre-tax return on equity estimate of 11.27% for the same asset/equity beta assumption.

If a weighting of 5% were applied to the FFM (in conjunction with a 5% weighting on the Black CAPM and a 90% weighting on the SL CAPM), the resulting pre-tax WACC would be 9.02%, compared to 8.93% when 100% weight is given to the SL CAPM.

11.2 Satisfying the ESC's compliance assessment framework

The ESC has established a compliance assessment framework for assessing how the proposed WACC estimate for the BEE satisfies the regulatory regime that involves the following steps:[348]

- use of well-accepted approaches in its development;
- determining the overall reasonableness of the proposed WACC estimate and whether it is likely to be commensurate with that required by the BEE, including having regard to the WACCs of comparable entities; and
- if any concerns arise regarding the proposed WACC estimate, a more detailed, focussed analysis of its basis will be undertaken.

The following sections demonstrate that the proposed WACC estimate for the BEE satisfies the regulatory regime. We address the first two steps in turn.

11.3 Use of well accepted approaches

Throughout our report, we outline the reasons for our view that the approaches adopted in the determination of the WACC, and in the determination and estimation of the necessary parameters, are 'well accepted' within the meaning of the Pricing Order. We provide evidence from economic regulators, finance practitioners and academics in support of the approaches that we have adopted.

In each chapter of our report, we set out how we have utilised a combination of those well accepted approaches to determine a WACC that satisfies the Pricing Order (including clause 4.1.1(a)). Step 2 in the ESC's compliance assessment involves comparing the WACC derived for the BEE, an issue to which we now turn.[349]

11.4 Benchmarking the WACC for the BEE

The purpose of this section is to substantiate the consistency of our proposed overall WACC estimate with the returns required by the BEE with a similar degree of risk as

[348] ESC (2020) Statement of Regulatory Approach – version 2.0, p 22.

[349] ESC (2020) Statement of Regulatory Approach – version 2.0, p 23.

that which applies to PoM in the provision of the Prescribed Services (as required by clause 4.1.1(a) of the Pricing Order). Firstly, we evaluate the WACC margins implied from the more comparable regulatory decisions identified by the ESC in its Interim Commentary, as well as the IPART NSW Rail Access Undertaking final decision.

Whilst the ESC has previously confined its assessments to regulatory decisions, we consider a broader assessment is necessary to ensure that the regulatory objectives are achieved. Accordingly, we have generated estimated WACC margins for our listed comparator set using data from Bloomberg on country-specific MRP values and risk-free rates, as well as firm-specific information regarding the return on debt. An overview of the methodology for the assessment of the cost of equity is located in Attachment J.

11.4.1 Complexities in benchmarking WACC

The inherent complexity in benchmarking WACCs can readily be seen in the different components and approaches that can be adopted for the purposes of benchmarking. In this context, there are two principal sources of difference:

- those relating to the intrinsic characteristics of the entities and their commercial environments
- those relating to the WACC assessment itself.

We briefly explain these in turn.

Differences in the intrinsic characteristics of the entities and their commercial environments include:

- Inherent differences in the entities being benchmarked – the BEE in this instance has substantial exposure to the domestic market because of its import concentration, and very high operating leverage, due to, amongst other things, its capital intensity, the Prescribed Services not incorporating property based revenue, the Port Licence Fee and Cost Contribution Amount under the Port Concession Deed and a regulatory regime which provides very limited scope to adjust prices in response to changing circumstances (in contrast to, for example, a revenue cap environment). It is also subject to a Government endorsed plan for the creation of a second port
- Different regulatory regimes – the Pricing Order confers upon PoM important discretions about the approaches to be adopted for determining the WACC that are not reflected in any other Australian regulatory regime. This affects the comparison of WACC because a wider range of values can be compliant under the Pricing Order when compared to the more common deterministic regimes that apply to the comparator regulated entities.

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These differences are captured in Table 52.

Table 52 Environmental benchmarking summary

Entity	Revenue model (where relevant, regulatory framework)	Systematic Risk Exposure	Other relevant factors	Comparability to PoM
PoM	Price-capped, full demand risk with variable tariffs Uncontracted revenue	Volumes linked to domestic economic cycles, high operating leverage exacerbated by large Government licensing fees Contestable trades Threat of 2nd port	Compliance not deterministic regime	N/A
Coal-related network entities	Long-term take-or-pay contracts Revenue capped, very low demand risk	Relatively limited exposure to imports Generally single commodity exposure	Deterministic regulatory regime	Poor comparator due to regulated revenue cap and substantially different operating environment, means significantly lower systematic risk
ARTC Interstate Network	Ceiling revenue test, full demand risk Limited contractual protection	Volumes linked to economic cycles Limited road competition on major route (East-West), other routes contestable (North- South)	Negotiate arbitrate regime 2018 Voluntary Access Undertaking withdrawn following ACCC Draft Determination	Reasonable comparator noting the impact of a different regulatory regime
Arc infrastructure	Ceiling revenue test, full demand risk Long term contracts	Predominantly export focused, although some domestic traffic akin to ARTC Interstate Network	Negotiate arbitrate regime with potential deterministic outcomes (arbitration)	Reasonable comparator noting the impact of a different regulatory regime
NSW Rail Access Undertaking	Ceiling revenue test, full demand risk	Wide variety of traffics ranging from coal (not contestable) to grain to intermodal (more contestable).	Negotiate arbitrate regime with potential deterministic outcomes (arbitration)	Lower systematic risk comparator noting the impact of a different regulatory regime
Pilbara rail networks	Take-or-pay model Ceiling revenue test, full demand risk	Relatively limited exposure to imports Generally single commodity exposure	Negotiate arbitrate regime with potential deterministic outcomes (arbitration)	Subject to single commodity risk with no regulated revenue cap protection
Class I US railroads	Intensity of competition between Class I Railroads is controversial Limited competitive switching Short term contracts	Volumes linked to economic cycles Lower operating leverage given variable costs Very light handed regulatory model	Extensions to switching regimes remain controversial	Comparable due to exposure to domestic freight activity, limited contractual protection and no regulated revenue cap protection

Entity	Revenue model (where relevant, regulatory framework)	Systematic Risk Exposure	Other relevant factors	Comparability to PoM
Marine and Ports	Concession agreements Typically non-regulated	Volumes linked to economic cycles Exposure to competition	Low operating leverage Exposure to shipping industry trends (e.g. growth in liner sizes)	Comparable due to exposure to freight activity, limited contractual protection and no regulated revenue cap protection Impact of low operating leverage significant for systematic risk Impact of international diversification lowers systematic risk in home market

Source: Synergies analysis

Differences relating to the WACC assessment itself include:

- Different cost of debt assumptions – different cost of debt assumptions materially affect the WACC and are therefore particularly important when comparing a WACC in the context of:
  - a regulated setting (such as PoM for current purposes) – where PoM adopts a trailing average and other entities comprised in the sample do not, even though, over time, an entity should be indifferent between a trailing average approach and an on-the-day approach
  - an unregulated setting – where debt margins are not available on a consistent basis for the entirety of the comparator set and we need to rely on an alternative (Bloomberg) that is unlikely to properly reflect the true cost of debt for the entity.
- Different tax regimes – post-tax comparisons abstract from consideration of differences in tax regimes and thereby highlight the underlying risk/return relationships of interest (the focus of 4.1.1(a)). This is particularly the case for international comparators. Moreover, in the context of domestic comparators, pre-tax comparisons reflect differences in the gamma, which is unrelated to the underlying risk/return relationship.

Accordingly, in presenting benchmarked relevant WACC estimates, we believe the following are most relevant:

- Post-tax unlevered cost of equity margins – on the basis that:
  - They remove the distracting influence of the cost of debt and the various approaches that inform that estimate in different comparators (the cost of debt is determined in a relatively transparent market and as such is generally not

contentious). Moreover, once the approach to the cost of debt is accepted, the attribution of parameter values is more uncontroversial in most cases. As such, removing the cost of debt facilitates a more straightforward reference point that is most relevant to the workably competitive market of greatest relevance for the BEE

– The relevant workably competitive market for the assessment of PoM's cost of equity is an international capital market. In such a market, a post-tax comparison is the most informative because international investors cannot access imputation credits.

- Pre-tax nominal WACC margins – whilst not necessarily the most representative, this presentation reflects the terms of the Pricing Order. Accordingly, the material is presented subject to the caveats expressed above. In order to address the cost of debt issue, we present pre-tax nominal WACC margins for the comparators adjusting for the BEE's trailing average cost of debt.

11.4.2 Post-tax cost of equity margins

In Attachment J, we disaggregate the pre-tax nominal WACC estimates for the entities listed in Table 53 into cost of equity and cost of debt margins.

Table 53 List of benchmarking comparators

Sector	Entity name
Listed Marine Ports and Services	Qube Holdings
	Port of Tauranga
	Hamburger Hafen und Logistik
	China Merchants Ports Holding Company
	COSCO Shipping Ports
	Dalian Port
	Hutchison Port Holdings Trust
Listed Railroads	CSX Corporation
	Kansas City Southern
	Norfolk Southern Corporation
	Union Pacific Corporation
	Canadian National Railway Company
	Canadian Pacific Railway
Regulatory comparators	Arc Infrastructure (ERA)
	Pilbara Railways (ERA)
	NSW Rail Access Undertaking (IPART)

Source: Synergies analysis

We find that median cost of equity margins for both listed Marine Ports and Services firms and Class I Railroads are higher (whether on a pre-tax or post-tax basis) than the cost of equity margin for PoM. Moreover, we also examined levered and unlevered cost of equity estimates, the latter removing the effect of gearing.

Results on a post-tax, unlevered cost of equity basis are displayed in Figure 20 using box and whisker plots, which display the data in quartiles.[350] The first box and whisker plot (dark green) shows the range of recent regulatory decisions.[351] The second box and whisker plot (orange) shows the range of post-tax unlevered cost of equity margins for listed Marine Ports and Services entities, while the third box and whisker plot presents post-tax unlevered cost of equity margins for listed Class I Railroads (light green). The fourth box and whisker plot (dark blue) presents PoM's post-tax unlevered cost of equity margin for the 2020-21 TCS submission.

In our view, post-tax unlevered cost of equity margins are the most representative benchmarking approach for current purposes. PoM's cost of equity margin estimate (5.30%) is situated towards the lower end of the ranges for the two listed comparator sectors, and approximately within the mid-range of relevant Australian regulatory transport decisions. The post-tax unlevered cost of equity margins for the regulatory transport decisions are as follows:[352]

- Arc Infrastructure = 4.13%
- Pilbara Railways = 5.90%
- IPART NSW Rail Access Undertaking: 4.10%

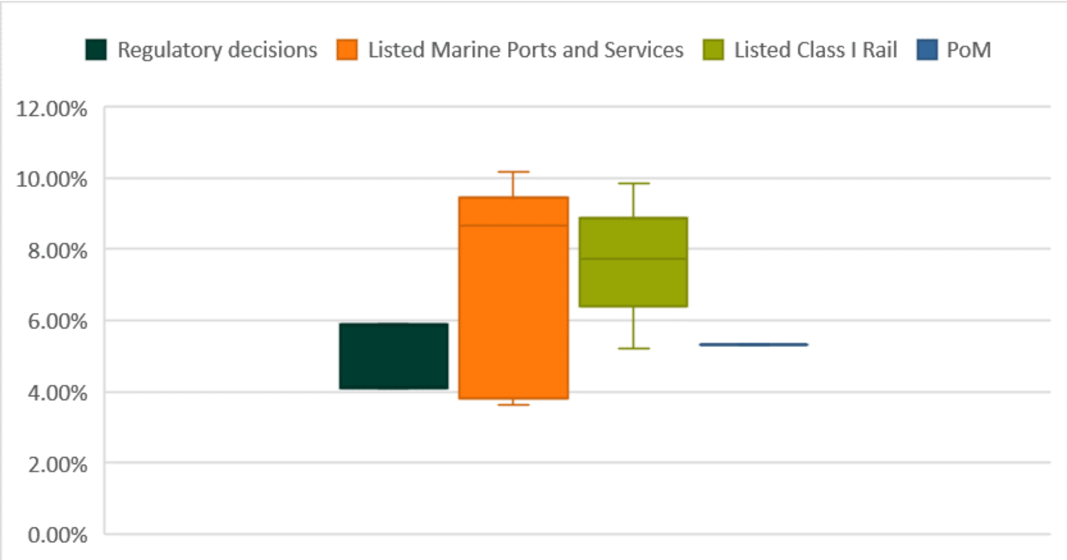
Results on a post-tax levered basis are similar and are presented in Attachment J.

350 The "box" component illustrates the interquartile range (i.e. the middle 50% of values). The "whiskers" at each end of the box show the lowest 25% of values and the highest 25% of values, respectively.

351 Specifically, the range is based on the 2019 Arc Infrastructure and Pilbara Railways determinations, as well as the 2019 IPART determination for the NSW rail access undertaking.

352 Regulated transport entities that are subject to revenue caps or equivalent mechanisms that insulate their revenue (Aurizon Network, QR, DBCT, ARTC (Hunter Valley) and Port of Newcastle) or were not the subject of regulatory decisions in the last decade (ARTC Interstate) were excluded from the benchmarking process.

Figure 20 Post-tax unlevered cost of equity margins



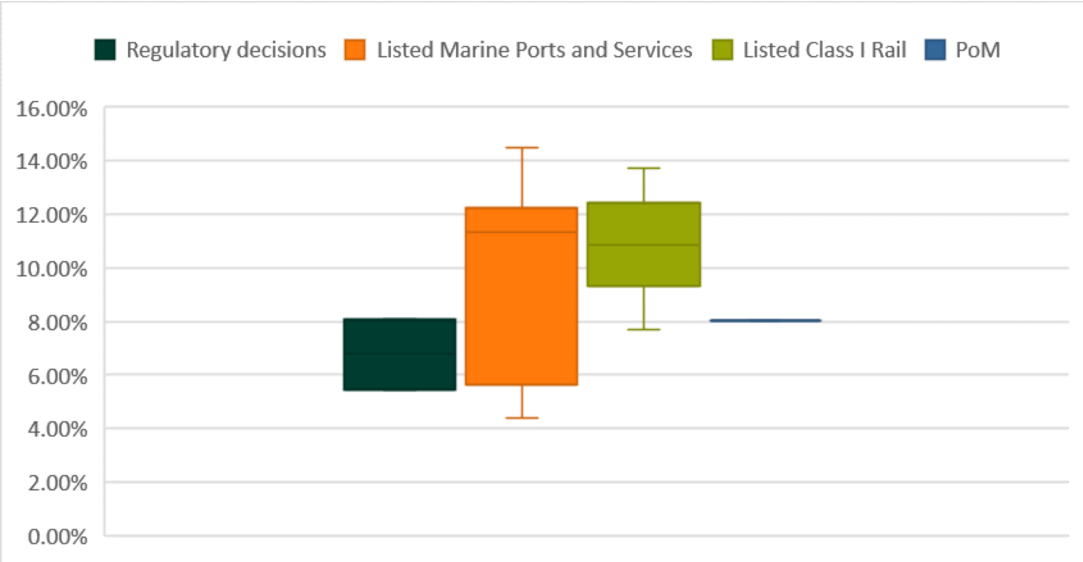
Data source: Synergies calculations, various regulatory decisions, Bloomberg

11.4.3 Pre-tax nominal WACC margins

Next, we present regulatory and listed comparator estimates on the basis of WACC margins (the WACC less the risk-free rate). Regulatory decisions provide a reference point for establishing an appropriate WACC, but for a range of reasons, including the comparability of regulated firms with the BEE as well as the reservations with applying regulatory benchmarks in the context of the Pricing Order (see Chapter 3) it is also important to consider evidence on WACC from listed, non-regulated comparators.

As such, we present WACC estimates for the Class I railroads and Marine Ports and Services entities from our comparator set. The calculations presented here are based on Bloomberg-generated estimates of the SL CAPM return on equity and return on debt. All calculations are expressed as pre-tax nominal estimates using country specific corporate taxation rates. These WACC margins are presented in Figure 21.

Figure 21 Pre-tax nominal WACC margins



Data source: Synergies calculations, various regulatory decisions, Bloomberg

PoM's pre-tax nominal WACC margin is situated:

- within the range of relevant Australian regulatory transport decisions - PoM's pre-tax nominal WACC of 8.93% remains below that of Pilbara Railways (9.62% as at 30 June 2019). Despite the risk-free rate as at 31 March 2020 being 63 basis points lower than at 30 June 2019, PoM's estimate WACC margin of 8.03% is still below that of Pilbara railways (8.09%). This is despite the ERA having implemented a substantial decrease in the MRP along with an increase in gamma that together decreased the pre-tax nominal WACC for Pilbara railways by approximately 200 basis points compared to earlier decisions (not including the fall in the risk-free rate). The ERA has retained its previous asset beta and gearing assumptions for Arc Infrastructure and it has applied only a slight decrease of 0.05 in the Pilbara railways asset beta in light of changes in relevant comparator estimates.,
- towards the lower end of the range for listed Class I railroads (, the median WACC margin for Class I railroads is 280 basis points above the WACC margin for PoM),
- towards the middle of the range for listed Marine Ports and Services entities (the median WACC margin for listed Marine Ports and Services entities is significantly higher than the WACC margin for PoM, by a margin of approximately 328 basis points).

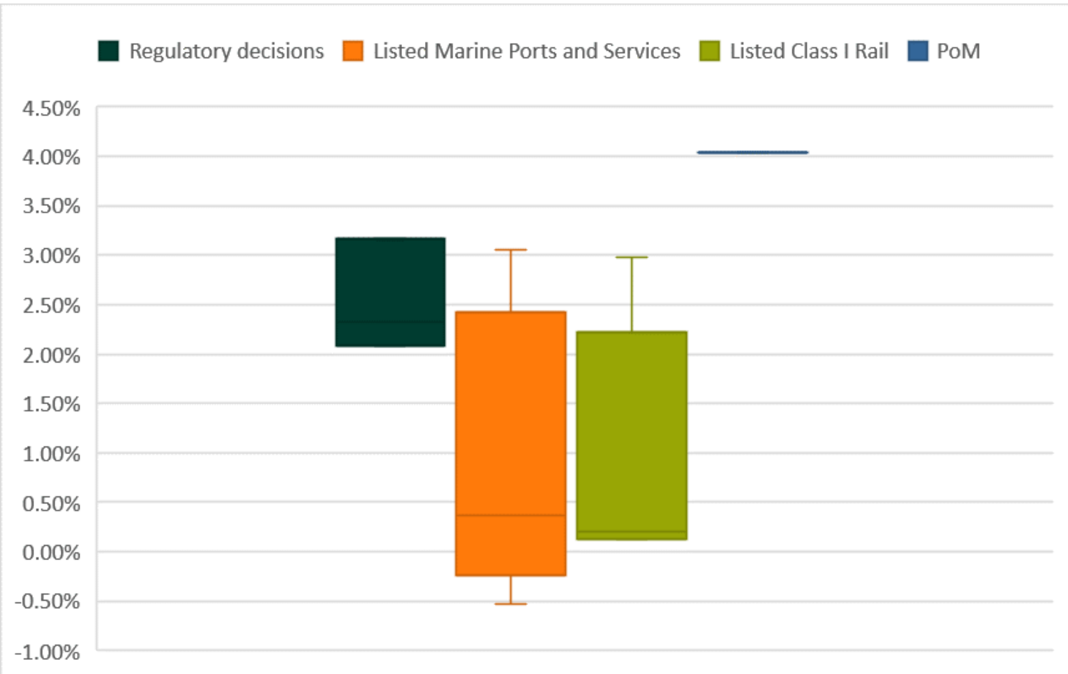
In the following subsection, we disaggregate the WACC margins into cost of equity and cost of debt margins, in an attempt to isolate the drivers of these differences.

11.4.4 Impact of cost of debt assumptions

Overall WACC comparisons of PoM with international non-regulated listed comparators are complicated by the low cost of debt assumptions that Bloomberg adopts for certain companies, including those in our comparator set. This occurs because Bloomberg applies a debt adjustment factor, which is a multiple of the risk-free rate. When the risk-free rate is very low (as it currently is both in Australia and internationally) this leads to relatively low (and, in our view, unrealistic) cost of debt estimates. As a result, a comparison of cost of equity margins is more informative.

Debt margins for regulatory decisions are relatively uncontroversial but depend on timing (risk free rate and debt margin) and whether or not the trailing average approach is adopted. On the other hand, the cost of debt margins Bloomberg applies to the listed comparators are considerably lower than that arising from the trailing average methodology that we have implemented for PoM. Debt margins for regulatory and listed comparators are shown in Figure 22. Median DRPs reported by Bloomberg across both sectors of listed comparators are less than 1% above the risk-free rate.

Figure 22 Debt risk premia (DRP)



Data source: Synergies calculations, various regulatory decisions, Bloomberg

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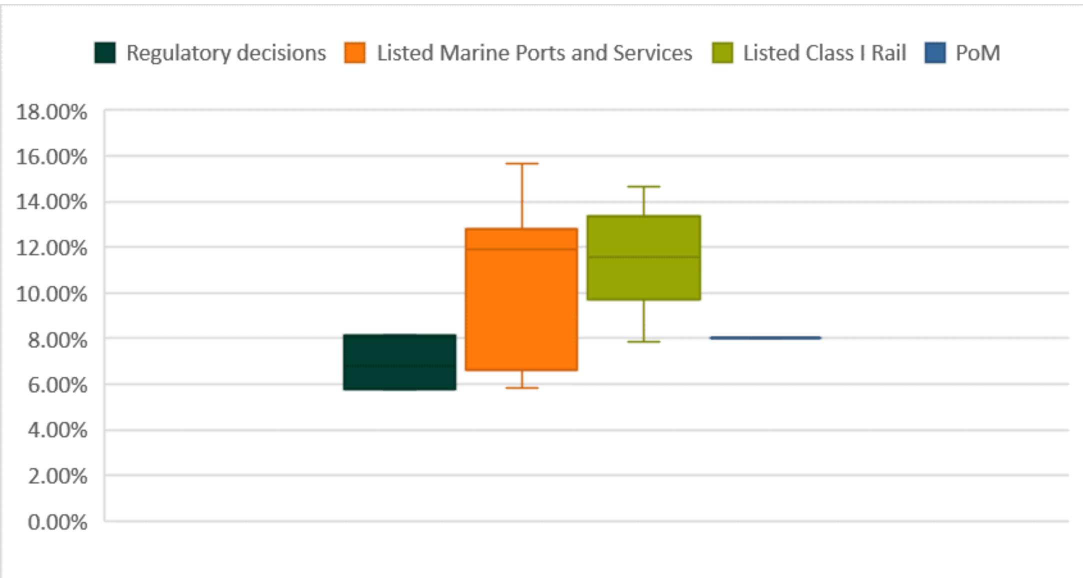
11.4.5 Adjusted pre-tax nominal WACC margins

Clearly, the Bloomberg-generated debt margins for listed comparators are unlikely to be commensurate with those required by the BEE in its provision of the Prescribed Services. Moreover, the debt margin for PoM is based on a trailing average which reduces comparability with a purely forward-looking assessment available from Bloomberg. As a result, to enhance comparability, we have re-calculated the WACC margins adopting the same cost of debt as that which we have applied for the BEE. For consistency, we have also adopted the BEE's trailing average cost of debt for the Australian regulatory decisions in this assessment.

Using these revised pre-tax nominal WACC margin estimates, shown in Figure 23, PoM's WACC margin is situated below the upper end of relevant Australian regulatory transport decisions. On the other hand, PoM's WACC margin is at the low end of the listed Class I Rail WACC margin range and within the interquartile range of listed Marine Ports and Services (denoted by the orange box).

Figure 23 Pre-tax WACC margins adjusted for the BEE's trailing average cost of debt



Data source: Synergies calculations, various regulatory decisions, Bloomberg

11.5 Conclusion

In undertaking these benchmarking comparisons, we note that a precise comparison of WACC decisions is elusive as the risk profile of each regulated entity in the transport sector differs materially. Moreover, when comparing regulatory decisions, regulators adopt different approaches to the estimation of the cost of capital – with different assumptions being made for WACC parameters and averaging intervals. There is inherent uncertainty surrounding the true value of key parameters, as evidenced by the range of assumed values for parameters such as the MRP and gamma.[353] Each parameter assumption exerts a significant influence on the regulator's determination of the cost of capital. It is possible regulators balance to some extent the exercise in regulatory discretion in making judgements (and trade-offs) on these parameters.

Moreover, regulated transport encompasses a diversity of entities and regulatory treatments, to the point where several transport entities, which are subject to revenue caps, are benchmarked for the purposes of their relevant BEE against energy networks.

Accordingly, we consider attempting a precise reconciliation of PoM's WACC with regulatory decisions is inviting false precision to the analysis and a more relevant insight in terms of PoM's compliance with the Pricing Order can be gained from undertaking a reconciliation on the basis of broad relativities and rankings. It also highlights the benefit of broadening the perspective of the comparison beyond regulatory decisions to include unregulated comparators for the purposes of this aspect of the ESC's assessment framework.

With these caveats in mind, our main findings highlight that our WACC estimate is consistent with the returns required by the BEE with a similar degree of risk as that which applies to PoM in the provision of the Prescribed Services:

- PoM's post-tax unlevered cost of equity margin estimate (which is the most informative basis for comparison given international differences in tax regimes) is within the range of comparable Australian regulatory transport decisions and is situated towards the lower end of cost of equity margins for Listed Marine Ports and Services and Class I railroads.
- PoM's pre-tax nominal WACC estimate is situated within the range of relevant Australian regulatory transport decisions. This is despite the fact that changes the ERA has made to its WACC parameters involved a substantial decrease in the MRP along with an increase in gamma. Together, these changes decreased the pre-tax nominal WACC for Pilbara railways by approximately 200 basis points relative to earlier decisions (even before taking lower risk-free rates into consideration). The ERA's decisions meant that the allowed rate of return for affected entities fell even further than the falls in the risk-free rate to recent low levels.
- PoM's pre-tax nominal WACC margin is towards the lower end of the WACC margin ranges for listed Class I railroads and Marine Ports and Services entities,

[353] Among Australian regulators, the current MRP range is 5.9%-7.4%, while the current gamma range is 0.25-0.585. Updating the risk-free rate methodologies of Australian regulators to 31 March 2020 results in a range for the risk-free rate of 0.90% to 2.00%.

especially when we take account of differences between cost of debt for these entities and that which we have applied for the BEE.

This chapter demonstrates that our proposed WACC estimate satisfies the requirements of the Pricing Order and is commensurate with the return on capital that would be required by a BEE providing services with a similar degree of risk as applicable to PoM in providing the Prescribed Services.

Additionally, Synergies' approach to the estimation of the WACC parameters for the current and previous TCS submissions continues to be in compliance with the guiding principles of this step, as we consider that these naturally form part of a robust WACC estimation process.

A Supplementary information on cost of equity methodologies

The purpose of this attachment is to provide additional detail on the well accepted cost of equity approaches discussed in Chapter 5.

A.1 Black CAPM

A.1.1 Application of Black CAPM by regulators

In its 2010 final decision relating to network regulation, Ofgem (UK Office of Gas and Electricity Markets) highlighted that although the return on equity will be computed using the CAPM approach, evidence from other models will also be considered.[354] Subsequently, Ofgem stated that the CAPM should be "sense-checked by other approaches and evidence."[355] This implies that other potential models (e.g. Black CAPM, FFM, DDM) can be used as cross-checks for the analysis of the return on equity.

The Public Service Commission of Maryland (PSCM 2016) considered the Black CAPM as well as a number of other financial models for its determination of return on equity. According to PSCM:[356]

> The ROE witnesses used various analyses to estimate the appropriate return on equity for BGE's electric and gas distribution operations, including the DCF model, the IRR/DCF, the traditional CAPM, the ECAPM (Black CAPM), and risk premium methodologies. Although the witnesses argued strongly over the correctness of their competing analyses, we are not willing to rule that there can be only one correct method for calculating an ROE. Neither will we eliminate any particular methodology as unworthy of basing a decision.

The Alberta Utilities Commission (2016) applied an equity risk premium (ERP) approach as its primary method. This approach considered several financial models employed by various experts that participated in its proceeding in order to establish a fair allowed return on equity. Financial models employed by experts were comprised of CAPM,

354 Ofgem (2010). RIIO: A new way to regulate energy networks, Final decision, October, p.40.

355 Ofgem (2013). Strategy decision for the RIIO-ED1 electricity distribution price control, Financial issues, Supplementary annex, 4 March.

356 Public Service Commission of Maryland (2016). *In the matter of the application of Baltimore gas and electric company for adjustments to its electric and gas base rates*, order no. 87591, case no. 9406, June, p.153.

Black CAPM, bond yield plus risk premium model, predictive risk premium model and DDM.[357]

Similarly, a rate of return was computed through a formula-based approach using the ERP method by the Ontario Energy Board (2009). Specifically, the OEB considered various financial models to determine the initial ERP model or cost of equity, i.e., CAPM, Black CAPM, bond yield plus risk premium model, predictive risk premium model and DDM.[358]

The Mississippi Public Service Commission (MPSC 2009) in the US has, in addition, included the Black CAPM as one of the models used for the return on equity determination.[359] The following regulatory decisions by the New York Public Service Commission provide further evidence to the use of the Black CAPM in US regulatory decisions:

- Public Case Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Consolidated Edison Company of New York, Inc. for Electric Service; Petition for Approval, Pursuant to Public Service Law, Section 113(2), of a Proposed Allocation of Certain Tax Refunds between Consolidated Edison Company of New York, Inc. and Ratepayers.[360]
- Public Case Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of National Fuel Gas Distribution Corporation for Gas Service.[361]
- Public Case Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Central Hudson Gas & Electric Corporation for Electric Service; Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Central Hudson Gas & Electric Corporation for Gas Service.[362]

An expert report to the AER in the process of AER's decision for ActewAGL's distribution determination 2015-16 to 2018-19 by Professor J. Robert Malko from Utah

[357] Alberta Utilities Commission (2016). 2016 generic cost of capital, Decision 20622-D01-2016, October.

[358] Ontario Energy Board (2009). Report of the board on the cost of capital for Ontario's regulated utilities, EB-2009-0084, December.

[359] Mississippi Public Service Commission (2009). Performance evaluation plan – Rate schedule "PEP-5A", Mississippi Power Company, Schedule No. 28.1, January.

[360] New York PUC 2009, LEXIS 507.

[361] New York PUC 2007, LEXIS 449; 262 PUR 4th 233.

[362] New York PUC 2006, LEXIS 227; 251 PUR 4th 20.

State University also highlighted that the Black CAPM had been presented and considered by many regulatory commissions in the US. This, for instance, included regulatory commissions in California, Colorado, Delaware, Kentucky, Maryland, Michigan, Minnesota, Mississippi, New York, South Dakota, Virginia, Washington and West Virginia.[363]

A.1.2 Academic literature on Black CAPM

The Black-CAPM proposes an equation similar to the SL CAPM, except that it attempts to address "low beta bias", the empirical observation that low beta stocks consistently outperform the SL-CAPM's estimate of required return, while high beta stocks underperform on the same metric. Black (1972) had developed a theoretical model that produces output that is more consistent with the empirical evidence than the SL-CAPM.[364]

Roll (1977) argued that the Black CAPM, like the SL CAPM, predicts that the market portfolio of all risky assets must be mean-variance efficient – it does not predict that the market portfolio of stocks must be mean-variance efficient.[365]

Stambaugh (1982)[366] estimated mean real return to the US market portfolio employing four different measures of the market portfolio.[367] The estimates are sensitive to the way the market proxy is constructed. Stambaugh found that the tests do not reject the hypotheses that the relation between expected return and systematic risk is linear and that the slope or 'risk premium' is positive, but the tests reject the equality of the intercept or 'zero-beta return' to a risk-free rate of interest. In other words, the tests rejected the SL CAPM and found no evidence against the Black CAPM.

There are a number of academic articles that have rejected the SL CAPM and have consistently found that the intercept is greater than the average risk-free rate (typically proxied as the return on a one-month Treasury bill), and the coefficient on beta is less than the average excess market return (proxied as the average return on a portfolio of

363 Malko, J.R. (2015). Statement of Dr. J. Robert Malko, June.

364 Black, Capital market equilibrium with restricted borrowing, Journal of Business 45(3), July 1972, pp. 452–454.

365 Roll, Richard, A critique of the asset pricing theory's tests: Part I, Journal of Financial Economics 4, 1977, pages 129-176

366 Stambaugh, R., On the exclusion of assets from tests of the two-parameter model: A sensitivity analysis, Journal of Financial Economics 10, 1982, pages 237-268

367 Market proxy no. 1 is a value-weighted portfolio of NYSE common stocks; market proxy no. 2 is no. 1 plus corporate bonds and government bonds and Treasury bills; market proxy no. 3 is no. 2 plus real estate, house furnishings and automobiles; market proxy no 4 is the same as no. 3 but with NYSE stocks given a 10 per cent weight.

U.S. common stocks minus the Treasury bill rate)—consistent with the Black CAPM model. These include Black, Jensen and Scholes (1972), Miller and Scholes (1972), Blume and Friend (1973), Fama and MacBeth (1973), and Fama and French (1992).[368]

A.1.3 ESC interim commentary on the Black CAPM

The ESC provided a number of observations on the Black CAPM and low beta bias in its interim commentary. Largely, these focus on the considerations of the AER. In this section, we summarise the issues the ESC has raised, and also supplement the discussion with developments from the AER's final Rate of Return Instrument. Section A.3 provides responses to the detailed issues raised by the ESC. We also address the key issues raised by the ESC.

As we have previously documented, the AER considered in its 2013 guidelines that the Black CAPM could be used to inform the equity beta. The AER stated in its December 2013 *Better regulation – Rate of return guideline* that:[369]

> 'We account for the Black CAPM because we recognize that there is merit to its theoretical basis, particularly when viewed alongside the standard Sharpe-Lintner CAPM.'

The AER cited the relaxed assumptions of the Black CAPM compared to the SL CAPM as reasons for consideration, but did caution that even these assumptions may not hold in practice. The AER noted that the Black CAPM can be used to inform the equity beta.[370] This was attributable to the SL CAPM understating and overstating the return on equity for low beta stocks and high beta stocks, respectively.

Accordingly, the AER chose an equity beta towards the upper end of the identified empirical range.

However, in the 2018 Rate of Return Guideline Review, the Independent Panel reviewing the AER's draft guidelines questioned this approach, arguing instead that the

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368 Black, F., Michael C. Jensen, and Myron Scholes. 1972. The Capital Asset Pricing Model: Some Empirical Tests, from Studies in the theory of Capital Markets. In Studies in the Theory of Capital Markets, edited by Michael C. Jensen, 79-121. New York: Praeger; Miller, Merton and Myron Scholes. 1972. "Rates of Return in Relation to Risk: A Reexamination of Some Recent Findings," in Studies in the Theory of Capital Markets. Michael C. Jensen, ed. New York: Praeger, pp. 47–78; Blume, Marshall and Irwin Friend. 1973. "A New Look at the Capital Asset Pricing Model." Journal of Finance. 28:1, pp. 19–33; Fama, Eugene F. and James D. MacBeth. 1973. Risk, Returns and Equilibrium: Empirical Tests. Journal of Political Economy 81 (3): 607-636; and Fama, Eugene F. and Kenneth R. French. 1992. The Cross-Section of Expected Stock Returns. Journal of Finance 47 (June): 427-465.

369 AER (2013b). Better regulation – Explanatory statement – Rate of return guideline, December, p.85.

370 AER (2013b), p.58.

Black CAPM and low beta bias are unrelated to the estimation of beta and recommended against applying any arbitrary adjustment in an attempt to rectify the bias.[371]

In comments referenced by the ESC, the AER now states that its consideration of the Black CAPM was not related to low-beta bias, but was instead intended to "capture possible market imperfections that may lead actual returns to differ from expected returns." Irrespective of the AER's justification for considering (or not considering) the principles of the Black CAPM, the ultimate outcome of its use (abandonment) is that it flattens (steepens) the security market line to be more (less) in keeping with long-term and persistent empirical reality. The AER abandoned the Black CAPM without ever addressing what these "possible market imperfections" may include. A number of stakeholders in the AER review process have been concerned that the regulator has reached an entirely different conclusion on much the same evidence base as was available at the time of the previous guideline review.[372] The Black CAPM was deemed suitable for consideration under the AER's assessment framework in 2013.

The AER appears to have considered only three papers that have been published since it released the 2013 guidelines. In its critique of issues with low beta bias and ex post empirical tests of the SL CAPM, the AER relies on Frazzini and Pedersen (2014) to support the argument that low beta bias arises due to the over-pricing of high beta stocks.[373] Frazzini and Pedersen (2014) examine the impact of funding constraints (such as an inability to borrow) on asset pricing models using a betting against beta (BAB) factor. A BAB factor is a portfolio that holds low-beta assets (i.e. a long position), while shorting high-beta assets. The rationale behind this is that investors without access to leverage will overweight high-beta assets rather than levering up low-beta assets, leading high-beta assets to offer lower returns. Frazzini and Pedersen (2014) conclude their paper by stating that:[374]

> The security market line is not only flatter than predicted by the standard CAPM for US equities (as reported by Black, Jensen, and Scholes (1972)), but we also find this relative flatness in 18 of 19 international equity markets, in Treasury markets, for corporate bonds sorted by maturity and by rating, and in futures markets.

371 Independent Panel (2018). Review of the Australian Energy Regulator's rate of return draft guidelines, 7 September.

372 See, for example, Energy Networks Australia (ENA), AER review of the rate of return guideline response to draft guideline, 25 September 2018, p. 96; Evoenergy. Review of rate of return guideline-draft decision, 25 September 2018, p. 3; AusNet Services, Submission on the AER's draft rate of return guideline, 24 September 2018, p. 2

373 Frazzini, A & Pedersen, L.H. (2014). Betting against beta. Journal of Financial Economics, 111, pp.1-25.

374 Frazzini & Pedersen (2014), p.20.

This appears to be wholly consistent with at least partial reliance on the Black CAPM to accurately estimate the return on equity. Baker et al. (2011) also appears to be a new paper for the Rate of Return Instrument not cited previously, which the AER also uses to substantiate the idea that investors overprice high-beta stocks.[375] The central hypothesis of the paper is that high beta stocks underperform low beta stocks in part due to institutional investors' mandates to beat fixed benchmarks, which discourage arbitrage activity:[376]

> The combination of irrational investor demand for high volatility and delegated investment management with fixed benchmarks and no leverage flattens the relationship between risk and return.

However, in the paper, the authors also go on to stress that:[377]

> If our explanation is valid, this thesis will be the case so long as fixed-benchmark contracts remain pervasive and the share of the market held by investment managers remains high. There is no reason to expect that the anomaly will go away any time soon.

This statement seems to be at odds with claims by some regulators, including the AER (and cited by the ESC), that it is not clear that low beta bias necessarily exists on an ex ante basis, nor whether this is accounted for by investors. The academic research above clearly shows that the case for the persistence of low-beta bias is bolstered by its theoretical underpinnings. As we have presented in previous submissions, a significant weakness in the SL CAPM arises because of the assumption that all investors can borrow and lend at the risk free rate. As long as this assumption fails to hold in practice, it can only be expected that the empirical reality will continue to depart from the pattern predicted by the SL CAPM, and can therefore not be considered a transitory anomaly.

Finally, the AER also cites "The low beta anomaly", an October 2014 presentation by Ed Fishwick, which is in part based on Muijsson, Fishwick and Satchell (2014), also cited by the AER.[378] This evidence is relied upon by the AER to support the hypothesis that observations of low-beta bias are attributable to interest rate movements. Specifically, low-beta assets outperform when interest rates fall, but underperform when interest rates rise. It is not clear to what extent this phenomenon is captured by the SL CAPM.

375 Baker, M., Bradley, B. & Wurgler, J. (2011). Benchmarks as limits to arbitrage: Understanding the low-volatility anomaly. Financial Analysts Journal, 67(1), pp.40-54.

376 Baker et al. (2011), p.49.

377 Baker et al. (2011), p.49.

378 Muijsson, C., Fishwick, E. & Satchell, S. (2014) Taking the art out of smart beta. Sydney University discussion paper.

Given the persistently low interest rates that continue to prevail at present (and which may do so for some time yet), this would seem to remain a relevant consideration for adjusting the output of the SL CAPM.

Reference was also made by the ESC to the Vasicek adjustment, which weights equity betas from a comparator set according to the precision of their standard errors.[379] As the ESC acknowledges in its interim commentary, the Vasicek adjustment is used by IPART to partly correct for the downward bias of the CAPM. However, just as the AER argues that its consideration of the CAPM is not related to low beta bias, IPART also makes clear that "the Vasicek adjustment is not explicitly designed to address the downward bias of the SL-CAPM," even though it can partly compensate for this bias in practice.[380] This is significant because it suggests that regulators are utilising methodologies and/or approaches for reasons different from their originally intended purpose.

In July 2018, the Australian Competition Tribunal found that the ERA did not commit a reviewable error by opting not to make adjustments for low beta bias in its determination for the Dampier to Bunbury Natural Gas Pipeline (DBNGP).[381] DBNGP sought for the ERA to adjust for low-beta bias through either a quantitative adjustment that better related actual/historical returns to the SL CAPM, or a qualitative adjustment (by selecting a beta at the top of the defined range, as the AER had done previously). The Tribunal considered that the exercise by the ERA of regulatory judgment (or discretion) was correct, having regard to all of the circumstances, nor was it unreasonable, such that:

> In the end, the issue before us was very narrow indeed. It was confined to the question of whether some adjustment to the output or alternatively to the alpha intercept should be made in order to reflect some alleged low beta bias.
>
> We are of the opinion that, in adopting the approach which it did, the ERA did not commit reviewable error."[382]

While we accept that qualitative adjustments may be difficult to substantiate, we continue to consider that the Black CAPM can be credibly implemented to rectify some (but not all) of the shortcomings of the SL CAPM. Moreover, ignoring alternative approaches to the SL CAPM that partially or wholly overcome this identified concern of the SL CAPM appears contrary to a statutory objective which requires identification of

379 Vasicek, O.A. (1973). A note on using cross-sectional information in Bayesian estimation of security betas. The Journal of Finance, 28(5), pp.1233-1239.

380 IPART (2018). Review of our WACC method, February, p.96.

381 Australian Competition Tribunal, Application by DBNGP (WA) Transmission Pty Ltd [2018] ACompT1, July 2018.

382 ACompT [2018], paras. 289-290.

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the return necessary to compensate a provider of Prescribed Services for the risks involved in providing Prescribed Services.

The ESC also makes reference to a January 2011 expert report to the AER by Professor Kevin Davis, which dates back to before the previous 2013 Rate of Return Guidelines. Although this particular report is referenced only once in the Explanatory Statement for the Rate of Return Instrument (and was not mentioned by the AER in the draft rate of return guidelines at all), Professor Davis nevertheless raises important points that we now address.[383]

Professor Davis concluded in 2011 that the theoretical assumptions of the SL CAPM do not necessarily lead to downwardly biased estimates of the rate of return for low-beta firms, and the empirical evidence does not clearly demonstrate low-beta bias. One of Professor Davis's observations is that even if investors are unable to borrow and lend at the risk-free rate, actual rates may not differ sufficiently to distort the SL CAPM. In our view, even if Professor Davis is correct that some institutional investors may be able borrow at rates close to the risk-free rate (noting that debt margins vary over time), the challenge remains that subsequent academic literature, such as that cited above, has continued to identify funding constraints as a material source of bias in the SL CAPM.[384]

The ESC then goes on to cite comments from Professor Davis that the use of the Black CAPM to address low-beta bias has limited empirical significance and does not resolve the problems of the SL CAPM. In a follow-up report in May 2011, Professor Davis adds the following:[385]

> While the data … may reject the static Sharpe CAPM, this does not imply that the alternative of the static Black CAPM would not also be rejected. Both may be inconsistent with the data, because some third model is appropriate, or due to specific assumptions adopted in estimating the relationship.

Professor Davis appears to be highlighting the merit of averaging a combination of well-accepted approaches as permitted by the Pricing Order. We accept that reliance on the Black CAPM, does not, on its own, resolve all of the problems of the SL CAPM. This is because the Black CAPM still ignores factors other than the market return that can influence the return of a stock.

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383 The 2011 Davis reports were relied upon by a number of consumer groups in their submission to the review process.

384 Funding constraints could comprise both the ability to borrow/lend at the risk-free rate, as well as the quantity of funds that can be borrowed/lent even if borrowing/lending at the risk-free rate is possible for some market participants.

385 Davis, K. (2011). Cost of equity issues: A report for the AER, 16 January, p.9.

A.1.4 SFG Consulting's estimate of the zero-beta premium

SFG quantifies the relationship between realised portfolio returns, market returns and beta, ultimately arriving at an estimate of the zero-beta premium.[386]

Its first step is to form portfolios. Rather than analyse returns on individual stocks, it analyses returns on portfolios of stocks to minimise the "noise" in historical stock returns.

Its second step is to perform a regression of portfolio returns every four weeks on two independent variables – beta × market returns and (1 – beta). SFG demonstrates that the coefficient on the second independent variable (1 – beta) is an estimate of the zero-beta return. To estimate the zero-beta premium, SFG subtracts the average four-weekly risk-free rate over the sample period, measured as the yield to maturity on 10-year government bonds.

Using this two-step process, SFG's estimated return on the zero-beta asset lies between the normal estimate of the risk-free rate of interest and the average market return. The zero-beta premium (the difference between the zero-beta return and the estimate of the risk-free rate) is estimated at 0.239% over four weeks or 3.34% per year.[387]

A.1.5 Synergies's updated estimate of the zero-beta premium

The ESC made a number of observations about our reliance on the SFG zero beta premium estimate. This year, we have generated an updated zero beta premium estimate, using data from 1993 to 2019. Our revised zero beta premium estimate is 4.56%, which is an increase from last year's estimate of 3.36%.[388] With a t-statistic of 0.87, the estimate remains statistically insignificant. The zero beta premium is the premium earned by a zero-beta portfolio in excess of the risk-free rate. As such, low risk-free rates could be responsible for the increase in this parameter.

[386] SFG Consulting (2014a).

[387] SFG Consulting (2014a), p.27.

[388] The monthly estimate is 0.38%, which corresponds to an annual estimate of 4.56%.

A.2 Fama-French Model (FFM)

A.2.1 Application of FFM in academia

There is an extensive literature that has built up surrounding the performance of the Fama-French model, along with the empirical existence of size and value premiums. The following is an overview with particular reference to Australian experience.

By the 1980s, empirical evidence was mounting that variations in expected returns were, to a significant extent, unrelated to market betas (well before the Fama French model emerged). Fama and French (2004)[389] identify Banz (1981) as one of the first papers to uncover a size effect, namely that average returns on smaller cap stocks were higher than those predicted by the CAPM.[390] Meanwhile, Stattman (1980)[391] and Rosenberg, Reid and Lanstein (1985) observed that stocks with high book-to-market equity ratios experienced returns not captured by their betas associated with market returns.[392] This was the turning point where research pursued other determinants of market returns, eventually leading to the seminal Fama and French (1993) paper.

There is extensive empirical evidence in support of the Fama and French factors. Davis, Fama and French (2000) show that the value premium, the positive relationship between average returns and book-to-market value of equity, is robust across time.[393] The estimated US premium between 1929 and 1963 (0.50 per cent per month) is almost identical to the premium between 1963 and 1997 (0.45 per cent per month). The size effect was found to be smaller (0.20 per cent per month) across their entire sample period.

In the Australian context, Gaunt (2004) demonstrates that the three-factor model offers a better explanation of observed Australian stock returns than the conventional SL CAPM.[394] He employed a longer dataset than earlier Australian contributions that returned mixed findings based on shorter, deficient data. However, in contrast to US findings, the main contributor to explanatory power was the size factor.

389 Fama, E.F and French, K.R. (2004).

390 Banz, R.W. (1981). The relationship between return and market value of common stocks. Journal of Financial Economics, 9(1), pp.3-18.

391 Stattman, D. (1980). Book values and stock returns. The Chicago MBA: A Journal of Selected Papers, 4, pp.25-45.

392 Rosenberg, R., Reid, K. and Lanstein, R. (1985). Persuasive evidence of market inefficiency. Journal of Portfolio Management, 3(11), pp.9-17.

393 Davis, J.L., Fama, E.F. and French, K.R. (2000). Characteristics, covariances and average returns. Journal of Finance, 55(1), pp.389-406.

394 Gaunt, C. (2004). Size and book to market effects and the Fama-French three factor asset pricing model: evidence from the Australian stockmarket. Accounting and Finance, 44(1), pp.27-44.

Gharghori, Lee and Veeraraghavan (2009) use Australian data from 1992-2005 and find evidence of both size effects and book to market ratio effects. They note that the observed R-square values are lower than those observed in the original Fama and French (1993) results for the US, but nevertheless provide important explanatory power.[395] This finding built on earlier work by Gharghori, Chan and Faff (2007) which found that Fama-French factors were capturing some form of priced risk.[396]

O'Brien, Brailsford and Gaunt (2010) consider information on 98% of all listed companies between 1981 and 2005, the most comprehensive dataset employed in the Australian literature.[397] The results also present evidence of size and book-to-market ratio effects, indicating that the FFM provides increased explanatory power relative to the CAPM.

Brailsford, Gaunt and O'Brien (2012) also find evidence of a value premium in Australia, but uncover less substantive evidence of a size premium.[398] Key to their investigation is the portfolio formation technique used in the analysis. Many previous studies simply sorted stocks into arbitrary categories with an equal number of stocks. To address this, the authors formed portfolios that better represent realistic investment sets. The impact of book to market ratios is found to be systematic across all size categories. This lends support to the use of the FFM, as it shows that the findings are robust to different dataset assumptions. Abhakorn, Smith and Wickens (2013) find that the value factor, though not the size factor, helps to determine equity returns.[399]

Chiah et al. (2016) and Huynh (2017) employ the most recent datasets.[400] [401] It should be noted that these two papers employ the five-factor model, which adds terms for profitability and level of investment premiums. However, Huynh (2017) in particular observes that the five-factor model offers only marginal improvements on top of the three-factor model. Importantly, the book-to-market factor (HML) or value premium

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395 Gharghori, P., Lee, R. and Veeraraghavan, M. (2009). Anomalies and stock returns: Australian evidence. Accounting and Finance, 49, pp.555-576.

396 Gharghori, P., Chan, H. and Faff, R. (2007). Are the Fama-French Factors proxying default risk? Australian Journal of Management, 32, pp.223-249.

397 O'Brien, M., Brailsford, T. and Gaunt, C. (2010). Interaction of size, book-to-market and momentum effects in Australia. Accounting and Finance, 49(1), pp.197-219.

398 Brailsford, T., Gaunt, C. and O'Brien, M (2012). The investment value of the value premium. Pacific-Basin Finance Journal, 20(3), pp.416-437.

399 Abhakorn, P., Smith, P. and Wickens, M. (2013). What do the Fama-French factors add to CCAPM? Australian National University, Centre for Applied Macroeconomic Analysis, Working Paper 23/2013.

400 Chiah, M., Chai, D., Zhong, A. and Li, S. (2016). A better model? An empirical investigation of the Fama-French Five-factor model in Australia. International Review of Finance, 16(4), pp.595-638.

401 Huynh, T.D. (2017). Explaining anomalies in Australia with a five-factor asset pricing model. International Review of Finance.

retains its explanatory power in both studies, even with the inclusion of the profitability and investment factors.

Chiah et al. (2016) also find that the SMB factor is not statistically significant. That being said, they do not conclude that the size factor is completely redundant; rather, the factor does still appear to bolster the model's capacity to explain empirical returns. This finding is not inconsistent with the results that we have generated for PoM, in which the size premium contributes substantially less to the return on equity relative to the value premium.

To verify the international applications of the FFM, Fama and French (2006) examine value premiums in 14 international markets (Australia, Belgium, Canada, France, Germany, Great Britain, Hong Kong, Italy, Japan, the Netherlands, Singapore, Spain, Sweden and Switzerland) between 1975 and 2004. International returns are found to exhibit statistically and economically significant value premiums.[402] Furthermore, the magnitudes of the effects are as substantial for the biggest stocks as they are for smaller stocks. Malin and Veeraraghavan (2004) confirmed the presence of a size effect in France, Germany and the United Kingdom, although they found no evidence of a value effect in these markets.[403]

Country-specific studies also provide backing for the use of the FFM. Nwani (2015) presented findings for 100 stocks in the United Kingdom, using monthly data from January 1996 to December 2013.[404] He detected evidence of a value effect across small and large cap stocks, suggesting that book to market ratios are an important determinant of returns. Daniel, Titman and Wei (2001) study Japanese stock returns between 1975 and 1997. They find that the observed value premium in average stock returns was even stronger in Japan than in the United States.[405] Rossi (2012) investigates the influence of factors for the Italian Stock Exchange between 1989 and 2004 and confirms the presence of a size effect.[406]

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402 Fama, E.F. and French, K.R. (2006). The value premium and the CAPM. The Journal of Finance, 61, pp.2163-2185.

403 Malin M. and Veeraraghavan M. (2004). On the Robustness of the Fama and French Multifactor Model: Evidence from France, Germany, and the United Kingdom. International Journal of Business and Economics, 3(2), pp.155-176.

404 Nwani, C. (2015). An empirical investigation of the Fama-French-Carhart Multifactor Model: UK Evidence. Journal of Economics and Finance, 66(1), pp.95-103.

405 Daniel, K., Titman, S. and Wei, K.C.J. (2001). Explaining the cross-section of stock returns in Japan: Factors or characteristics. The Journal of Finance, 56(2), pp.743-766.

406 Rossi, F. (2012). The three-factor model: evidence from the Italian stock market. Research Journal of Finance and Accounting, 3(9), pp.151-160.

Mishra and O'Brien (2019) developed an ex ante variant of the three-factor FFM based on an implied cost of equity approach.[407] They found that the ex ante FFM provides a better explanation of the dispersion of the implied cost of equity observations than the CAPM. Furthermore, the average absolute difference between the CAPM and FFM estimates was substantial (199 basis points). With respect to our task in estimating the return on equity for PoM, the insights from this paper demonstrate that the FFM has ample validity when determining a forward-looking return on equity allowance.

SFG Consulting reviewed leading finance journals to gauge acceptance of the FFM among finance academics.[408] They found FFM is routinely applied to estimate required returns in articles published in the Journal of Finance and the Journal of Financial Economics which, it was noted, have both received the highest possible ratings for journals from both the Australian Council of Deans and the Australian Research Council. SFG Consulting argued that "the use of the Fama-French factors, for the purpose of estimating the required return on equity, is so widespread in the academic literature, its use as a measure of normal returns has become a matter of course."[409]

A.2.2 Application of FFM in regulatory practice

We have identified several examples of regulators applying or considering the results of the FFM. The FFM has been recognised as an appropriate model by several eminent economic experts (for example, Professor Stewart Myers and Professor Julian Franks) engaged by the New Zealand Commerce Commission (NZCC).[410] Moreover, in its 2009 report concerning the estimation of the cost of capital, the NZCC stated that:[411]

> Where appropriate (e.g., where reliable data are available and where the models seem amendable to particular industries), the Commission may use evidence based on the Fama-French and DCF (or DDM) models as cross-checks on the CAPM.

[407] Mishra, D.R. & O'Brien, T.J. (2019). Fama-French, CAPM, and implied cost of equity. Journal of Economics and Business, 101, pp.73-85.

[408] SFG Consulting (2014d). The Fama-French model, 13 May, p.19.

[409] SFG Consulting (2014d), p.20.

[410] Franks, J., Lally, M. and Myers, S. (2008). Recommendations to the New Zealand Commerce Commission on an appropriate cost of capital methodology, 18 December.

[411] New Zealand Commerce Commission (2009). Revised draft guidelines – the Commerce Commission's approach to estimating the cost of capital, 19 June, p.21.

In Australia, IPART has expressed a willingness to consider implementation of the FFM in the future. In the February 2018 final report of its WACC methodology review, IPART stated that:[412]

> We intend to monitor the FFM over the next five years to examine how it would perform if we adopted it instead of the SL CAPM in our WACC method.

IPART acknowledged the reasoning that the increased explanatory power of the FFM (relative to the SL CAPM) outweighed any theoretical concerns or costs of implementation, stating that:[413]

> In our view, this argument is sufficient to warrant estimation and comparison of FFM estimates, but is not sufficient reason to replace the SL CAPM as our model at this stage.

These remarks from an Australian economic regulator lend credence to the implementation of a multi-model cost of equity approach. Consistent with IPART's position, PoM does not propose to remove the SL CAPM from consideration entirely; rather, the SL CAPM should be considered in conjunction with other well accepted models when determining the appropriate cost of equity for the BEE.

There is also regulatory precedent for the use of the FFM in the UK. In 2005, the then Competition Commission (CC) employed the FFM in a liquefied petroleum gas (LPG) inquiry.[414] The CC was tasked with estimating the appropriate cost of capital for a pure-play LPG supplier. The CC deemed that there was only one relevant listed UK comparator, and sought to determine whether any size premium was warranted. In this particular application of the methodology, neither the size nor value premium was found to be statistically significant. However, this in no way detracts from this example of the FFM being adopted in a regulatory setting. Regardless of whether the Fama-French factors for this specific firm were significant or not, what is clear is that the economic regulator applied and had regard to the FFM as part of its assessment.

The FFM has been used in several regulatory processes throughout the United States. For example, according to Ronald L. Knecht, the Nevada State Controller:[415]

> [W]hile there is still some apprehension about the use of the FF3F [Fama-French Three Factor] Model it has been recognised in at least three states, Massachusetts, Delaware

412 IPART (2018a), p.98.

413 IPART (2018a), p.98.

414 UK Competition Commission (2005). Market investigation into supply of bulk liquefied petroleum gas for domestic use: Provisional findings report, August, Appendix K, p.7.

415 Knecht, L. R. (2015). Statement, 19 June, para. 4.6, p.3.

and Nevada, when used in conjunction with other models to produce an arithmetic mean as an estimate. This approach ensures that factors that are ignored by one model are adequately addressed. Because the FF3F model is fairly new relative to other models I am not aware of any jurisdiction that has endorsed it exclusively or adopted allowed rates of return based expressly on it. Instead, the tradition in the United States is for regulatory decisions to review (or even just list) all the evidence in the record and then, subjectively balancing the merits and results of all of it, to arrive at a final conclusion as either a range of reasonableness or a point estimate.

As a former and thereby well-experienced energy regulator, Mr Knecht has employed the FFM in several state regulatory proceedings. These include:

- A 2006 hearing conducted by the Public Utilities Commission of Nevada, where the commission accepted his evidence.[416]
- A 2014 expert evidence held before the California Public Utilities Commission, where the commission acknowledged that the FFM had "gained great currency in investment practice."[417]

Furthermore, Mr Paul R. Moul, as an expert witness before the Massachusetts Department of Telecommunication, noted the FFM as a useful approach for investigating the association between stock returns and firm size.[418] Mr Paul Hunt as an expert witness before the California Public Utilities Commission presented results using both the CAPM and FFM.[419] Artesian Water Company before the Delaware Public Service Commission highlighted findings from the FFM that was accepted by the Commission without reservation.[420] In 2007, before the California Public Utilities

[416] Application of Sierra Pacific Power Company for the authority to increase its annual revenue requirement for general rates charged to all classes of electric customers and for relief properly related thereto; Application of Sierra Pacific Power Company for approval of new and revised depreciation rates for electric operations based on its 2005 deprecation study, 2005 Nev. PUC LEXIS 91.

[417] Application of Southern California Edison Company (U338E) for authority to establish its authorised cost of capital for utility operations for 2013 and to reset the annual cost of capital adjustment mechanism 2014 Cal. PUC LEXIS 633.

[418] Moul, R. P. (2005). Direct testimony of Paul. R. Moul, Managing Consultant, P. Moul & Associates, Concerning cost of equity, Commonwealth of Massachusetts Department of Telecommunications and Energy, p.50.

[419] Application of Pacific Gas and Electric Company for Authority to Establish Its Authorized Rate of Return on Common Equity for Electric Utility Generation and Distribution Operations and Gas Distribution for Test Year 2006. (U 39-M); Application of Southern California Edison Company (U 338-E) for Authorized Capital Structure, Rate of Return on Common Equity, Embedded Cost of Debt and Preferred Stock, and Overall Rate of Return for Utility Operations for 2006; Application of San Diego Gas & Electric Company (U 902-M) for Authority to: (i) Increase its Authorized Return on Common Equity, (ii) Adjust its Authorized Capital Structure, (iii) Adjust its Authorized Embedded Costs of Debt and Preferred Stock, (iv) Increase its Overall Rate of Return, and (v) Revise its Electric Distribution and Gas Rates Accordingly, and for Related Substantive and Procedural Relief 2005 Cal. PUC LEXIS 537; 245 P.U.R.4th 442.

[420] In the matter of the application of Artesian Water Company, Inc., for an increase in water rates 2003 Del. PSC LEXIS 51 at [8]-[11]

Commission, Mr Gary Hayes (an expert from San Diego Gas and Electric) also provided expert testimony using the FFM.[421]

The Public Utility Commission of Nevada in the state of Nevada has recognised the use of the FFM in calculating the return on capital estimates. See, for example, the Decisions in Docket No. 05-10003 and Docket No. 05-10004.[422] In 2006, Mr Knecht acted as a representative on behalf of the Nevada Public Utilities Commission and used the average of a combination of models, comprised of two dividend discount model (DDM) estimates, average of 2 CAPM/FFM and one risk premium estimate, for the calculation of the return on equity.[423] Mr Knecht, once again, acted as a representative on behalf of the Nevada Public Utilities Commission in 2007, where he examined the return on equity using the FFM.[424]

Sarmentero and Hull (2017) examine FERC's policy regarding return on equity determinations.[425] They identify Opinion No. 551, issued in September 2016 in regard to the Midcontinent Independent System Operator, as having significant implications for FERC's methodological approach.[426] They write that:[427]

> The CAPM analysis that Opinion No. 551 relied upon used an upward adjustment based on the rationale that differences in investors' required rates of return that are related to firm size are not fully captured by beta.

In the opinion, FERC reinforced its position from an earlier 2015 opinion that "this type of size adjustment is a generally accepted approach to CAPM analyses."[428] FERC then goes on to explain that the purpose of such an adjustment is to render the CAPM analysis useful in estimating the cost of equity for companies that are smaller than the companies that are typically used to determine the MRP in the CAPM analysis.

421 Testimony of Gary G. Hayes on behalf of San Diego Gas and Electric before the California Public Utilities Commission 2007, p.19.

422 Decisions in Docket No. 05-10003 and Docket No. 05-10004, April 26, 2006, 2006 Nev. PUC LEXIS 91.

423 Application of Sierra Pacific Power Company, 2006 Nev. PUC LEXIS 91 at [63]

424 Application of Nevada Power Company 2007 WL 2171450 (Nev. P.U.C) at [102]; and Application of Sierra Pacific Power Company, 2006 Nev. PUC LEXIS 91 at [63].

425 Sarmentero Garzon, A.I. & Hull, G.F. (2017). Developments in FERC policy for determining return on equity. Energy Law Journal, 38, pp.375-412.

426 Opinion No. 551, Association of Businesses Advocating Tariff Equity v. Midcontinent Independent System Operator, Inc., 156 FERC ¶ 61,234 (2016), rehearing pending.

427 Sarmentero Garzon, A.I. & Hull, G.F. (2017), p.396.

428 Opinion No. 531-B, Martha Coakley v. Bangor Hydro-Electric Co., 150 FERC ¶ 61,165 (2015), order on rehearing.

Opinion No. 551 is subject to a rehearing of the case, but it does indicate that regulators are increasingly having regard to the merits of additional premiums that augment the CAPM, bringing them more into line with the conventions of financial practitioners.

A.2.3 Application of FFM by financial practitioners

A measure of implicit acceptance of the FFM in finance industry practice is indicated by the fact that it is routine for industry practitioners to make additional risk adjustments in estimating the SL CAPM, as documented at the beginning of this chapter. Independent experts consistently estimate the cost of equity to be several percentage points higher than the estimate derived from a simple application of the SL CAPM alone. The point to emphasise here is that it is plainly common practice among finance practitioners to estimate discount rates based on risk factors in addition to systematic risk.

In this regard, the survey-based research by Graham and Harvey (2001) and Brounen, de Jong and Koedijk (2004) identified that significant minorities of investors adjusted their expectations based on additional risk factors including business size and market to book ratio.[429] Of the more advanced CAPM alternatives in which additional risk factors are included they found that these techniques were used mostly by large companies. In the case of Bancel and Mittoo (2014), the most recent survey, 66% of respondents consider firm size as a risk factor, while more than 45% have regard to price-book ratios (another term for market-to-book ratios) in their valuations.[430]

The Ibbotson Stocks, Bonds, Bills, and Inflation Yearbook is an industry data reference for advisors, planners, and brokers seeking to analyse asset class performance and determine the cost of capital in the US. It provides historical return figures such as equity risk premiums and includes a chapter for each of the FFM factors – quantifying the size and value premiums appropriate to specific settings.[431]

A.2.4 Acceptance in other spheres

When it awarded the 2013 Nobel Prize in Economics to Eugene Fama, the Economic Sciences Prize Committee said that Fama's extension of the CAPM "greatly improves

[429] Brounen, D., de Jong, A. and Koedijk, C.G. (2004). Note that Brounen et al. collated and included summaries of the data from Graham and Harvey (2001) in their 2004 paper.

[430] Bancel, F. & Mittoo, U.R. (2014). The gap between the theory and practice of corporate valuation: Survey of European experts. Journal of Applied Corporate Finance, 26(4), pp.106-117.

[431] See Wiley Publishing (2017). Available from: http://au.wiley.com/WileyCDA/WileyTitle/productCd-1119316405.html.

the explanatory power relative to the single-factor CAPM model."[432] The Committee considered asset pricing to be "one of the fields in economics where academic research has had the most impact on non-academic practice."[433] It went on to say that "many professional investors use factor models such as the Fama-French model to guide their portfolio decisions"[434] and that "it has become standard to evaluate [investment] performance relative to 'size' and 'value' benchmarks, rather than simply controlling for overall market returns."[435]

The FFM is taught as part of many finance qualifications, including the Chartered Financial Analyst (CFA) certification. As this is the leading professional finance qualification in both Australia and the US, it is noteworthy that course participants are required to be able to both explain and demonstrate the use of both the SL CAPM and the FFM.

A.2.5 ESC interim commentary on the Fama-French model

The ESC raised a number of issues with the FFM in its interim commentary. At a high level, these concerns can be grouped under the following categories:

- Consideration of the FFM by other Australian regulators
- Theoretical underpinnings for the FFM
- Use of the FFM by financial practitioners
- Data limitations and other technical issues

Section A.3 provides responses to the detailed issues raised by the ESC. In this section, we address the key issues raised by the ESC.

Consideration of the FFM by other Australian regulators

In the interim commentary, the ESC made reference to conclusions other Australian regulators have drawn on the FFM. The ESC made clear that no Australian regulator has moved away from the SL CAPM in favour of the FFM or any other return on equity model. On this point, we are largely in agreement with the ESC, noting that IPART has recognised the FFM as a model to which it could potentially have regard in the future.

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432 Economic Sciences Prize Committee (2013). Scientific Background on the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2013: Understanding Asset Prices, p.3.

433 Economic Sciences Price Committee (2013), p.42.

434 Economic Sciences Price Committee (2013), p.43.

435 Economic Sciences Price Committee (2013), p.44.

However, at no stage have we suggested abandoning the SL CAPM. Rather, we are of the view that the SL CAPM, whilst well accepted, could tend to understate the return necessary to commensurate PoM for the risks involved in providing Prescribed Services if relied upon exclusively, and thereby not achieve the regulatory objectives. This is in recognition of the evidence that suggests that the SL CAPM is an underspecified model (i.e. it omits crucial size and value factors) that can understate the returns necessary to promote efficient investment.

The ESC considered that we had not provided sufficient discussion of how the FFM has been considered by other regulators. We have addressed several of these issues previously (e.g. empirical reliability, portfolio formation, consensus on how to apply the FFM) and where appropriate reiterate and elaborate upon our response here. Where the ESC has cited specific points raised by regulators previously, we have responded to these in Section A.3.

The ESC also questioned the extent to which IPART's recent endorsement of the FFM for possible future use lends credence to our multi-model return on equity approach. We accept that IPART's stance on the FFM is not yet an example of an Australian regulator actually applying the Fama-French model to calculate a WACC. Nevertheless, IPART's preparedness to consider the FFM at a future methodology review is a significant development. A frequent criticism of the FFM is that it is not "fit for purpose" in a regulatory setting, regardless of its acceptance in academic circles and in financial practice. We are cautious not to infer too much from IPART's statements on the FFM, however, we deem it unlikely that IPART would even be monitoring the FFM if it could not be fit for purpose for calculating the return on equity in a building blocks framework.

The ESC also noted that decisions of the AER and ERA have previously been found not to be in error on appeal. The following quote from the Tribunal is worth noting:[436]

> The Tribunal's role is not to pass judgment on the superiority of one study over the others investigating the application of the FFM to Australian data. Its role is to assess whether the regulator made errors or was unreasonable in considering (or not considering) the available information available to it in forming a judgment about the merits of incorporating results from one, or some, or none of those studies into its determination of the return on equity.

In other words, the findings in support of regulator's rejection of the FFM were made in relation to a different instrument to the Pricing Order that conferred different discretions on the regulator and the regulated. Further, the fact that a tribunal found no legal error

436 ACompT 10, 13 July 2016, para. 678.

in a regulator's preference for one model over another does not necessarily mean that that other model is not, or cannot be, well accepted for the purposes of the Pricing Order.

Theoretical underpinnings

The ESC listed previous concerns among regulators about the theoretical basis for the FFM. As we qualify below, there is clear economic logic supporting the existence and persistence of the Fama-French factors. However, in our view, theoretical elegance is not an end in itself in meeting statutory objectives – indeed, what is paramount is the ability of a model to deliver a return that adequately compensates the provision of Prescribed Services. Nevertheless, it is acknowledged that the FFM lacks the theoretical elegance and simplicity of the SL CAPM.

However, this is not to suggest that the FFM is without a theoretical base. With respect to the size premium, Carlson et al. (2004) develop a theoretical framework in which the size premium reflects the importance of growth options relative to assets in place.[437] Meanwhile, the authors posit that book-to-market effects can be attributed to differences in operating leverage.

Koijen et al. (2017) link excess returns on high minus low book-to-market stock portfolios to negative cash-flow shocks and output risk during economic downturns.[438] They provide evidence to support the hypothesis that the value premium reflects compensation for macroeconomic risk not captured by the conventional market beta. This is based on the premise that periods of low returns on value stocks versus growth stocks are times when future economic activity is low and future cash-flows on value stocks are low relative to those on growth stocks.

To better understand the economic origin of the size and value premium, de Groot and Huij (2018) investigate the hypothesis that these factors reflect pricing for distress risk.[439] Although small-cap stocks tend to have substantially higher probabilities of financial distress, the authors find that distress risk is not priced and that the size premium is priced "beyond" distress risk. Importantly, the results indicate that it is not the case that small-cap stocks only yield positive abnormal returns if they run higher levels of distress risk; rather, the size premium can also be concentrated in low risk small-cap stocks. Similar conclusions were reached on the value premium.

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437 Carlson, M., Fisher, A. & Giammarino, R. (2004). Corporate investment and asset dynamics: Implications for the cross-section of returns. The Journal of Finance, 59(6), pp.2577-2603.

438 Koijen, R.S.J, Lustig, H. & Van Nieuwerburgh, S. (2017). The cross-section and time series of stock and bond returns. Journal of Monetary Economics, 88, pp.50-69.

439 De Groot, W. & Huij, J. (2018). Are the Fama-French factors really compensation for distress risk

In a recent article on selection criteria and assessing the merits of competing factors, Eugene Fama and Ken French discuss how the FFM's theoretical underpinnings can be derived from the dividend discount model (DDM):[440]

> We suggest that model comparisons in any paper should be limited by theory, even an umbrella theory like the dividend discount model, and by evidence on model robustness out-of-sample (different time periods and markets). For example, Fama and French (2015, 2016) invoke the dividend discount model to motivate the five-factor model.

These comments are significant, because they clearly show that even Fama and French themselves acknowledge the importance of a theoretical framework for their model. We have not replicated these derivations, but they can be found in Fama and French (2015) or Fama and French (2016).[441]

At this point, it is worthwhile to clarify the distinction between the three-factor model (that we implement for PoM) and the five-factor model, which has emerged in recent years. The five-factor model is an extension of the three-factor model. Both models incorporate size (SMB) and value (HML) premiums, but the five-factor model adds additional factors for profitability and investment. In the 2018 interim commentary, the ESC highlighted our remarks that more recent contributions to the Fama-French literature actually adopt a five-factor model as opposed to the three-factor model. It also referenced commentary by the ERA, which noted Fama and French's observation that the value premium appeared to become redundant when the profitability and investment factors are added.

Taken at face value, critiques of the three-factor model on the basis that there exists a five-factor model are not detrimental to the merits of the FFM as a well accepted model per se. It could well be the case that profitability and investment adequately account for the same phenomena that the book-to-market value of equity has historically captured.

However, even if the five-factor model is superior to the to the three-factor model, then it is clear that the inclusion of the three-factor model (as one of a combination of well of accepted approaches) can meet the well accepted threshold, and, in turn, the objective of clause 4.1.1(a) of the Pricing Order, and is likely to better meet the statutory objective concerning the return to be earned by the provider of Prescribed Services, relative to a

440 Fama, E.F. & French, K.R. (2018). Choosing factors. Journal of Financial Economics, 128, pp.234-252. The 2015 and 2016 papers relate to five-factor model publications (see next footnote).

441 Fama, E.F. & French, K.R. (2015). A five-factor asset pricing model. Journal of Financial Economics, 116, pp.1-22; Fama, E.F. & French, K.R. (2016). Dissecting anomalies with a five-factor model. The Review of Financial Studies, 29, pp.69-103.

situation where it is abandoned altogether. In other words, this apparent stance towards the five-factor model seems to imply that the debate revolves around which variant of the FFM to apply, rather than a debate around whether any FFM is a well accepted approach, and whether it should be given consideration at all. If this is indeed the case, then in terms of the statutory objectives it would appear preferable to implement the three-factor FFM rather than disregard the FFM framework entirely.

Use of the FFM by financial practitioners

In determining the WACC to apply to PoM, we have investigated approaches that can be considered well accepted. In regard to financial community support for the FFM, we have previously presented evidence that the FFM is taught in financial curricula, and that the awarding of the Nobel Prize clearly stated that the methodology was relied upon by financial professionals.[442]

We also demonstrated that many financial practitioners depart from a conventional application of the SL CAPM through the use of ad hoc risk premia in independent expert reports. Updating our analysis to the end of 2018 (see Section 5.2.6), we find that on average, these ad hoc adjustments add 2.65% to the final WACC estimate. Despite this widespread departure from the SL CAPM, we did not uncover explicit applications of the FFM as we implement it for PoM amongst independent expert reports.

Financial practitioners are likely to be less constrained in the discretion that they can use in determining WACC estimates. If we were to truly emulate private sector financial practice, then the most representative way to do this would be by applying an ad hoc premium adjustment based on our own judgement. However, such an adjustment may appear arbitrary in the context of regulatory process adhering to statutory objectives. This would likely fall short of expectations in a regulatory setting, where each component of a WACC must be substantiated.

At the same time though, it is not a satisfactory conclusion to apply no augmentation whatsoever to the SL CAPM, as this would be clearly inconsistent with how many financial practitioners would ascertain the efficient cost of financing for an entity such as PoM. Instead, we have sought to identify candidate return on equity models that best capture the imperfections of the SL CAPM that financial practitioners are trying to resolve when they use ad hoc premia.

We undertake this task following the guiding principles for WACC approaches mentioned in Chapter 3. In this instance, we ensure transparency and replicability based

[442] Professor William F. Sharpe, one of the originators of the SL CAPM, was also awarded the Nobel Prize for his contributions to the theory of corporate finance

on robust data by avoiding arbitrary adjustments. Viewed in conjunction with IPART's recent sentiment towards the FFM, we maintain that the FFM is the best available augmentation of the SL CAPM capable of achieving these objectives, in addition to the Black CAPM. Furthermore, the premium over the SL CAPM implied by the FFM (see Attachment K) is not inconsistent with the average premium that we have seen applied in independent expert reports, a fact that the ESC's advisor has acknowledged.[443]

Data limitations and other technical issues

The Ken French website does not provide country-specific factors for all of the countries in PoM's comparator sample. This means that in many instances, we are required to rely on global factors. This led the ESC to suggest that the FFM does not have a theoretical base, because parameters can be defined in a way that is incompatible with a domestically segmented market framework. This is not the case. The use of global factors relates solely to a paucity of available data for all of the countries in the sample. As we have previously noted in response to information requests from the ESC, the global factors cover many of the countries contained in PoM's comparator set.

The ESC also considered that Synergies had not sufficiently explained why it used Professor Ken French's data for all countries except Australia. As previously explained, to calculate the return on equity for PoM, we require estimates of the size and value premia for Australia (analogous to the requirement for an Australian MRP). The compilation of country-specific factors is a data-intensive process, and we would anticipate that the sample of countries for which these factors exist will improve over time.

Moreover, PoM's comparator now consists of 13 companies. Of these 13 comparators, 5 have country-specific size and value factors, while 8 do not.[444] This deficiency does not invalidate the FFM to inform the cost of equity for the BEE – all well accepted approaches have limitations. In this instance, we use FFM as a cross-check, and will continue to assess its appropriateness for use in future TCS processes.

Portfolio formation has been another point of contention. The ESC reproduced ERA commentary that there is no strong theory to guide the method of portfolio formation. In principle, it is unclear whether we would necessarily expect there to be strong theoretical literature around a specific technical issue such as portfolio formation.

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443 Frontier Economics (December 2019), p 7.

444 In the Marine Ports and Services sector, 3 firms have country-specific factors, while 8 do not. In the railroads sector, 6 firms have country-specific factors, while 2 do not.

The Brailsford et al. method, upon which our approach was based, takes into account the unique composition of the Australian market when forming portfolios. They show that this country-specific adjustment emulates the total market capitalisation assigned to each portfolio in US studies. Whilst it is true that different portfolio formations could lead to different results, we are not aware of any compelling case that has been put forward in the literature for deviating from current practice. Moreover, a similar criticism could be directed toward various other WACC parameters; naturally if model assumptions are changed, outputs will also change, but there needs to be a rationale for doing so.

A.3 Detailed responses to ESC 2018 interim commentary

This section addresses specific comments made by the ESC in its 2018 interim commentary.

Table 54 Overview of ESC interim commentary on Black CAPM

ESC interim commentary	Synergies response
Currently, IPART makes adjustments to its estimation of equity betas to partly correct for the downward bias of the SL CAPM. IPART implements the Vasicek adjustment, which gives a higher weight to more precisely estimated equity betas and lower weight to estimated equity betas with higher standard errors. IPART was of the view that the adjusted equity beta estimates sufficiently adjusted for the known downward bias of the SL CAPM.	We have provided commentary on IPART's use of the Vasicek adjustment in this attachment. Elsewhere, the ESC has questioned our reliance on statistical significance, and, by extension standard errors. These statistics play a central role in the Vasicek adjustment. More importantly though, IPART's implementation of such a method demonstrates that the existence of downward bias is acknowledged in a regulatory context.
The main weakness Synergies identified with the SL CAPM is that it produces downwardly biased estimates of the rate of return for low-beta entities. We note that this issue does not appear to be especially relevant for the moment as Synergies has estimated that the port does not have a low beta	Frontier Economics' observation is correct. As we have noted in our report, the SL CAPM and Black CAPM result in the same cost of equity when the equity beta is equal to 1. In fact, reliance on the Black CAPM would actually reduce the upper end of our WACC range (but would not affect our point estimate). There is an important distinction between the approach that is applied and the application of that approach. The point made by Frontier Economics does not undermine the use of the Black CAPM as a well accepted approach to inform the estimate of the rate of return to be earned by PoM under the Pricing Order. Our objective is to utilise well-accepted models that estimate the return on equity as accurately as possible for any beta assumption.
The AER noted that the use of the Black CAPM is an alternative model to the SL CAPM and is not the only method to address low-beta bias.	While true, this in isolation does not disqualify the Black CAPM from consideration.
The AER stated that its consideration of the Black CAPM is not related to low-beta bias and is instead to 'capture possible market imperfections that may lead to actual returns to differ from expected returns.'	Similarly, IPART also acknowledges that the Vasicek adjustment is not explicitly designed to address the downward bias of the SL CAPM either. Regardless of the AER's actual intention, the Black CAPM has the effect of mitigating the "flatter than expected" security market line for which there is widespread acceptance of its existence.
The AER noted some shortcomings of the Black CAPM, such as that it is not empirically reliable, it is not widely used and does not meet the AER's assessment criteria well.	It is true that there are shortcomings of any asset pricing model; the SL CAPM has been shown not to be empirically reliable either. Consideration of the Black CAPM has met the AER's assessment criteria in the past. Concerns have been raised by energy networks that the AER has reached

ESC interim commentary	Synergies response
	a different conclusion in its 2018 Rate of Return Guideline review based on substantively identical evidence. This attachment demonstrates that the Black CAPM has been widely used in overseas jurisdictions with similar statutory objectives to the PMA.
The AER does not give any weight to low-beta bias in its rate of return guidelines, partly due to: • Ongoing academic debate on the existence of low-beta bias • The existence of a number of explanations (such as economic conditions) that do not imply a bias in equity beta.	We have supplemented our analysis from previous reports with additional literature confirming the existence of low-beta bias As discussed above, many of the explanations for low-beta bias still imply substantial deficiencies in the SL CAPM, which are unlikely to disappear over time.
The AER also noted that it is not clear that low-beta bias exists on an ex-ante basis or is accounted for by investors and market practitioners on an ex-ante basis.	The persistence of low-beta bias over time strongly suggests that this phenomenon is not merely an ex post deviation from ex ante returns that would otherwise be based on the conventional CAPM.
In relation to low beta bias, Professor Davis suggested that it is not possible to make inferences about whether the SL CAPM produces downwardly biased estimates for low-beta firms.	Professor Davis' report to the AER dates back to 2011. Subsequently, reliance on the Black CAPM was accepted by the AER in its 2013 guidelines.
In particular, Professor Davis is of the opinion that: • The theoretical assumptions of the SL CAPM do not necessarily lead to downwardly biased estimates of the rate of return for low-beta firms • The empirical evidence does not clearly demonstrate a low-beta bias of the SL CAPM	The issue is not so much the theoretical assumptions themselves as it is the validity of these assumptions in practice. The empirical evidence that we have compiled in this attachment comprehensively demonstrates that observations of low-beta bias are too persistent to be attributed to transitory statistical anomalies.
In addition, Professor Davis suggested that the use of the Black CAPM to address low-beta bias has limited empirical significance and does not resolve the problems of the SL CAPM.	Although we disagree on the empirical significance of the Black CAPM, we are largely in agreement with Professor Davis that reliance on the Black CAPM, does not, on its own, resolve all of the problems of the SL CAPM. This is because the Black CAPM still ignores factors other than the market return that can influence the return of a stock. Thus, we have also placed weight on the Fama-French Model.

Table 55 Overview of ESC commentary on the Fama-French model

ESC interim commentary	Synergies response
In Synergies' submission, there is no discussion of the consideration of the FFM in the Australian context, where regulators have noted that it is unreliable on empirical and theoretical grounds and so rejected its use.	We have previously stated that the FFM is less commonly employed in regulatory contexts, and that the model in the Australian market has sometimes yielded inconclusive results. The ESC has previously acknowledged that the decisions of overseas regulators can helpfully inform the issue of whether an approach is well accepted. This attachment details the relevant precedent on this issue.
It is notable that Synergies has not mentioned the analysis and conclusions of the AER and ERA (including where the decisions of these regulators relating to the FFM have not been found to be in error on appeal).	In our previous reports for PoM (and presented again in this attachment), we have addressed many of the issues raised by these regulators (including portfolio formation in the Australian setting; empirical stability of the estimates; the emergence of the five-factor model; and dealing with the complexity of empirical implementation). Subsequently, we have responded to specific areas of concern among these regulators that the ESC cited. With regards to judicial appeals, commentary from bodies such as the Australian Competition Tribunal is a useful source of guidance, but ultimately this guidance is focused primarily on how regulators weigh up conflicting evidence. Our objective is to have regard to approaches well-accepted by regulators, academia and financial practitioners in the context of the Pricing Order and the

ESC interim commentary	Synergies response
	regulatory objectives (including providing PoM with a reasonable opportunity to recover a return commensurate with the risks involved). This may or may not differ from the task facing other regulators on previous occasions. Further, the fact that a tribunal found no legal error in a regulator's preference for one model over another does not necessarily mean that that other model is not, or cannot be, well-accepted for the purposes of the Pricing Order.
The FFM is not used by any Australian regulator	
Synergies stated that IPART's views lend credence to the implementation of a multi-model approach to estimating the return on equity. This is not an example of a regulator 'applying or considering the results of the FFM'. IPART has maintained the use of the SL CAPM as its return on equity model and did not find sufficient evidence to replace this model.	We have not at any time proposed that the SL CAPM be replaced. Rather, we believe that it should continue to be given weight in conjunction with other well accepted models, being the Black CAPM and FFM. The ESC states elsewhere that it is "particularly interested in the model's application in a regulatory context to estimate the benchmark return on equity". The key question is whether a sufficient return is allowed to enable PoM to earn a return commensurate with the risks involved. Over time, it may be appropriate to place greater weight on the FFM to inform the return on equity.
Synergies appears to overstate instances of the use of the FFM by international regulators	
Synergies stated that Professors Myers and Franks consider the FFM is to be an 'appropriate' model. This reflects the advice of these academic and not views or decisions of the NZ Commerce Commission.	As we have presented in previous reports, the NZCC subsequently went on to endorse the FFM as a potential cross-check on the CAPM in its 2009 revised guidelines.
Synergies used similar examples when referring to expert witnesses; Mr Paul Moul, Mr Paul Hunt and Mr Gary Hayes. These individuals are not regulators and are not applying the FFM in a regulatory context.	In these cases, the regulator in question subsequently acknowledged the findings of these expert witnesses. In any case, it shows that the FFM has received attention by expert witnesses in a regulatory context.
Various examples provided by Synergies in its review of expert reports and of financial practice highlight the making of ad hoc adjustments to the SL CAPM formula, rather than the adoption of the FFM. Synergies explicitly notes that this practice is 'consistent with the underlying rationale of the FFM' rather than the use of the FFM. Further below we note that it is also common practice for Australian regulators to use the SL CAPM with some adjustments and cross checks, rather than adopt an alternative model for estimating the cost of equity.	In our experience, financial practitioners and independent expert report authors have more latitude to apply discretionary adjustments to mechanical cost of equity calculations. Our approach formalises these adjustments by considering the exposure to factor premia for comparators relevant to PoM. For Australian regulators, many adjustments to the SL CAPM are somewhat arbitrary in nature and require the exercise of significant regulatory discretion, especially when the regulator is required to select a value within a range of possible estimates. Nevertheless, the ESC's statement seems to suggest that it is indeed common practice for Australian regulators to make adjustments to the SL CAPM. If so, it would appear open to PoM to give weight to other approaches that achieve a similar outcome but in a more formulaic and transparent manner.
Synergies notes that 'in the 344 independent expert reports that we interrogated, we have not located any formal application of the three-factor Fama-French model as it is employed in the PoM WACC report.' This is a significant finding in that it does not appear to support Synergies' claim that the FFM is 'well accepted' by financial practitioners, and also highlights that the FFM can take various forms. The variability in how the FFM is applied gives rise to concerns on theoretical and empirical grounds.	Independent experts are typically not required to present detailed analysis to substantiate the premia that they apply. One reason for this is that the application of ad hoc risk premia not accounted for in the SL CAPM is commonplace in financial practice. In our view, the FFM is a well accepted model available for accurately quantifying size and value premia. The fact that financial practitioners are accounting for premia outside the CAPM framework is a sign that the SL CAPM requires augmentation.
Australian regulators have recognised issues with the SL CAPM but do not use the FFM	
No Australian regulator has moved away from the SL CAPM in favour of the FFM or any other return on equity model. Professor Kevin Davis, in a report for the AER in	As we have stressed in previous reports (and presented again in this attachment), we are not recommending moving away from the CAPM. If there is indeed a lack of general

ESC interim commentary	Synergies response
2011, stated his view that there is a lack of general agreement on the superiority of alternative asset pricing models to the CAPM.	agreement on the superiority of alternative pricing models to the CAPM, then, given the recognised weaknesses with the SL CAPM it is preferable to have regard to a wider range of well-accepted approaches.
The FFM appears to have theoretical issues	
A number of Australian regulators have raised concerns with the theoretical basis for the FFM's risk factors. Specifically, while these factors have been identified through empirical methods to explain ex post equity returns, how they explicitly or implicitly affect investors' perceptions of risk is not well understood.	More recently, Fama and French have motivated the theoretical basis underpinning the Fama-French model using the theory of the dividend discount model. Carlson et al. (2004) argue that the size premium reflects the importance of growth options relative to assets in place, while book-to-market effects can be attributed to differences in operating leverage. In response to ESC commentary, we extended our coverage of the theoretical size and value premium literature in this year's report.
In its 2013 and 2018 rate of return guideline reviews, the AER stated that the FFM could not be used to inform any parameter estimates in its foundation model due to its lack of clear theoretical foundation.	Despite our comments above confirming that the FFM is an empirically based model, it is not without a theoretical basis; theoretical underpinning is only one of several criteria for an effective cost of equity model and is not a requirement for a model to be well accepted.
The ERA, in the context of a 2016 decision on the Dampier to Bunbury Natural Gas Pipeline (DBNGP), also noted that the FFM is 'empirically unstable due to the fact that the model is not developed on a robust theory'.	Commenting on the wide range of factors that have been considered over time, Fama and French (2018) acknowledge that some factors have lost explanatory power out-of-sample. However, they stress that "most if not all" of the three-factor and five-factor variables survive tests on samples of different time periods and different countries. This is at odds with the claim that the FFM is empirically unstable.
The ERA raised a similar view on the theory of the FFM in its 2015 final decision on ATCO Gas' access arrangement for gas distribution. Specifically, the ERA stated that there is no strong theoretical basis to support the inclusion of the size and value risk factors in the return on equity estimation.	We discuss the theoretical underpinnings for the FFM in this attachment. The theory of the FFM can be motivated via the Dividend Discount Model (DDM). Size and value premia can be driven by factors such as growth options and operating leverage.
The ERA considered that the FFM risk factors were selected based on data exploration and were not guided by economic theory.	The key issue is whether an approach is well accepted in the context of advancing statutory objectives. The theoretical elegance of a model is very much a secondary consideration to the more important issue of its efficacy and its level of acceptance. In this context, whilst it is true that the factors were originally identified through empirical observation, that does not detract from the FFM's empirical performance. Further work has been undertaken to understand why such phenomena have persisted over time.
The ERA noted that the introduction of the Fama French five-factor model has placed the validity of the value premium in doubt, based on Fama and French suggesting the value premium appears redundant for explaining average returns in this new model.	This line of reasoning seems to suggest that the five-factor model is more appropriate than the three-factor model. This is possible, but at present the three-factor model is the most widely accepted model and represents a significant improvement on the CAPM in terms of its empirical efficacy.
On appeal, the Australian Competition Tribunal did not find that the ERA made any error in its determination relating to the FFM. In particular, the Tribunal considered that it was not unreasonable for the ERA to be concerned over the theoretical foundations of the FFM, due to the empirical facts of the model not being generally agreed.	Whether or not the ERA made any error in the context of the merits review framework is a different question from whether the FFM is well accepted for the purposes of the Pricing Order. Further, the Tribunal made the following remarks: "The Tribunal recognises that the evolution of approaches and differences in results in succeeding versions of a research project's output are an inherent feature of the research process, rather than indicating that the credibility of the most recent results is contaminated by differences with earlier results." Viewed in this light, the evidence in favour of applying the FFM has only strengthened since this decision was handed down. Whether or not a decision is validly made under a different statutory test is a different consideration to whether or not an approach is compliant with the Pricing Order.

ESC interim commentary	Synergies response
The FFM has been found to produce unreliable empirical results	
Regulators in Australia have found it difficult to apply the FFM in a regulatory context due to a lack of consensus on the appropriate risk factors and portfolio formation.	The Brailsford method, upon which our approach is based, takes account of Australia-specific portfolio breakpoints. Brailsford et al. successfully show that their portfolio formation approach emulates the distribution of total market capitalisation among portfolios observed in US studies.
Regulators have also found that the results of the FFM are dependent upon the methodology chosen, and the robustness of the FFM risk factors in explaining Australian data has been questioned.	See next point and comment from the Tribunal above.
Synergies listed a number of academic studies that suggest the FFM provides a better explanation of observed stock returns than the SL CAPM, including for Australian datasets. As described in Synergies' report, these studies provide mixed evidence on the reliability of the FFM. The ESC notes that the results from the academic studies referenced by Synergies are inconsistent, and the most recent studies do not appear to provide clear evidence in support of the size effect.	Brailsford et al. observes that "prior Australian studies employ a portfolio construction method that is not comparable with prior US research. The consequently mixed and inconclusive findings from previous Australian studies leave a confusing picture for those interested in a deeper understanding of how the Australian equity market prices risky assets." Extending on the Tribunal's comments about the difficulties in concluding on the superiority of one paper over another, previously mixed findings do not detract from the model's current merits going forward.
Synergies noted that past studies of the FFM in the Australian market have yielded inconclusive results, which may be due to 'data issues'. Synergies stated that the Brailsford et al study (2012) addressed these issues and produced FFM estimates using Australian data that reconciled with US studies. As noted above, Brailsford et al found the value premium was statistically significant, while the size premium was not.	As noted below, we find evidence that the size premium is significant at the 10% level. It is important to remember that the Brailsford study had access to approximately 25 years of data. Meanwhile, we have access to 32 years of data. More observations increase the precision of the data.
The Brailsford et al study has been relied on by other regulated entities in proposing reliance on the FFM. The ERA, in its 2015 final decision for ATCO Gas, decided against relying on the Brailsford et al study. The ERA did not agree with ATCO's consultants that one study is superior to others.	Our application of the Fama-French is not conditional on a single study. It is also informed and supported by a growing body of literature and the approach of financial practitioners, who regularly augment the CAPM to account for additional factors that the model fails to capture.
In the subsequent review of the ERA's decision by the Australian Competition Tribunal, the Tribunal accepted that the ERA considered the latest available research before rejecting the use of the FFM.	As we have documented in Section 5.2, there is a wide array of available research that rejects the use of the SL CAPM. In our view, a combination of well-accepted approaches can be a compliant approach under the Pricing Order, which is a different statutory framework to that considered by the Tribunal.
Synergies also noted that the most recent studies employ a five-factor model, rather than the three-factor model it uses in its submission. (p.49)	It is possible to generate a five-factor model for the Port of Melbourne, but the three-factor model is nevertheless a significant improvement on the SL CAPM and the widely recognised approach.
Synergies also reviewed a number of independent Australian financial expert reports, where around 30 per cent of reports made ad hoc adjustments to the SL CAPM, although none formally used the three-factor FFM. Synergies is not clear on how often the financial expert reports use value and size premiums compared to other ad hoc adjustments.	See above for our comments on our interrogation of independent expert reports.
Australian regulators have found that the FFM has empirical issues in a regulator context	
The ERA noted that the ranges of the high-minus-low and small-minus-big risk premium were too large to confirm the presence of these risk factors when using the FFM in Australia. (p.50)	The ERA references studies as far back as 1998. In any case, the range of HML and SMB values are not prohibitively large when clear outliers are removed.

ESC interim commentary	Synergies response
The ERA noted that a fundamental issue with the application of the FFM in Australia is the adoption of different approaches to portfolio formation, which can lead to different conclusions. (p.50)	We agree that different portfolio approaches could lead to different conclusions, but this does not prevent the application of the FFM in Australia. What is important is that the ultimate choice of portfolio formation is informed by sound financial and economic reasoning, as is the case in the Brailsford et al. paper and that the approach itself is well accepted.
The ERA suggested that there is no strong theory to guide the method of portfolio formation due to the inherent empirical nature of the types of studies the FFM has been used in. (p.50)	See comments on Brailsford approach. It is unclear why portfolio formation would actually require "guiding theory." Arguably, the technical nature of portfolio formation should in fact be informed by empirical considerations. It does not address the question of whether the FFM is well accepted.
The ERA also recognised that the FFM is dependent on empirical justification (the systematic observance of the FFM risk premia). The ERA noted that because these risk premia are not systematically observed in the Australian market, there is no reasonable basis for this model to be applied in Australia.	The value premium has been found to be persistent over time. We also believe there is a convincing basis for persistence of the size premium, especially when 2008 data is omitted.
The ERA further justified its rejection of the FFM's value and size premium in a 2015 decision based on the following: • The 2012 Brailsford study concluded that the size premium is not priced in Australia. A number of the academic studies referenced by Synergies in its submission suggest a similar finding for the size premium. • In Fama and French's most recent five factor model, they conclude that the value premium has become redundant in explaining average returns	We find that removing 2008 data results in a statistically significant size premium. As per above, it is possible to estimate the five-factor model for PoM. Whether or not the five-factor model is well accepted for the purposes of the Pricing Order does not bear on the question of whether or not the three-factor FFM is well accepted.
The AER has similarly dismissed various proposals to rely on the FFM for a range of reasons, including: • The FFM's empirical implementation is relatively complex and opaque • There appears to be no consensus on the appropriate factors and methodological choices for the FFM • The FFM is sensitive to the choice of factors and methodology, creating a potential for bias and regulatory gaming • There is no agreed 'best' methodology for applying the FFM and there are no clear objective grounds to distinguish the 'best' studies of FFM estimates	Complexity of empirical implementation: we have provided the ESC with extensive detail of our approach for implementing the FFM, both in our report and via information requests. Consensus on appropriate factors and methodological choices: This criticism could be made of several other WACC parameters, such as gamma and the MRP. We do not consider that this is a valid reason for excluding the FFM from consideration. Potential for bias and regulatory gaming: The choice of factors and methodology must at all times be informed by credible and carefully reasoned academic and financial market evidence. If these criteria are satisfied, it is difficult for regulatory gaming to occur. The issue is whether or not an approach is well accepted. It is not clear how an approach that is well accepted for the purposes of the Pricing Order and demonstrated to be empirically superior to the preferred model of regulators could be a vehicle for regulatory gaming if applied in a well accepted manner. Conversely, finance practitioners do not appear to apply the CAPM in a manner that is compatible with the approach by regulators. No clear objective grounds to distinguish the 'best' studies of FFM estimates: There is unlikely to be any definitive basis (quantitative or otherwise) for distinguishing best studies – the issue for compliance under the Pricing Order is the level of acceptance – not a test of what is a "best methodology". Instead, as is the case for other WACC parameters and models, studies should be judged on the strengths of their assumptions and the breadth of real-world considerations that they incorporate into their modelling. In our view, the work of Brailsford and others meets this threshold and is well accepted for the purposes of the Pricing Order.

ESC interim commentary	Synergies response
In IPART's 2018 review of its WACC methodology, it noted some shortcomings with the FFM, including that the empirical evidence on the impact of firm size on equity returns had not been stable over time in Australia.	There is evidence that the MRP has not been stable over time in Australia either. IPART did note shortcomings, but overall we consider that IPART viewed the method positively.
We have identified what appear to be methodological issues with Synergies' application of the FFM	
Synergies' use of the FFM appears to lack a consistent theoretical approach in terms of whether national share markets are assumed to be integrated internationally or are segmented and reflect domestic investment choices only.	Our reliance on global data is not related to the consistency of the theoretical approach. Rather, it relates to data availability.
The portfolios chosen for foreign companies are local in respect of the market portfolio and (for some countries) global in respect of the HML and SMB portfolios. This tends to suggest that the FFM does not have a theoretical base, and is therefore open to defining parameters in ways that are incompatible with any theoretical framework. That is, Synergies' use of global data occurs in those cases where Professor French's database lacks data for the country in question rather than because of any guiding principle. A lack of strong theoretical foundation could undermine confidence in the model in the case (as applies here) of conflicting evidence on observed statistical relationships.	See response above.
Synergies did not explain why it used data from Professor French's database for all foreign markets but not for Australia. (p.51)	On p.168 of the 2018 report, we explained that Professor French does not construct factors specifically for Australia. However, we require estimates of the Australian size and value premia just as it is well accepted to derive a country-specific estimate for the MRP.
Regarding Australian data, Synergies' estimate of the MRP in the FFM (and SL CAPM) is based on the same historical data used by Australian regulators (spanning the years 1883 to 2017). However, data used to estimate the risk premiums for HML and SMB in the FFM are from 1986 to 2017. No explanation is offered for this difference, however, presumably reflects the computational burden of constructing the HML and SMB portfolios back to 1883. The result is a much less reliable estimate of the HML and SMB premiums.	For all parameters, we seek to utilise as much information as is available. Data availability prevents us from collecting information prior to the 1980s. While it is true that the dataset for HML/SMB is shorter than that for the MRP, this is still a substantial time series of almost 400 observations each. It is sufficient for a well accepted approach.
We are not aware of there being a method to estimate the HML and SMB premiums that is substantially different to that used by Synergies.	This seems at odds with the ESC's claims that there are too many competing methodologies for deriving FFM estimates. Rather, there appears to be a very clear procedure that stands out for deriving robust estimates.
The SMB premium estimated by Synergies is 1.93 per cent. This annual value is derived from monthly observations that produced a premium estimate of 0.16 per cent, with a standard error of 0.15 per cent, meaning the premium estimate is not statistically significant. This is consistent with most of the Australian empirical studies cited by Synergies failing to find clear evidence of the size effect.	With the removal of data from 2008, the size premium becomes significant at the 10% level. Significance at the 5% level can be justified if a one-sided hypothesis is assumed (i.e. if the size premium is assumed to be positive). The literature identifies that the SL CAPM would fail similar tests but that does not undermine its level of acceptance for the purposes of the Pricing Order.
Sensitivity of Synergies' results to changes in method	
The changes in the overall FFM cost of equity attributed to the coefficients for the 'market' and 'growth' risk factors are large and offsetting.	The fact that the changes are offsetting suggests that both methods lead to a similar cost of equity estimate, which is the ultimate objective of any cost of equity model.
We do not have any context to determine whether these changes 'result in a more robust and stable estimate over time' as claimed by Synergies. We are concerned that an apparently slight change in methodology can result in large changes in some of the FFM's component estimates	Despite changes to the comparator set, the FFM methodology continues to result in a stable estimate of the return on equity.

B Market risk premium – Supplementary information

The purpose of this attachment is to provide further details of regulatory precedent and market survey evidence in regard to the market risk premium.

The market risk premium (MRP) is the amount an investor expects to earn from a diversified portfolio of investments (reflecting the market as a whole) that is above the return earned on a risk-free investment. The key difficulty in estimating the MRP arises from it being an expectation and therefore not being directly observable.

Whilst the MRP is an inherently forward-looking parameter, the difficulty with observing or inferring it from market data means that there is valuable information about its value in historical data (historical averages of excess returns from the market above the relevant risk-free rate).

A range of methods have been developed to estimate the MRP falling broadly into two approaches – historical and forward looking. These are considered in turn. In combining approaches to determining the MRP we have had regard to the approaches adopted by financial practitioners, academic literature and regulators in their assessment of the MRP.

B.1 Regulatory decisions on the MRP

Brief summaries of Australian regulators' past approaches to estimating the MRP are presented below. This supplements the detailed review of current approaches used by these regulators, which is set out in the body of the report.

B.1.1 IPART

IPART derives its feasible WACC range from a range based on long run averages and a range based on current market data.

Under this approach, it will still use long run historical averages of the MRP, which it values at between 5.5% and 6.5%, to estimate its long run average WACC range. Its current WACC range reflects the current implied MRP, which is derived from DDM estimates.

In its semi-annual update for February 2018, IPART's range for the MRP extended from 6.0% (mid-point of long term average range) to 9.1% (mid-point of current range), with a mid-point of the two ranges of 7.6%.[445]

[445] IPART (2018b), p.2.

In February 2019, IPART continued to hold its long-term estimate fixed at 6.0%. Meanwhile, its current measure has fallen over the last 12 months by 50 basis points to 8.6%, making the midpoint of these two estimates 7.3%.[446]

For the most recent update in February 2020, IPART's long-term estimate remains fixed at 6.0% (and will continue to remain fixed until the next methodology review). On the other hand, the current measure is now 8.8%. The resulting midpoint MRP is 7.4%.

However, IPART's MRP estimate as a margin above the contemporary risk-free rate is likely to be greater than this reported value because of the higher risk-free rate assumed in its approach (2.75%, due to its 50% weighting on the 10-year risk-free rate estimate).

B.1.2 ERA (WA)

In 2015, the ERA completed a review of the methodology it applies to estimate the WACC for rail networks. In its first Draft Determination for this review released in June 2014, the ERA's assessment of the MRP was primarily informed by historical averages and the DDM.[447] It arrived at a range of 5% to 7.5% and stated that it will apply judgement as to where it will select the point estimate at any point in time. For that Draft Determination, it proposed a value of 6%.

Subsequently, the ERA fundamentally changed its approach to estimating the MRP for rail networks. In a revised Draft Decision issued in November 2014, it proposed to solely rely on the Wright approach.[448] The ERA further revised its position in the Final Decision issued in September 2015 and took into consideration estimates informed by historical excess returns (Ibbotson and Wright) and DDMs.[449] It stated it is more inclined towards the Wright approach as "a strong indicator for the likely return on equity for the next 50 years, given the statistical evidence for the mean reversion of the return on equity."[450] It arrived at a final estimate of 7.3%.

The ERA took a similar approach in its assessment for ATCO Gas, where it applied an MRP of 7.6%.[451] It applied an updated value of 7.4% in its 2016 determination for the

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446 IPART (2018c). WACC biannual update, February 2019, p.2.

447 ERA (2014a). Review of the method for estimating the weighted average cost of capital for the freight and urban rail networks, Draft determination, 5 June.

448 ERA (2014b). Review of the method for estimating the weighted average cost of capital for the regulated railway networks, Revised draft decision, 28 November.

449 ERA (2015a).

450 ERA (2015a), p.145.

451 ERA (2015b). Final decision on proposed revisions to the Access Arrangement for the Mid-West and South-West gas distribution systems, Submitted by ATCO Gas Australia Pty Ltd, 30 June.

Dampier to Bunbury Pipeline.[452] In its June 2015 decision for ATCO, the ERA commented on its approach as follows:[453]

> Most significantly, the Authority has now concluded that it is not reasonable to constrain the MRP to a fixed range over time. The erratic behavior of the risk-free rate in Australia to date, and more particularly, its pronounced decline in the current economic environment, leads to a situation where the combination of a fixed range for the MRP and prevailing risk-free rate may not result in an outcome which is consistent with the achievement of the average market return on equity over the long run.

On this basis, the ERA concluded that the long run historical estimate of 6 per cent could be a poor predictor of the MRP prevailing in future regulatory periods.[454]

We note that the changing values applied by the ERA primarily reflect changes in the DDM estimates, which are more volatile through time (compared with comparatively stable historical excess returns).

More recently, the ERA has expressed less confidence in the Wright MRP. For the Western Power final decision released in September 2018, the ERA applied an MRP of 6.0%, which was a further decrease from the 6.2% applied in the draft decision.[455] These decisions give no weight to the Wright approach. The ERA has also signalled that it has diminished confidence in the dividend growth model and considers that it is reasonable to place less reliance on it relative to the historic MRP. The ERA revised its MRP estimate to 5.9% for the rail WACC draft determination in May 2019.

ERA position on the Wright MRP – further information

The ESC noted in its interim commentary that the ERA has now withdrawn its support for the Wright approach. We consider it useful to provide an overview of how the ERA has perceived the Wright MRP over time, and the justifications it has provided for its recent change in methodology.

In its 2015 rail decision, the ERA considered that the Wright MRP provided a strong indicator for the likely return on equity for the next 50 years.[456] This was based on

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452 ERA (2016). Final decision on proposed revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016-2020, 30 June.

453 ERA (2015b), p.249.

454 ERA (2015b), p.248.

455 ERA (2018). Final decision on proposed revisions to the access arrangement for the Western Power network – Appendix 5: Return on regulated capital base, 20 September.

456 ERA (2015), p.145.

statistical evidence in support of mean reversion for the return on equity. Using Dickey-Fuller and Engle-Granger statistical tests for unit roots and cointegration, the results indicated that:

- The market return on equity was a stationary series
- Bill and bond yields were non-stationary
- The MRP was likely to be non-stationary, although the evidence was mixed.

In essence, this implied that the return on equity was observed to be constant over time, while the risk-free rate was not, leaning to the conclusion that the MRP must vary over time. These findings offered empirical support for the Wright MRP and led to its subsequent use in ERA decisions.

In its final decision on the 2018 Rate of Return Guidelines published in December, the ERA has confirmed that it will no longer have regard to the Wright approach when calculating the MRP. The ERA attributes the decision not to continue using the Wright MRP primarily to analysis by Partington and Satchell for the AER.

In their 2017 report, Partington and Satchell considered that the MRP is likely to be lower than its long run historic mean.[457] They contend that the cost of equity in the Australian market has decreased since 2013, but that the MRP has remained constant. In reviewing the empirical evidence, Partington and Satchell did not find it compelling that the MRP should be estimated as the long run mean return on the market less the current risk-free rate (i.e. the Wright approach), as opposed to simply calculating the long run average MRP (i.e. the Ibbotson approach).

In reviewing the ERA's analysis, Partington and Satchell identified a series of issues:

- A random walk, as indicated by the findings of a unit root test, is not the only notion of non-stationarity, such that there are time series that are non-stationary, yet not random walks.
- The non-stationarity detected for bill and bond yields was possibly attributable to high inflation between 1973 and 1986, and therefore real yields may have been a more suitable candidate for unit root and cointegration testing.
- It may have been more ideal to perform the econometric analysis on all of the variables in levels (i.e. prices) rather than on first differences (i.e. the change in prices).

457 Partington, G. & Satchell, S. (2017). Report to the AER: Discussion of estimates of the return on equity, 12 April.

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Specifically, Partington and Satchell remark that if the conclusions relied upon by the ERA "did not apply, then it would substantially weaken the ERA case for using the mean return on equity rather than the mean MRP."[458]

In principle, we do not disagree with Partington and Satchell's technical appraisal of the ERA's econometric analysis. The high inflation in the 1970s and 1980s may well have led to the detection of a random walk, and it is more conventional to test for cointegration using variables in levels rather than in first differences.

Synergies has previously endorsed the ERA's use of the Wright MRP, but not exclusively based on the unit root testing that the ERA conducted. In other words, we consider that the evidence in support of the Wright MRP approach is in no way conditional on whether or not the MRP is found to be stationary through unit root and cointegration testing.

In essence, the argument being put forward by Partington and Satchell and the ERA is that the recommended refinements to the unit root and cointegration testing may ultimately reveal that the MRP is a stationary time series. Such a finding, however, would not necessarily be inconsistent with the application of the Wright MRP. Specifically, what stationarity implies is that a time series is mean-reverting.[459] This does not stipulate that a time series must take the exact same value in each and every time period. For instance, GDP growth (as opposed the level of GDP itself) is typically a stationary series for most countries, but annual growth rates can still vary significantly from year to year in proportional terms.

Shocks may cause a stationary series to deviate in the short run from its long-run average. Shocks may also be prolonged by the tendency for economic cycles to not be perfectly correlated; for example, there may be a lack of synchronisation between cycles in equity market valuations, observed returns and risk-free rates in the short term. With the property of stationarity though, the impact of such shocks on the series will eventually die down, allowing the variable to revert to its long-run mean.

Applying this rationale to the context of the MRP, the return on the market less the risk-free rate could be stationary in the long run. However, in response to macroeconomic shocks (such as the persistently low interest rates in the aftermath of the GFC, particularly in the context of the current macroeconomic environment in Australia, which will see accommodating monetary policy for some time), the MRP may deviate

458 Partington & Satchell (2017), p.41.

459 Partington & Satchell note that "stationarity and mean reversion are not necessarily the same thing and compatibility between them requires the imposition of various assumptions on the behavior of the time series under consideration." We accept this, but consider that these assumptions are not likely to be contentious in the present context.

from a long-run average, until such a time as these shocks begin to dissipate. Consequently, the potential stationarity of the MRP does not preclude the use of the Wright approach under present market conditions.

If the risk-free rate is sufficiently high, estimates from both the Ibbotson and Wright MRP approaches will be similar (i.e. in the event that the spot risk free rate resembles the historical average). Furthermore, when the risk-free rate is above its long-run average it is possible for the Ibbotson MRP to be higher than the Wright MRP. This is precisely the purpose of the Wright MRP. It reflects the phenomenon that the MRP tends to increase during periods of low interest rates, but corrects back once interest rates return to levels around the average risk-free rate from the Ibbotson MRP calculation. This is reflected in the relatively stable TMR estimates that we observe in recent independent expert reports.

In separate comments, Partington and Satchell claimed in 2016 that:[460]

> Current 10 year Australian bond yields are 40 basis points below the previous minimum, so we have struck a new minimum. However, we do not consider that the magnitude of current interest rates is so dissimilar to the past as to invalidate the historic MRP informing an estimate of the current MRP.

It is not entirely clear to which previous minimum Partington and Satchell are referring. Historical data from the RBA website extends back to July 1969. Prior to December 2008, the lowest recorded 10-year risk-free rate over that timeframe was 4.8% in June 2003, so the previous minimum being referred to is possibly a post-GFC minimum.[461] In any event, it is clear from the analysis contained in Section 6.1 that this observation cannot be sustained in the current environment.

If so, the argument above implies that the Wright MRP is not required because the risk-free rate is only marginally lower than it has been post-GFC. Yet the depressed risk-free rates resulting from the GFC, and particularly those currently prevailing, are precisely the reason why the Wright MRP is warranted.

If the cost of equity is to be informed (at least in part) by backward looking assessments of the MRP (as is normally the case) then the assessment of the MRP should recognise the average risk free rate over the period corresponding to the measurement period of the MRP – that is the TMR that was generated over that period. There is no evidence that the MRP has declined to the extent implied by the Ibbotson model assessed over a long term average when applied with contemporary risk free rates (which are currently at historical lows).

[460] Partington & Satchell (2016), p.25.

[461] For context, the current 10-year risk-free rate, while not at an all-time record minimum, is 0.90% (as at 31 March 2020)

It could instead be the case that Partington and Satchell are referring to interest rate history prior to 1969, but it would be difficult to draw parallels between the methods adopted for determining the MRP then and now.

We disagree with Partington and Satchell's comments that the Wright approach has no "well accepted theoretical support", "does not seem to be much used, if at all" and "runs contrary to the well accepted view that asset prices are inversely related to interest rates."[462]

Partington and Satchell's comments in no way justify combining a prevailing risk free rate with an historical (Ibbotson) MRP. We have presented a wide range of evidence from other economic regulators and financial practitioners that substantiates the principles behind the Wright MRP. This is in addition to our investigation of Connect 4 databases, where independent experts consistently assume risk free rates in excess of prevailing rates (see Chapter 6), which results in a "Wright-like" TMR. While this does not constitute an explicit adoption of the Wright approach per se, this has the end result of increasing the return on equity that these practitioners adopt.

B.1.3 AER

In its Explanatory Statement accompanying its Final Decision on the 2013 Rate of Return Guideline[463], the AER arrived at a range for the MRP of 5% to 7.5% (with historical averages informing the lower bound and DDM estimates the upper bound). It arrived at a point estimate of 6.5%, which was consistent with its post-GFC uplift previously applied under its Statement of Regulatory Intent. It set out its reasons based on the consideration of the relative strengths and weaknesses of each piece of evidence. It did not stipulate weights but stated that "greatest consideration" was given to historical averages, followed by the DDM estimates and then surveys.[464]

Unlike previously, the AER did not prescribe the MRP in its 2013 guideline, which reflected a view that it is likely to vary through time (although this does not imply that it is considered highly variable or volatile). However, it consistently applied an MRP of 6.5% in all decisions made under that guideline since it was finalised in December 2013.

However, the 2018 Rate of Return Instrument now applies an MRP of 6.1% for the duration of the review period.[465] This is a slight increase from the draft decision of 6.0%.

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[462] Partington & Satchell (2016), p.31.

[463] AER (2013b).

[464] AER (2013b), p.95.

[465] AER (2018). Rate of return instrument – Explanatory statement, December.

The 0.1% increase was attributable to the increase in the utilisation rate between the draft and final decisions. The AER no longer relies on the Wright approach to inform the overall return on equity.

B.1.4 ACCC

Based on its most recent WACC determination (the 2018 ARTC interstate access undertaking draft decision), the ACCC adopts an MRP of 6.0%.[466]

The ACCC considers that a long-term mean of historical premiums (i.e. Ibbotson) provides a robust estimate of the expected MRP because:[467]

- realised premiums are likely to fluctuate around a mean, and so a long-term mean based on a large number of historical observations is likely to be an accurate estimate of the expected MRP; and
- investors' current expectations of the MRP are likely to be strongly influenced by the observed historical difference between the returns to equity and bond holders.

The ACCC also considers that market surveys can inform estimates of the MRP, but does not have regard to DDMs.

B.1.5 QCA

The QCA applies five methods to estimate the MRP, being three forms of historical averaging (the Ibbotson, Siegel and Wright methods), survey evidence (including independent expert reports) and the Cornell DDM.

Having previously adopted an MRP of 6.5%, in its UT5 draft decision for Aurizon Network in December 2017, the QCA approved Aurizon Network's proposed MRP of 7%. The QCA stated that in light of stakeholder submissions, it reviewed its position on the Wright approach and will now give "more regard to estimates from the Wright method".[468] In reaching this conclusion, the QCA noted that its analysis suggesting greater stability in the MRP than the return on equity over time was "not determinative, given the limitations identified."[469] The QCA maintained this approach for both the

466 ACCC (2018). Australian Rail Track Corporation's 2018 Interstate Access Undertaking, 20 December.

467 ACCC (2018), p.130.

468 QCA (2017), p.493.

469 QCA (2017), p.493.

Seqwater Bulk Water Price Review 2018-21 in March 2018, and the UT5 final decision in December 2018.[470]

For the 2020 Queensland Rail Draft Access Undertaking, the QCA applied a 10-year risk-free rate instead of a risk-free rate matching the regulatory period.[471] The use of a higher risk-free rate led the QCA to decrease its MRP to 6.5% because its methodology relies in part on approaches that respond to changes in interest rates.

B.1.6 ESCOSA

In its June 2016 determination for SA Water, ESCOSA applied an MRP of 6%, expressing a preference for historical excess returns. It considers that the DDM approach is "potentially volatile and unreliable."[472] It also notes that this is the value it has applied to SA Water in previous determinations.

ESCOSA's 2020 draft decision for SA Water is an MRP estimate of 6%. This is consistent with the estimate used in 2013 and 2016. SA Water supported the use this MRP in its proposal. ESCOSA estimates a single 6% figure for the market risk premium based on long-run data, to be used as a forecast for the regulatory horizon, and applies as a premium over the 10-year risk-free rate.[473] The final determination is not expected until early June 2020, after PoM is required to submit its TCS.

B.1.7 Essential Services Commission (Victoria)

The ESC does not have any formal guidelines in place that outline its approach to assessing WACC.

We note that in its June 2016 Melbourne Water decision it applied an MRP of 6%, which was originally contained in a Guidance Paper.[474] The reasoning behind this was not provided. It reflects a preference for relying on historical excess returns to estimate the MRP.

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470 The QCA identified the following "statistically defensible" weights for each of its methodologies: Ibbotson (25%); Cornell DDM (25%); Siegel (15%); Wright (15%); Surveys (20%).

471 QCA (2020). Queensland Rail's 2020 draft access undertaking – Decision, February.

472 ESCOSA (2016). SA Water regulatory determination – Final determination, June, p.124.

473 ESCOSA (2020). SA Water Regulatory Determination 2020 - Draft Determination: Statement of reasons, March, pp.155-157.

474 ESC (2015). Melbourne Water 2016 price review, Guidance paper, March. We note that 6% was also applied to Goulburn Murray Water in its June 2016 decision, although for a different reason, which was the need for consistency with the ACCC's Pricing Principles for Price Determinations and Approvals under the Water Charge (Infrastructure) Rules 2010. These Pricing Principles prescribe an MRP of 6%.

B.1.8 Office of the Tasmanian Economic Regulator (OTTER)

The Economic Regulator currently sets its MRP at 6.5%. It had previously used an MRP of 6% for TasWater's first and second regulatory periods. For the third price determination completed in March 2018, the Economic Regulator accepted TasWater's proposal that all state-owned regulated network monopolies should have the same MRP.[475] As the AER had applied an MRP of 6.5% for TasNetworks, the Economic Regulator elected to apply the same MRP for TasWater.

B.1.9 Independent Competition and Regulatory Commission (ICRC)

The ICRC also currently sets its MRP at 6.5%. The most recent evidence for its stance on this parameter comes from its final report on regulated water and sewerage services prices for Icon Water.

As the ESC noted in its interim commentary, the ICRC had regard to the range of MRP estimates adopted by other Australian economic regulators in reaching its decision. On this point, the ICRC noted that:[476]

> Most Australian regulators use a range of methodologies to arrive at a preferred estimate of the market risk premium. The AER, ERA, IPART and the QCA have completed major reviews of their WACC methodologies in recent years and used a range of information to establish a preferred market risk premium.
>
> Such practices effectively recognize that there is no firm consensus on how the market risk premium should be estimated for regulatory applications.

For its final decision, the ICRC considered that the most recent AER decision available to it at the time (handed down in November 2017) provided the best estimate of the MRP. It noted elsewhere that:[477]

> The practice of using a range of methods and models, provided they have credibility, is more appropriate when there is uncertainty about a parameter, as recognised by the Australian Competition Tribunal in endorsing the AER approach.

The ICRC has not published any further decisions since May 2018, so it is not clear whether its support extends to the value of 6.1% that the AER will now apply in its Rate of Return Instrument.

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475 OTTER (2018). 2018 water and sewerage price determination investigation, p.169.

476 ICRC (2018). Regulated water and sewerage services prices 2018-23, Final report, May, p.109.

477 ICRC (2018), p.112.

B.2 Market surveys

Fernandez's surveys

This section summarises earlier iterations of the Fernandez et al. surveys introduced in Section 6.2.4.

Of the surveys frequently cited by regulators is one conducted by the Spanish academic Pablo Fernandez. Frontier Economics (2016) raised the concern that this source consistently reports an MRP in the range of 6%, regardless of the conditions in financial markets.[478]

However, in the 2017 Fernandez et al. survey, the average (median) MRP was estimated to be 7.3% (7.6%) for Australia.[479] In a report for the QCA, Lally (2017) argued that this Australian MRP estimate was higher than any other developed country in the survey (other than Portugal) and that the sample size was relatively small (26 responses, roughly one third of the previous year's responses).[480] Thus, there are substantial issues regarding how much weight can be placed on evidence from market surveys.

The 2018 Fernandez et al. survey reported an average (median) MRP of 6.6% (7.1%), a slight decrease from the 2017 results.[481] The 2018 survey was based on 74 responses, a sample size more in line with previous years. The survey also samples the average and median risk-free rate used in each country. For Australia, the average (median) risk free rate was 3.1% (3.0%), substantially above the observed 10-year Commonwealth Government bond yields that prevailed during the course of the year. The average (median) required return to the market (the risk-free rate plus MRP) in the sample was 9.7% (10.0%).

The 2019 Fernandez et al. survey[482] reported an average (median) MRP of 6.5% (6.1%) for Australia, a decrease from the 2018 results. The 2019 survey for Australia was based on 54 responses. The survey also samples the average and median risk-free rate used in each country. For Australia, the average (median) risk free rate was 2.8% (2.8%),

[478] Frontier Economics (2016). The market risk premium: Report prepared for Aurizon Network, November.

[479] Fernandez, P., Pershin, V. & Acin, I.F. (2017). Discount rate (risk-free rate and market risk premium) used for 41 countries in 2017: a survey.

[480] Lally, M. (2017). Review of submissions from Frontier Economics on the WACC for Aurizon Network. 8 November, p.19.

[481] Fernandez, P., Pershin, V. & Acin, I.F. (2018). Market risk premium and risk-free rate used for 59 countries in 2018: a survey.

[482] Fernandez, P., Martinez, M. & Acin, I.F. (2019). Market risk premium and risk-free rate used for 69 countries in 2019: a survey.

substantially above the observed 10-year Commonwealth Government bond yields that prevailed during the course of the year. The average (median) required return to the market (the risk-free rate plus MRP) in the sample was 9.2% (8.7%).[483]

Respondents are identified as managers of companies, analysts, regulators and professors, with details obtained from previous correspondence, papers and websites of companies and universities, but there is no further information presented about the specific qualifications of these respondents.[484] The survey does not ask respondents for what purpose they are using their estimate of the MRP.

Asher and Hickling Surveys

Regulators including the ACCC have also relied upon the Asher and Hickling *Equity Risk Premium Surveys*.[485] In a summary of the survey results, Asher and Carruthers (2016) discuss the methods that survey respondents use for determining their MRP estimates:[486]

> Most people (52%) used a variety of methods for determining the equity risk premium, with forward looking measures (21%) more prevalent than historical data (17%) for the rest. The methodology for determining the ERP ranged from detailed modelling to "gut feel based on 40 years' experience". Gut feel has a bad name in some quarters … but only time will tell which method proves to be most accurate.

KPMG Australian Valuation Practices Survey

This section summarises earlier iterations of the KPMG valuation surveys introduced in Section 6.2.3.

With regard to the 2015 KPMG Australian Valuation Practices Survey, 40% of participants state that they 'always' adjust the CAPM rate of return by a premium, to reflect unique risks that are not modelled in the forecast cash flows.[487] The remaining 60% report doing this at least 'sometimes', while no respondent stated that they 'never' make an adjustment. In terms of the methodology used to adjust the CAPM rate of

483 The 2019 survey asked respondents to report the parameters they used in 2019. Thus, no specific point in time is specified as in the KPMG survey. However, Fernandez et al. (2019) report that they initially sent out emails to survey participants in February 2019, and responses were collated by 22 March 2019.

484 Fernandez, P., de Apellaniz, E. & Acin, J.F. (2020). Market risk premium and risk-free rate used for 81 countries in 2020, p.12.

485 See, for example: ACCC (2018). Australian Rail Track Corporation's 2018 Interstate access undertaking – Draft decision, pp.131-132; AER (2019). Rate of return annual update, December, p.15.

486 Asher A. and Carruthers, D. (2016). Equity risk premium survey 2015, Actuaries Digital, Available from: https://www.actuaries.digital/2016/05/26/equity-risk-premium-survey-2015/ [Accessed 4 May 2017].

487 KPMG (2015). Australian valuation practices survey 2015, May, p.21.

return, 13% of respondents relied solely on the historic equity bond spreads, 26% relied solely on the expected premium, while the majority (61%) used a combination of the two.

No survey was conducted in 2016, but the 2017 survey provides useful insights into the approaches of financial practitioners. KPMG found that:[488]

> Australia's current low-interest environment has resulted in some valuers adjusting the market risk premium upwards by either 0.5% or 1.0%. However, 6% remains the most commonly adopted market risk premium for Australia.

In regard to the determination of the risk-free rate, KPMG reported that the 10-year government bond yield remained the most common source for the Australian risk-free rate. However, compared to the previous 2015 survey, approximately a third of respondents applied an adjustment to the 10-year government bond yield, whereas none had explicitly reported doing so previously.[489] Out of 37 respondents, more than half applied a risk-free rate in excess of 3% and 40% of respondents adopted a risk-free rate of 4% or higher. In contrast to more recent KPMG surveys, the 2017 report was not specific about when participants were surveyed, but at the time of publication the 10-year risk-free rate was 2.64%. This suggests that practitioners had been applying material uplifts to the contemporaneous risk-free rate.

The 2018 iteration of the survey also surveyed respondents on the risk-free rates and MRPs that they applied.[490] The survey found that the majority of respondents (54%) adopted an MRP between 6.0% and 6.5%.[491] Only 5% of survey participants had change the MRP that they adopted in the preceding 12 months. The most common risk-free rate range adopted by practitioners was 2.5% to 3%, implying an overall TMR range of 8.5%-9.5%.[492]

Other commentary on surveys

The Australian Competition Tribunal has also raised concerns about the use of market surveys:[493]

> Surveys must be treated with great caution when being used in this context. Consideration must be given at least to the types of questions asked, the wording of

488 KPMG (2017). For all it's worth – Valuation practices survey 2017, July, p.11.

489 KPMG (2017), p.10.

490 KPMG (2018). It is worth taking note – KPMG valuation practices survey.

491 KPMG (2018), p.11.

492 KPMG (2018), p.10.

493 Application by Envestra Ltd (No 2) [2012], ACompT 3, para. 162-163.

> those questions, the sample of respondents, the number of respondents, the number of non-respondents and the timing of the survey. Problems in any of these can lead to the survey results being largely valueless or potentially inaccurate.
>
> When presented with survey evidence that contains a high number of non-respondents as well as a small number of respondents in the desired categories of expertise, it is dangerous for the AER to place any determinative weight on the results.

In a report to Corrs Chambers Westgarth, McKenzie and Partington list several shortcomings associated with surveys:[494]

- Selecting an appropriate survey group that is representative of actual investors.
- Low response rates, and the extent to which survey authors deal with response bias.
- The lack of justification for respondents' claims
- The effect of question wording on responses – ambiguity can lead to diverse responses
- How respondents adjust their opinions in relation to changing market conditions

B.3 Overview of dividend discount models (DDMs)

B.3.1 DDMs used by IPART[495]

Damodaran (2013)

Professor Damodaran annually publishes implied MRP estimates for the US market using the S&P 500 Index. Following Damodaran (2013), IPART assumes that:

- The expected dividends over the next 5 years are estimated using the geometric average of the expected growth rates over the next 5 years.
- Growth rates for years 1 and 2 are estimated using analysts' earnings per share (EPS) forecasts for the companies in the index for 1 and 2 years ahead.
- The growth rates in years 3 and 4 are estimated assuming a linear decrease (or increase) in the growth rate from the growth rate in the second year to the constant growth rate of g in year 5.

[494] McKenzie, M. and Partington, G. (2011), p.19.

[495] IPART (2013). Review of WACC methodology – Research – Final Report, December, pp.33-34

- After 5 years, the growth rate reverts to the long-term constant growth rate, g.
- As in all of IPART's MRP models, g is assumed to be 5.5%, which is equal to the expected long-term nominal growth rate of the Australian economy.

The equation for the Damodaran (2013) approach is shown in Figure 24.

Figure 24 Damodaran (2013) MRP equation

$$P_0 = \sum_{t=1}^{t=5} \frac{E(D_t)}{(1 + MRP + r_f)^t} + \frac{E(D_6)}{(MRP + r_f - g)} \frac{1}{(1 + MRP + r_f)^5}$$

Data source: IPART

Bank of England (BoE, 2002)

As explained by IPART, the purpose of BoE (2002) was not to derive implied MRPs, but to value the FTSE 100 Index using a DDM. This methodology assumes that the FTSE 100 Index grows at a different rate from the long-term constant growth rate for the first 12 years. Its model consists of 3 phases:

1. In Phase 1, dividends are expected to grow at a constant rate given by analysts' forecasts for long-term growth (g_{LTG}) for the first 4 years.
2. During Phase 2, the dividend growth rate declines (or increases) in a linear fashion until year 12.
3. In Phase 3, from year 12 on, dividends are assumed to grow at a constant rate, g.

BoE (2002) applies the simplified formula in Figure 25, which is given by Fuller and Hsia (1984).[496]

Figure 25 BoE (2002) MRP equation

$$P_0 = \frac{D_0}{(MRP + r_f) - g} [(1 + g) + 8(g_{LTG} - g)]$$

Data source: IPART

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496 Fuller, R.J. & Hsia, C. (1984). A simplified common stock valuation model. Financial Analyst Journal, 40, pp.49-56.

Bank of England (BoE, 2010)

In its quarterly bulletin for Spring 2010, the Bank of England extends its previous work on valuation. In the BoE (2010) methodology:

- Growth rates for years 1, 2 and 3 are estimated using analysts' EPS forecasts on the index for 1 year, 2 years and 3 years ahead.
- The growth rate in year 4 is given by the analysts' long-term growth rate forecast.
- After 4 years, the growth rate reverts to the long-run constant growth rate of g.

IPART explains that the DDM of BoE (2010) is similar to Damodaran (2013) in the sense that dividends grow for a certain number of years at a different rate to a long-term constant growth rate and then reach a constant growth stage.

The BoE (2010) equation is shown in Figure 26.

Figure 26 BoE (2010) MRP equation

$$P_0 = \sum_{t=1}^{4} \frac{E(D_t)}{(1 + MRP + r_f)^t} + \frac{E(D_5)}{(MRP + r_f - g)} \frac{1}{(1 + MRP + r_f)^4}$$

Data source: IPART

B.3.2 ERA two-stage model

The ERA's DDM is based on a two-stage methodology as shown in Figure 27.[497]

Figure 27 ERA two-stage DDM equation

$$P_0 = \frac{m \text{ x } E(D_0)}{(1+k)^{m/2}} + \sum_{t=1}^{N} \frac{E(D_t)}{(1+k)^{m+t-0.5}} + \frac{\frac{E(D_N)(1+g)}{k-g}}{(1+k)^{m+N-0.5}}$$

Data source: ERA

[497] ERA (2016). Final decision on proposed revisions to the access arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016-2020 – Appendix 4 Rate of Return, 30 June, p.115.

- P_0 is the current price of the equity index;
- m is the fraction of the current year remaining;
- $E(D_0)$ is the dividend per share expected in the current year
- $E(D_t)$ is the dividend per share expected t years into the future
- k is the return on equity implied by the model
- N is the year of the furthest out dividend forecast; and
- G is the long run dividend growth rate (which the ERA assumes to be 4.6%)

The ERA sources monthly net dividend per share forecasts for the All Ordinaries Index from Bloomberg for the current year, the next year and the year after. The monthly closing price for the All Ordinaries index was also sourced from Bloomberg.[498]

B.3.3 QCA Cornell MRP

As outlined by the QCA, Cornell (1999) argues that the short-run forecasts of the dividend growth rate are materially higher than reasonable estimates of the long-run growth rate in GDP, which introduces an inconsistency. Specifically, while existing companies' dividends might grow faster than the economy for several years, such a situation is unsustainable on an indefinite basis. This is because dividends in absolute terms would eventually overtake GDP in absolute terms, and this outcome is considered to be impossible.[499]

Accordingly, Cornell (1999) argues that there must be some type of convergence of short-run growth rates to the long-run growth rate of the economy over a period of time. Cornell (1999) suggests a period of 20 years, but the correct convergence period is unknown. As a result, assumptions must be made about the number of years until convergence and the type of transition path.

The QCA calculates six MRP estimates, three assuming a 10-year convergence period, and three assuming a 20-year convergence period. For each convergence period, the QCA generates estimates based on long-run growth rates of 4.0%, 4.6% and 5.1%. Its point estimate is based on the median of these six estimates.[500]

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498 Although we have sourced all data used in the DDMs from Bloomberg, some data, such as the closing prices for the All Ordinaries or the ASX200, could also potentially be extracted from publicly available sources.

499 Cornell, B. (1999). The Equity Risk Premium: The Long Run Future of the Stock Market, John Wiley & Sons, New York, New York, United States.

500 QCA (2014). Cost of capital: market parameters – Final decision

The QCA's Cornell MRP formulation is shown in Figure 28.

Figure 28 QCA Cornell MRP equation

$$P_m = \sum_{t=1}^{N} \frac{DIV_m(1+g_1)\ldots(1+g_t)}{(1+r_m)^t} + \frac{\frac{DIV_m(1+g_1)\ldots(1+g_N)(1+g)}{r_m-g}}{(1+r_m)^N}$$

Data source: QCA

B.4 Arithmetic and geometric averaging by Australian regulators

B.4.1 Australian Energy Regulator

The AER states that it places more weight on arithmetic averages than geometric averages.[501] Although the AER openly acknowledges that geometric averages are downwardly biased, it nevertheless relies on them to select a point estimate towards the bottom of the range defined by arithmetic averaging over different time periods.[502] This also exerts downward pressure on the AER's MRP estimate relative to Synergies' calculations.

The AER considers arithmetic averages of historical excess returns (HER) are the most robust source of evidence for estimating the MRP.[503] However, the AER does not entirely disregard geometric averages. The AER considers that combining both approaches, with more weight on the arithmetic average, is more likely to arrive at an unbiased estimate than exclusively using either method.[504]

Accordingly, AER gives more weight to the arithmetic average, but uses the geometric average to highlight when high returns over certain periods may be driven primarily by high volatility and to set a floor when viewing the range of potential results from the HER. For instance, in 2018 the AER said the data from HER shows:[505]

- The range given by arithmetic averages for different sample periods is 6.0 per cent to 6.6 per cent. The two longest sample periods provide arithmetic averages of 6.3

501 AER (2018). Rate of return instrument, Explanatory statement, December, p.94.

502 AER (2018). Rate of return instrument, Explanatory statement, December, p.94.

503 AER (2018). Rate of return instrument, Explanatory statement, December, pp. 89-90, 94, 244, 250-253.

504 Partington & Satchell, Report to the AER, November 2018, pp.29-31.

505 AER (2018). Rate of return instrument – Explanatory statement, December, p.94.

and 6.0 per cent. The most recent, 30 year, period (which is also the shortest period from 1987) produces an arithmetic average estimate of 6.1 per cent and is most likely to reflect current prevailing conditions.

- Geometric averages indicate a range of 4.2 to 5 per cent. The most recent, 30 year, period produces a geometric average estimate of 4.6 per cent. AER said these geometric averages indicate the forward looking MRP value is most likely to be towards the bottom of the range given by the arithmetic averages.

AER considered that the evidence of a falling MRP over time[506] supports a forward looking MRP estimate of 6.1 per cent. AER noted the following strengths and limitations of the two estimates:[507]

- The arithmetic average is a mathematically unbiased estimator of future returns if yearly returns are independently and identically distributed and future returns are expected to have the same distribution. However, the AER noted debate as to the independence of returns from year to year and the uniformity of the distribution over time, as shown by trends in long-term data.[508] Changes in volatility, alongside the issue of autocorrelation in historic returns, could also affect the arithmetic average's quality as an unbiased estimator. On this basis, the AER concluded it was not clear that using solely the arithmetic average of historic results will provide an unbiased estimation of future excess returns.

- The geometric average is downwardly biased, but is most useful when considering returns over a longer period or highlighting periods of differing volatility. Academic results have shown that as the investment horizon increases, results from the geometric average become closer to the unbiased estimator than the arithmetic average.[509] In addition, the AER had regard to evidence that, with shorter sample periods, increasing weight should be placed on the geometric results in order to reach an unbiased estimate.[510]

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506 The AER was of the view that there is evidence that excess returns are trending down over time. AER noted that the theory supporting this trend is that as investing in a global portfolio becomes easier and investors are able to achieve greater diversification, the risk premium is likely to fall as systematic risk is diversified away. It gives some weight to the theory that the equity risk premium is likely to be lower now than the long run historic average.

507 AER (2018), p.90.

508 Bianchi, Drew & Walk, *The Unpredictable Equity Risk Premium*, November 2015; Partington & Satchell, Report to the AER, November 2018, p. 29-31

509 Blume ME, *Unbiased Estimators of Long-Run Expected Rates of Return*, Journal of the American Statistical Association, vol. 69, 1974, pp. 634–638; Jacquier E, Kane A, Marcus AJ, *Geometric or Arithmetic Mean: A Reconsideration*, Financial Analysts Journal, 59, pp.46- 53.

510 Partington & Satchell, Report to the AER, November 2018.

The AER also noted the following evidence:

- Blume (1974) and Jacquier et al. (2003) show that where the holding period is more than one year, then the arithmetic mean of one year returns is an upward biased measure.[511]
- Partington and Satchell (2018) detail that the autocorrelation shown in historic returns can increase the biases of both the geometric and arithmetic averages.[512] They show that to construct an unbiased estimate using historical returns, most weight should be given to the arithmetic average but with some weight assigned to the geometric average. They cited other academic work highlighting weight assigned to the geometric average should increase as the sample period selected decreases.

In a report for the AER, Dr Martin Lally's view was that if historical average returns are used, they should be arithmetic rather than geometric averages.[513] The AER's belief that geometric averages are useful apparently arises from a belief that there is a compounding effect in their regulatory process, and therefore the analysis of Blume (1974) and Jacquier et al (2003) applies. However, Lally did not consider that there is any such compounding effect in regulatory situations and the absence of a compounding effect leads to a preference for the arithmetic mean over the geometric mean.

B.4.2 Economic Regulation Authority (ERA)

The ERA adopts a simple average of the lowest arithmetic and highest geometric means across different averaging periods to estimate the lower bound of the historic market premium. The ERA justifies this on the basis that "an arithmetic average will tend to overstate returns, whereas a geometric average will tend to understate them."[514] In our view, the ERA's proposed remedy is likely to understate the true MRP as well.

The ERA's view was that an unbiased estimate of the historical market risk premium was likely to be somewhere between the geometric average and the arithmetic average. In the 2019 final determination for rail WACCs, the ERA took the average of the lowest

[511] Blume ME, Unbiased Estimators of Long-Run Expected Rates of Return, Journal of the American Statistical Association, vol. 69, 1974, pp. 634–638; Jacquier E, Kane A, Marcus AJ, Geometric or Arithmetic Mean: A Reconsideration, Financial Analysts Journal, 59, pp. 46-53.

[512] Partington & Satchell, Report to the AER, November 2018, p.29

[513] Lally, M. (2012). The cost of equity and the market risk premium, July.

[514] ERA (2018). Final gas rate of return guidelines – Explanatory statement. 18 December, p.178.

arithmetic mean (5.99 per cent) and the highest geometric mean (5.13 per cent) to develop an estimate of the historic market risk premium of 5.6 per cent.[515]

The ERA recognised that there were mixed views as to the best averaging technique to apply when estimating the historic market risk premium. However, the ERA's concern was how best to estimate a market risk premium, noting an often-overlooked presumption is that the forecaster knows the true values of the statistical parameters. In practice these are estimated, and even using the best estimation techniques, the estimators are subject to sampling error. It is this variability of returns, or sampling error, that causes a level of bias in both arithmetic and geometric means. Therefore, to determine a forward estimate of the market risk premium, one must recognise these biases.

The ERA noted the following views:

- Blume (1974), also cited by the AER, showed that:[516]
  - Compounding the arithmetic average of one period returns gave an upwardly biased estimate of expected return over N periods.
  - Compounding the geometric average of one period returns underestimated the expected return over N periods when the sample period T exceeds N.
  - An unbiased estimate of the expected N period returns lay between the compounded value of the arithmetic mean and the geometric mean.
- Indro and Lee (1997)[517]:
  - Confirmed Blume's finding that biases existed in the use of arithmetic and geometric averages.
  - Found that biases tended to be exacerbated in the presence of autocorrelation in returns.
  - Found that bias arising from the use of the arithmetic average increased as the investment horizon lengthened and as the volatility of the returns increased.
  - Found that bias arising from the geometric average increased as volatility of returns increased.

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515 ERA, August 2019, Final Determination - 2018 and 2019 Weighted Average Cost of Capital For the Freight and Urban Networks, and the Pilbara Railways, pp. 39-42

516 Blume, M., 'Unbiased Estimators of Long-Run Expected Rates of Return', *Journal of the American Statistical Association*, vol. 69, 1974, pp. 634-638.

517 Indro, D. and Lee, W. 'Biases in arithmetic and geometric averages as estimates of long-run expected returns and risk premia', *Financial Management*, vol 26, 1997, pp. 81–90.

- Lally (2013)[518] detailed that the arithmetic mean was consistent with the "present value principle."
- McKenzie and Partington (2012):[519]
  - used findings from various academic studies to support their view that the unbiased estimator of the market risk premium lay between the arithmetic average and the geometric average. For example, they cited Indro and Lee (1997) and Jacquier et al. (2003), who concluded that arithmetic returns were upwardly biased and geometric returns were downwardly biased.[520]
  - considered that the strength of the estimator of the historic market risk premium should also be taken into consideration, together with its unbiasedness. Strong estimators have lower standard errors and so are more precise. They cite findings from Jacquier et al. (2003) that compounding using the estimated arithmetic average return gave results that were not only upwardly biased, but also highly inefficient.
  - consistent with Blume (1974), considered that: First, when compounding the arithmetic mean over time, it was the sampling error in the measurement of the arithmetic mean return that caused the upward bias in the expected return. Second, with a finite sample of returns, there was an upward bias when the arithmetic average was compounded over more than one period.
- Partington and Satchell's (2018)[521] advice to the AER (but also cited by the ERA) was that:
  - The AER's objective is to determine the rate of return that investors expect in equilibrium, and investors do compound returns. Whether or not the AER compounds returns is not a relevant issue.
  - Since the unbiased estimate of the expected return for a long-term investment is bounded by the arithmetic and geometric averages, both are relevant to the determination of the market risk premium for a long horizon investment.

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518 Lally, M., *Review of the AER's Methodology for the Risk Free Rate and the Market Risk Premium*, March 2013, p. 40.

519 McKenzie, M. and Partington, G., *Supplementary report on the equity market risk premium, a report to the AER on behalf of the Securities Industry Research Centre of Asia-Pacific (SIRCA) Limited*, February 2012, p. 6.

520 Jacquier, E., Kane, A. and Marcus, A., 'Geometric or Arithmetic Mean: A Reconsideration', *Financial Analysts Journal,* vol 59, 2003, pp. 46-53.

521 Partington, G. and Satchell, S., *Report to the AER: Discussion of Submissions on the Draft 2018 Guideline,* November 2018, pp. 29-34.

– Some weight should be attached to the geometric return and that weight should be greater the more the concern for accuracy relative to unbiasedness.

Partington and Satchell (2018) did not propose a weighting between arithmetic and geometric averages, and considered a regulator needs to exercise judgement in making a determination on the weight.

ERA concluded that:[522]

- When compounding the arithmetic averages over time, sampling error can cause an upward bias.
- Geometric average can understate returns as it is based on a constant compounding, which does not account for actual variability of returns over time.
- Given the volatility of returns over time, an investor may consider different investment horizons.
- An unbiased estimate of the historical market risk premium is likely to be somewhere between the geometric average and the arithmetic average.

The ERA, therefore, sought to minimise any error with over-reliance on one of the two types of average by continuing the even weighting of the arithmetic and geometric means.

B.4.3 QCA (2014)

The QCA does not consider geometric means are consistent with applying the CAPM in a regulatory context.[523] The QCA noted that the geometric mean measures changes in wealth over more than one period using a buy-and-hold strategy (with dividends reinvested). If the average investor rebalances his portfolio each period, the arithmetic mean would provide a better measure of typical performance over a single historical period (Carleton and Lakonishok, 1985: 39)[524].

In the context of the cost of capital, Patterson notes that Ibbotson and Sinquefield state (Patterson, 1995: 109)[525]:

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522 ERA (2019). 2018 and 2019 weighted average cost of capital for the freight and urban networks, and the Pilbara railways – Final Determination, 22 August, p.42.

523 QCA (2014). Final decision, Cost of capital: market parameters, August, pp. 58, 83.

524 Carleton, W & Lakonishok, J 1985, 'Risk and Return on Equity: The Use and Misuse of Historical Estimates', Financial Analysts Journal, vol. 41, no. 1, pp. 38–47, 62.

525 Patterson, C 1995, The Cost of Capital: Theory and Estimation, Quorum Books, Westport, Connecticut.

'"...the arithmetic mean equates the expected future value of an investment with its present value. This property makes the arithmetic mean the correct return to use as the discount rate or cost of capital"'.

The QCA noted that the AER placed some reliance on geometric means of the market risk premium (AER, 2013: 81)[526]. The AER views the arithmetic mean as biased in the context of discounting an expected multi-period cost of equity (AER, 2012: 23)[527]. To date, the QCA has considered that the arithmetic mean is the correct estimator as it is consistent with the concept of mathematical expectation of returns in the CAPM. In the further context of applying a building blocks methodology, Lally (2012) shows that only the arithmetic mean ensures that the expectation of the regulated asset's value equals the current regulatory book value. On this basis, Lally concluded that the AER's concern about bias in arithmetic means is unfounded.[528]

For these reasons, the QCA supports the arithmetic mean as the relevant estimator for averaging historical estimates of the market risk premium.

B.4.4 IPART

For its long-term MRP estimate, IPART adopts a midpoint of 6.0% from a range of 5.5% to 6.5%, based exclusively on historical arithmetic averaging.[529]

526 Australian Energy Regulator 2013, Better Regulation Explanatory Statement: Rate of Return Guideline, December.

527 Australian Energy Regulator 2012, Aurora Energy Pty Ltd 2012–13 to 2016–17 — Final Distribution Determination, Appendixes, April.

528 Lally, M 2012, The Cost of Equity and the Market Risk Premium, Report for the Australian Energy Regulator, 25 July, pp.31-32.

529 IPART (2018). Review of our WACC method – Final Report, February, p.88.

Synergies ECONOMIC CONSULTING

C Australian regulatory precedent on beta determination

The purpose of this attachment is to set out the relevant regulatory precedent for the assessment of an asset beta for Australian transport infrastructure companies. It focuses on the decisions of the following regulators:

- QCA
- ACCC
- IPART
- ERAWA
- ESC
- ESCOSA.

C.1 QCA

C.1.1 Approach to identifying relevant comparators

The QCA's approach is to identify comparators based on whether they are exposed to similar levels of systematic risk (that is, covariance of their returns with market returns) as the regulated entity's business. The QCA does not prefer the alternative approach of assigning weights to different industry groups selected on the basis of physical or operational characteristics that are similar to the regulated entity.[530]

The QCA undertakes a first principles analysis, that is, examines the relevance of industry, regulatory and market characteristics for the systematic risk of the regulated entity as well as of the proposed industry group comparators to establish appropriate comparators for the regulated entity.

For instance, in respect of DBCT, the QCA's view was that DBCT Management's systematic risk profiles is closely aligned with Aurizon Network's and with the regulated water and energy sectors.[531]

[530] The QCA articulated its approach in its most recent decision on Queensland Rail's 2020 draft access undertaking. See QCA, April 2019, Draft decision: Queensland Rail's 2020 Draft Access Undertaking, p. 134.

[531] QCA, November 2016, Final decision: DBCT Management's 2015 DAU, pp. 87, 103.

In the context of Queensland Rail (QR), the QCA considered it appropriate to define a lower and upper bound based on the first principles analysis, namely that QR's West Moreton coal asset beta is likely to be:

- greater than the asset beta of regulated energy and water businesses (QR more exposed to counterparty risk and volume risk)
- less than the asset beta of toll road businesses (QR less exposed to an economic shock and its regulatory regime provides a high level of revenue stability).[532]

C.1.2 Application – DBCT 2015 draft access undertaking

The QCA accepted its consultant's (Incenta's) analysis in respect of DBCTM's systematic risk profile and comparator analysis, in the context of DBCTM's 2015 draft access undertaking (DAU).[533]

Incenta's view was that DBCT's financial characteristics are more closely aligned to regulated energy and water businesses than to container ports, rail or coal companies, which are all much more sensitive to the economic cycle.[534] Incenta has previously drawn similar conclusions for Aurizon Network, which has typically been assigned a similar asset beta to that of DBCT. For instance, Incenta:

- did not consider that the best comparators for DBCT are commercial ports where the vast majority of the cargo is containers and other goods whose traffic (and hence revenue to the port) is sensitive to the economic cycle, unlike the product (metallurgical coal) handled by DBCT
- considered that the systematic risk of DBCT will be less than the asset beta of toll roads, because relative to DBCT, toll roads have greater revenue sensitivity (as they are not cost-base regulated and are more sensitive to economic cycles), do not have the protection of take-or-pay contracts, and have similarly low opex risk and stranding risk.

Incenta's view was that while the regulated energy and water industries do not share physical similarities with DBCT, it is the financial characteristics of firms and industries that determine their systematic risks.

[532] QCA, April 2019, Draft decision: Queensland Rail's 2020 Draft Access Undertaking, p. 28.

[533] QCA, November 2016, Final decision: DBCT Management's 2015 DAU, p. 87.

[534] Incenta, March 2016, DBCT 2015 DAU: Review of WACC parameters, pp. 15-47.

C.1.3 ACCC

C.1.4 Approach to identifying relevant comparators

The ACCC's approach is to identify comparators based on whether they are exposed to similar levels of systematic risk as the entity whose beta is being determined.

For instance, in the context of the Glencore-PNO arbitration, the ACCC's view was that ARTC's Hunter Valley rail network was an appropriate comparator because both PNO and ARTC's Hunter Valley rail network are highly dependent on thermal coal exports and are part of the same coal supply chain.

In the context of assessing beta for ARTC's 2008 interstate access undertaking, the ACCC's view was that overseas firms that provide the same type of service (below rail service) are appropriate comparators due to a lack of relevant below rail operators in Australia.

C.1.5 Application – Glencore/PNO arbitration[535]

The ACCC considered that PNO and ARTC's Hunter Valley rail network face a very similar risk profile. This is because both PNO and ARTC's Hunter Valley rail network are highly dependent on thermal coal exports. As such, the ACCC considered that its draft decision on ARTC's 2017 Hunter Valley access undertaking (HVAU) provides a strong indicator of the appropriate asset beta for PNO.

The ACCC considered a range of factors (including demand risk, stranding risk, contract duration and nature and cash flow risk) to form a view that the systematic risk faced by PNO was slightly higher compared to ARTC's Hunter Valley rail network.

C.1.6 Application – ARTC 2008 Interstate rail access undertaking[536]

In the beta assessment of ARTC's interstate network (2008), ACCC determined that the asset betas of Australian trucking, shipping and other non-rail service providers are not suitable proxies for ARTC's asset beta.[537]

535 ACCC, September 2018, Final Determination: Statement of Reasons, Access dispute between Glencore Coal Assets Australian Pty Ltd and Port of Newcastle Operational Pty Ltd, pp. 159-161. (https://www.accc.gov.au/system/files/public-registers/other/Glencore%20PNO%20access%20dispute%20-%20Final%20Determination%20-%20Statement%20of%20Reasons%20-%2018%20September%202018%20%28Public%20version%29.pdf)

536 The term of the 2008 Interstate rail access undertaking has been extended and it is due to expire on 30 June 2020 (https://www.accc.gov.au/regulated-infrastructure/rail/artc-interstate-access-undertaking)

537 ACCC (2008), p.154.

ACCC's view was that although these firms' betas are observable and have the desirable quality that they are Australian based transport businesses, the systematic risks of these types of transport investments are likely to differ markedly to that of a below rail service provider. For this reason, the ACCC focussed on non-regulated below rail operators operating overseas, principally in North America, to determine whether ARTC's proposed beta seemed reasonable. In its view, the use of overseas firms was necessitated by the lack of non-regulated below rail operators in Australia to use as proxy companies.

The ACCC acknowledged that North American railways may have higher market risk because they often compete with one another due to parallel infrastructure. The ACCC also noted that ARTC operates under some market demand and price constraints due to inter-modal competition. As such, it bears some market risk and if the economy does badly (or well) ARTC will lose (or gain) business and profits. On the contrary, the ACCC considered that a typical regulated business, such as electricity distribution or transmission, can simply raise prices if demand drops and, therefore, bears far lower market risk than ARTC. On balance, the ACCC considered that North American and other overseas rail operators' asset betas generally support ARTC's argument for an asset beta of 0.65 for its Interstate Rail Network.

C.1.7 Application – ARTC 2017 Hunter Valley access undertaking

The ACCC determined that an asset beta of 0.45, resulting in an equity beta of 0.94, was appropriate for the Hunter Valley Coal Network.[538] In coming to this view, the ACCC considered:

- the first principles of what an asset and equity beta represent
- the ACCC's view on asset beta in the Position Paper for the 2010 HVAU and changes since; and
- a comparison between Aurizon Network and ARTC's Hunter Valley network.

In regard to first principles analysis, the ACCC argued that one way a firm can reduce its asset beta is through decreasing its cyclicality (the strength of the positive correlation between a firm's earnings and the aggregate earnings of all real assets). To decrease the strength of this positive correlation, and therefore the asset beta, a firm can:

- hedge using financial derivatives or create natural hedges
- match revenues to cost or passing through costs to the consumers.

[538] ACCC (2017). Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking – Draft decision, 20 April, pp.149-158. (ARTC subsequently withdrew its undertaking, which meant that no final decision was ever published.)

For ARTC, the ACCC considered that the benchmark asset beta should first be selected based on comparable firms. Then, further adjustments should be made to this initial asset beta to account for systematic risk mitigating factors. In particular, the ACCC found that ARTC's ability to decrease its cyclicality was critical. ARTC's cash flows for the Hunter Valley Coal Network are regulated so revenue does not exceed Economic Cost and an unders and overs accounting mechanism applies through the annual compliance assessment. This led the ACCC to conclude that this implies a low degree of cyclicality for ARTC. In coming to a final asset beta, the ACCC considered this low degree of cyclicality in the context of comparable firms. Furthermore, the ACCC stated that ARTC should have an asset beta equal to or less than the 0.45 determined by QCA for Aurizon Network, as ARTC's cash flows are likely to be more stable than those of Aurizon Network.

C.2 IPART equity beta methodology review

On 1 April 2019, IPART initiated a consultation on its approach to estimating the equity beta. The review will cover pre-estimation screening rules, data quality and liquidity filters, and post-estimation screening rules. At the time of writing, IPART had invited submissions on its draft report that was released in March 2020. An overview of IPART's proposed framework is outlined in

Table 56. To a large extent, these steps resemble those already embedded in our own filtering process (e.g. removing firms with overly diversified revenues; excluding companies from China, Russia and some African exchanges; deleting firms with a high number of missing observations).

The draft decision for this review was released in March 2020.[539] In the draft decision, IPART announced a series of changes to its approach. These included the use of weekly rather than monthly returns when calculating beta; use of the Brealey-Myers levering formula instead of the Hamada formula; using average gearing over the sample period to de-lever equity betas rather than an end-of-period gearing estimate; and increasing the requirement that any proxy firm must have 60 months (i.e. 5 years) of available data, instead of only 36 months.

[539] IPART (2020). Estimating equity beta for the weighted average cost of capital – Draft report, March.

Table 56 IPART equity beta estimation sample selection methodology

Criteria	Procedure
1.0 Pre-estimation screening rules	To pass stage one, the selection of proxy companies must pass three characteristic screening tests and must operate in an industry that faces similar risk characteristics to the benchmark entity for which we calculate the WACC. If the industry sector is narrow, there may be few if any listed firms to observe. In those cases, IPART may examine upstream or downstream industries on which the benchmark entity relies.
1.1 Industry	**Does the firm operate in the nominated industry?**
What industry/s should be used to identify proxy firms?	The industry of the benchmark firm is often chosen as a broad proxy for the risk profile of that firm because all firms within a common industry group face the same or similar business risks. However, it is possible to broaden the scope of potential comparators (with the additional risk of bias) by including companies that operate under similar conditions in another industry from the benchmark firm. The Thompson Reuters Business Classification (TRBC) is one of many industry classification schemes. It divides publicly traded equities into 54 industries and 136 sub-industries. IPART used this scheme in its case study to estimate a water industry beta using the “Water” sub-industry definition.
1.2 Market	**Does the firm undertake their activities in capital markets that are sufficiently similar to Australia?**
	Sample firms must undertake their activities in capital markets that are sufficiently similar to Australia given the benchmark firm is Australian. IPART seeks to include markets that approximate Australia’s sovereign characteristics. IPART’s criteria to determine the comparability of international firms include: - Is the sovereign’s government bond market sufficiently deep and liquid compared to the benchmark firm’s capital market? - Is the sovereign’s equity market sufficiently deep and liquid? - Is the firm’s international headquarters consistent with their actual operating market? In IPART’s case study, it excluded companies that trade on the Chinese, Russian and African stock exchanges on the basis they exhibit sufficiently different sovereign characteristics to Australia which may bias the results.
1.3 Operating Profile	**Does the firm have a similar operating profile to the benchmark firm?**
Are firm revenues predominately in the nominated industry?	In terms of business structure, firms that should be included in the sample must have revenues that are predominately sourced from the nominated industry chosen for the benchmark firm. IPART nominated the ‘water’ sub-industry and have assumed the majority of firm’s revenue comes from activities related to water supply and treatment. Therefore, no adjustments to the sample size was made in this selection criteria.
2.0 Data quality and Liquidity filters	**Exclude firms with insufficient data and thinly-traded stocks according to three liquidity filters**
Data quality	To ensure accuracy and robustness, only firms with high quality data are kept in the sample. Firms are excluded from the sample if they: - Do not return an International Securities Identification Number (ISIN) since relevant data for the firm cannot be extracted - Do not return a market index code since the market in which the firm operates in cannot be identified - Are no longer trading
Beta estimation liquidity filters are applied as thinly-traded stocks could produce distorted estimates due to stale price data	1. Remove a monthly observation for a given stock if there is less than 10 days of trading data available in that month In IPART’s case study, only around 70% of the monthly observations for all companies have more than 10 days of trading data. 2. Remove a monthly observation for a given stock if the calculated Amihud measure exceeds the threshold of 25 The Amihud measure approximates the price impact of illiquidity and is used as a screening tool to remove a monthly observation for a given stock if the calculated Amihud measure exceeds the threshold of 25. This threshold value was benchmarked against historical equity returns data for the Australian stock market.

Criteria	Procedure
	3. Remove firm if it has less than 60 months of trading data available In IPART's case study, after applying the above filters, firms with less than 60 months of trading data are excluded from the sample because a time series of less than five years is too short to calculate a reliable medium-run beta estimate. A short time series represents a newly established firm, which is inconsistent with a mature benchmark firm. Short time series are also prone to measurement error, hence reducing reliability of results.
3.0 Post-estimation screening rules	The post-estimation screens focus on the equity beta outputs for the sample of individual firms, to ensure estimates are robust and appear unbiased. IPART would accept the proxy sample as final where: 1. The sample size is sufficiently large 2. Estimates appear to be consistent, with clear outliers excluded from the sample 3. There is no obvious bias in the results by comparing the equity beta estimates against other estimates from Bloomberg, Datastream and other comparable regulators or academic estimates

Source: IPART

C.3 ERA

C.3.1 Approach to identifying relevant comparators

The ERA has established beta estimates for Arc Infrastructure, the Pilbara railways and the Public Transit Authority.[540]

The ERA notes that choosing a relevant benchmark sample for these three entities is difficult due to the lack of close comparators of rail infrastructure trading on the Australian Stock Exchange. Only one directly comparable company is available in Australia, Aurizon, which was floated on the ASX in July 2010 as QR National. A single comparable firm leaves the Authority with an insufficient sample on which to estimate regulated cost of capital parameters.

The ERA is of the view that estimates of asset beta based on benchmark samples should ideally be relevant to the regulated rail businesses in Western Australia. In this context, the ERA considers that two aspects of relevance to a benchmark entity should be considered.

First, estimates of asset beta from the benchmark samples should provide some relevance to the economy in which the BEE is operating (in this case, the Australian economy). Second, these estimates should also provide some relevance to the industry/sector in which the efficient benchmark entity is operating (in this case, the rail industry).

540 ERA (2015a).

The ERA considers that a benchmark sample including only Australian businesses that are comparable with rail is preferred for the purposes of its empirical studies. However, the ERA's analysis indicates that there are insufficient rail businesses comparators operating in Australia. Given empirical estimates are the only viable option for estimating the asset beta for rail businesses, the ERA is of the view that a benchmark sample including both Australian and developed countries in Europe and America is appropriate.

In this context, the ERA follows the same structured process to determine its beta comparators for each of these regulated entities, which entails first identifying Australian comparators and then due to an insufficiently small sample, extending its search to include the most comparable international entities. The ERA recently released a draft determination for its 2019 draft determination. Its approach to beta is substantively similar to the 2015 methodology.

C.3.2 Arc Infrastructure (2015 and 2019)

The Arc Infrastructure network in the south-west of Western Australia is a freight rail network that primarily transports commodities such as iron ore, grain, coal, alumina and interstate freight.

The ERA considers that a firm must satisfy the following conditions in order to belong to the Arc Infrastructure benchmark sample:

- primarily involved in the transportation of goods across comparable distances;
- located in Australia or a similar developed economy;
- involved in the transportation of similar commodities to those transported on the Arc Infrastructure network (that is, bulk goods, but also general freight).

The ERA indicates that it applies the following filters in the Bloomberg terminal using the Equity Screening function, such that the comparator firm must:

- operate in an OECD country that has similar political, economic and geographical similarities to Australia;
- belong to the ICB (Industry Classification Benchmark) Subsector: Railroads; and
- provide sufficient pricing data to allow calculation of its equity beta and gearing.

In addition, the ERA has included comparator companies that were included in its previous WACC determinations for the Arc Infrastructure network.

The ERA considers that Aurizon is the closest comparator company to the Arc Infrastructure network in respect of its Australian operations and transport task. It is also listed. However, the regulatory regime differs between Arc Infrastructure and Aurizon in that Arc Infrastructure is subject to a negotiate-arbitrate regulatory regime, while the Aurizon network is subject to a revenue cap system. In addition, the use of only one comparator company may not adequately capture the risks faced by the Arc Infrastructure network.

The ERA has previously accepted advice that Australian and New Zealand transport companies are relevant to inform the required equity beta, credit rating and gearing for the Arc Infrastructure network. However, it considers non-rail operators to be less relevant proxy companies compared to rail network operators. Nevertheless, they provide some information of value, particularly given the small size of the sample, so are retained.

The ERA's beta comparators are presented in Table 57.[541] This sample of 11 comparators is reduced from the 15 comparators used in its rate of return decisions prior to 2015. The ERA removed Auckland Airports and Infratil (a NZ investment fund with investments in energy, transport and social infrastructure businesses) from the pre-2015 benchmark sample, as well as Macquarie Infrastructure Group. Aurizon Holdings has been added to the sample.

541 ERA (2015a).

Table 57 Comparator companies for Arc Infrastructure

Company Name	Country	Ticker	Company Description
Genesee & Wyoming	United States	GWR US Equity	Genesee & Wyoming Inc., through its subsidiaries, owns and operates short line and regional freight railroads and provides related rail services. The company also provides railroad switching and related services to United States industries with extensive railroad facilities within their complexes. Genesee operates in the United States and Australia.
Union Pacific Corporation	United States	UNP US Equity	Union Pacific Corporation is a rail transport company. The Company's railroad hauls a variety of goods, including agricultural, automotive, and chemical products. Union Pacific offers long-haul routes from all major West Coast and Gulf Coast ports to eastern gateways as well as connects with Canada's rail systems and serves the major gateways to Mexico.
Norfolk Southern Corporation	United States	NSC US Equity	Norfolk Southern Corporation provides rail transportation services. The Company transports raw materials, intermediate products and finished goods primarily in the Southeast, East and Midwest and, via interchange with rail carriers, to and from the rest of the United States. Norfolk Southern also transports overseas freight through several Atlantic and Gulf Coast ports.
Kansas City Southern	United States	KSU US Equity	Kansas City Southern, through its subsidiary, is the holding company for transportation segment subsidiaries and affiliates. The Company operates a railroad system that provides shippers with rail freight services in commercial and industrial markets of the United States and Mexico.
CSX Corporation	United States	CSX US Equity	CSX Corporation is an international freight transportation company. The Company provides rail, intermodal, domestic container-shipping, barging, and contract logistics services around the world. CSX's rail transportation services are provided principally throughout the eastern United States.
Canadian Pacific Railway	Canada	CP CN Equity	Canadian Pacific Railway Limited is a Class 1 transactional railway, providing freight and intermodal services over a network in Canada and the United States. The Company's mainline network serves major Canadian ports and cities from Montreal to Vancouver, and key centers in the United States Midwest and Northeast.
Canadian National Railway	Canada	CNR CN Equity	Canadian National Railway Company operates a network of track in Canada and the United States. The Company transports forest products, grain and grain products, coal, sulphur, and fertilizers, intermodal, and automotive products. Canadian National operates a fleet of locomotives and rail cars.
Toll Holdings Limited	Australia	TRH NZ Equity	Toll NZ Ltd. Provides freight transport and distribution services. The Company offers transportation, long-haul bulk freight, warehousing and freight forwarding services. Toll NZ also operates passenger and freight transport vehicles that provides relocation and priority delivery services. Toll NZ conducts its business in New Zealand and Internationally.
Aurizon Holdings	Australia	AZJ AU Equity	Aurizon Holdings Ltd. is a rail freight company. The Company provides coal, bulk and general freight haulage services, operating on the Central Queensland Coal Network (CQCN) and including specialised track maintenance and workshop support functions.
Asciano Limited	Australia	AIO AU Equity	Asciano Limited is a provider of essential transport services in the rail and ports and stevedoring industries in Australia and New Zealand. The Company operates container terminals, bulk export facilities and container and bulk rail haulage services.
Port of Tauranga	New Zealand	POT NZ Equity	Port of Tauranga Limited activities include the provision of wharf facilities, back up land for the storage and transit of import and export cargo, berthage, cranes, tug and pilotage services for exporters, importers and shipping companies and the leasing of land and buildings. The Group also operates a container terminal and has bulk cargo marshalling operations.

Source: Bloomberg, ERA analysis

Finally, the ERA's a priori expectation is that overseas rail operators will possess a higher level of risk, relative to an Australian railway operator, as American and Canadian railway operators for example are expected to face higher degrees of competition from alternative forms of transportation, such as roads. The ERA indicates it will therefore employ significant regulatory discretion when determining appropriate benchmark parameters for the Arc Infrastructure network, with a view that its risks are at the lower end of overseas railway operators, and at the higher end of Australian and New Zealand transport companies.

The ERA estimated the asset beta for the Arc Infrastructure network as being 0.7. Utilising the estimated gearing of 25 per cent, this corresponds to an equity beta of 0.9.

C.3.3 TPI (2015 and 2019)

The TPI railway transports iron ore from Fortescue Metal Groups (FMG) Cloud Break iron ore mine in the East Pilbara to TPI's port facilities at Anderson Point, Port Hedland.

Of the three Western Australian rail networks, TPI has the least number of direct comparators. Unlike, the PTA and Brookfield Rail, TPI lacks diversification and exclusively services the mining industry exposing it to the relatively high volatility of minerals markets.

The ERA notes that TPI's reliance on a single commodity – iron ore – transported across one large distance, significantly differentiates it from the Brookfield Rail network. As a consequence, not all of the companies in the Brookfield sample are appropriate as comparators to TPI. The ERA considers that only Aurizon in Australia supplemented by overseas railway operators are able to adequately capture the risks faced by the TPI rail network.

Furthermore, the ERA considers that due to TPI's exposure to only a limited number of potential users in the mining industry, TPI's risks are likely to be at the upper end of those faced by the companies contained in the benchmark sample. At the same time, the Authority considers that the US short-line rail operator Genesee & Wyoming Inc. is likely to be the best comparator for TPI. This is primarily due to Genesee & Wyoming Inc. operating class II/III short railway lines, including a number of similar lines in Australia. The ERA's beta comparators are presented in Table 58.

Table 58 Comparator companies for TPI Network

Company Name	Country	Ticker	Company Description
Aurizon Holdings	Australia	AZJ AU Equity	Aurizon Holdings Ltd is a rail freight company. The Company provides coal, bulk and general freight haulage services, operating on the Central Queensland Coal Network (CQCN) an including specialised track maintenance and workshop support functions.
Genesee & Wyoming Inc.	United States	GWR US Equity	Genesee & Wyoming Inc., through its subsidiaries, owns and operates short line and regional freight railroads and provides related rail services. The company also provides railroad switching and related services to United States industries with extensive railroad facilities within their complexes. Genesee operates in the United States and Australia.
Union Pacific Corporation	United States	UNP US Equity	Union Pacific Corporation is a rail transportation company. The Company's railroad hauls a variety of goods, including agricultural, automotive, and chemical products. Union Pacific offers long-haul routes from all major West Coast and Gulf Coast ports to eastern gateways as well as connects with Canada's rail systems and serves the major gateways to Mexico.
Norfolk Southern Corporation	United States	NSC US Equity	Norfolk Southern Corporation provides rail transportation services. The Company transports raw materials, intermediate products, and finished goods primarily in the Southeast, East, and Midwest and, via interchange with rail carriers, to and from the rest of the United States. Norfolk Southern also transports overseas freight through several Atlantic and Gulf Coast ports.
Kansas City Southern	United States	KSU US Equity	Kansas City Southern, through its subsidiary, is the holding company for transportation segment subsidiaries and affiliates. The Company operates a railroad system that provides shippers with rail freight services in commercial and industrial markets of the United States and Mexico.
CSX Corporation	United States	CSX US Equity	CSX Corporation is an international freight transportation company. The Company provides rail, intermodal, domestic container-shipping, barging, and contract logistics services around the world. CSX's rail transportation services are provided principally throughout the eastern United States.
Canadian Pacific Railway	Canada	CP CN Equity	Canadian Pacific Railway Limited is a Class 1 transcontinental railway, providing freight and intermodal services over a network in Canada and the United States. The Company's mainline network serves major Canadian ports and cities from Montreal to Vancouver, and key centres in the United States Midwest and Northeast.
Canadian National Railway	Canada	CNR CN Equity	Canadian National Railway Company operates a network of track in Canada and the United States. The Company transports forest products, grain and grain products, coal, sulphur, fertilizers, intermodal, and automotive products. Canadian National operates a fleet of locomotives and railcars.

Source: Bloomberg, ERA analysis

The ERA now considers that an asset beta of 1.00 reflects the higher risks associated with the returns of the TPI network. This is a decrease from 1.05 in the previous review, due to asset beta decreases observed for relevant comparators. When combined with the estimated gearing of 0.2, this results in an equity beta of 1.3.

C.3.4 Public Transit Authority (PTA) (2015 and 2019)

The ERA considers that a firm must satisfy the following in order to belong to the PTA benchmark sample:

- provide a service similar to passenger rail, for example toll road or commercial passenger transportation companies;
- be located in Australia or a similar OECD economy;
- be mature, hence have limited growth opportunities;
- be of similar size to the PTA.

The ERA identfied comparable companies that had the following characteristics using Bloomberg's Equity Screening function:

- belong to the OECD;
- provide a reference service similar to that of the PTA (toll roads and/or commercial passenger transportation across suburban areas);
- be well established with limited growth opportunities; and
- have sufficient pricing data in order to estimate equity beta and gearing.

The ERA's beta comparators for the PTA are presented in Table 59.

Table 59 Comparator companies for PTA

Company Name	Country	Ticker	Company Description
Transurban Group	Australia	TCL AU Equity	Transurban Group is involved in the operation of the Melbourne City Link and the Hills Motorway M2 toll roads. The Group is also involved in developing and operating electronic toll systems.
Atlantia SPA	Italy	ATL IM Equity	Atlantia S.P.A is a holding company with responsibility for portfolio strategies in the transport and communications infrastructures and network sectors.
Vinci SA	France	DG FP Equity	Vinci SA builds roads, offers electrical, mechanical and civil engineering and construction services, and operates toll roads. The Company builds and maintains roads and produces road construction materials, builds electricity and communications networks, installs fire protection and power and ventilation systems, and operates toll highways, bridges, parking garages, and a stadium.
Abertis Infraestructuras S.A	Spain	ABE SM Equity	Abertis Infraestraucturas S.A is an international group which manages mobility and telecommunications infrastructures through three business areas: toll roads, telecommunications infrastructure and airports. The group is present in Europe and the Americas.
Macquarie Atlas Roads Group	Australia	MQA AU Equity	Macquarie Atlas Roads Group manages toll roads. The Company operates toll highways in the United Kingdom, France and the United States.

Source: Bloomberg, ERA analysis

Given the low level of systematic risk for the PTA rail network, the ERA considers that an asset beta of 0.3 is appropriate. Utilising the estimated gearing of 50 per cent, this corresponds to an equity beta of 0.6.

C.3.5 ERA's pre-2015 beta comparators for Brookfield Rail (freight)

Based on advice from Allen Consulting Group, the ERA used the following sample of Australian and international beta comparators in its rate of return decisions between 2008 and 2015.[542] A key difference in the comparator set adopted in 2008 relative to 2015 was the inclusion of airports in the former sample.

Table 60 Relative asset and equity betas of US comparator firms

Company	Country	Raw Equity Beta	Debt/assets ratio	Asset beta
Kansas City Southern	US	1.23	0.70	0.74
Union Pacific Corporation	US	0.81	0.38	0.59
RailAmerica Inc	US	1.61	1.32	0.69
CSX Corporation	US	1.15	0.77	0.65
Burlington Northern Santa Fe	US	1.07	0.43	0.75
Average				**0.69**

Source: Bloomberg, ACG Analysis

Table 61 Relative asset and equity betas of Canadian comparator firms

Company	Country	Raw Equity Beta	Debt/assets ratio	Asset beta
Canadian Pacific Railway Ltd	Canada	0.956	0.48	0.65
Canadian National Railway Company	Canada	1.023	0.28	0.80
Average				**0.73**

Source: Bloomberg, ACG Analysis

Table 62 Relative asset and equity betas of Australian comparator transport sector firms

Company	Country	Raw Equity Beta	Debt/assets ratio	Asset beta
Adsteam Marine Limited	Australia	1.238	0.90	0.65
Macquarie Infrastructure Group	Australia	0.745	0.31	0.57
Patrick Corporation Ltd	Australia	1.056	0.07	0.99
Toll Holdings Limited	Australia	0.869	0.22	0.71
Average				**0.73**

Source: Bloomberg, ACG Analysis

542 Allen Consulting Group (2007). Railways (Access) Code 2000: Weighted average cost of capital, 2008 WACC determinations, October, pp.28-29.

Table 63 Relative asset and equity betas of New Zealand comparator transport sector firms

Company	Country	Raw Equity Beta	Debt/assets ratio	Asset beta
Auckland International Airport Ltd	New Zealand	0.944	0.26	0.75
Infratil Ltd	New Zealand	1.29	0.65	0.78
Port of Tauranga Ltd	New Zealand	0.873	0.31	0.67
Toll NZ Ltd	New Zealand	0.773	0.72	0.45
Average				**0.66**

Source: Bloomberg, ACG Analysis

C.4 ESC

The ESC's most recent transport precedent on beta comes from the June 2012 final decision for the V/Line access arrangement.[543] The ESC had previously adopted an equity beta value of 1.00 for V/Line. It referenced the ACCC's 2008 decision on ARTC's interstate rail network, which used an equity beta of 1.29 (50% gearing), and the QCA's determination that used an equity beta of 0.8 (55% gearing) for QR's coal network. The ESC also acknowledged the ERA's 2008 decision that used an equity beta of 0.46 for WA's urban rail network and 1.0 for Westnet Rail's freight network (35% gearing).

The ESC adopted gearing of 50% for V/Line, which it described as a relatively conservative gearing assumption. V/Line also operated under some market demand and price constraints due to potential road competition. No explicit comparator set was relied upon.

C.5 ESCOSA

In August 2015, ESCOSA published the final report for its 10-year review of revenues for the Tarcoola-Darwin Railway.[544] This decision did not determine a specific value for the asset beta. Rather, ESCOSA used comparisons with recent Australian regulatory rail decisions to define a suitable range for the overall WACC. Importantly, these decisions were not normalised nor adjusted in any way to account for timing differences or to reflect specific requirements under the prevailing rail code. This assessment resulted in a real pre-tax WACC range of 5.25% (for Aurizon Network) to 13.3% (for Pilbara Railways), and ESCOSA selected the lower bound of 5.25% for the purpose of initial testing for relevant revenue outcomes.

ESCOSA's rationale for relying on a lower bound WACC was that if excessive revenues were not detected at this WACC value, then they would not be evident at any higher

543 ESC, June 2012, final decision, V/Line access arrangement.

544 ESCOSA (2015). Tarcoola-Darwin Railway: 10-year review of revenues – Final report, August.

WACC either. ESCOSA explained that a comprehensive WACC assessment was a complex and costly exercise and would not have a bearing on the outcome of the review.

A 2003 determination for WestNet Rail by the WA Office of the Rail Access Regulator makes reference to an earlier decision by ESCOSA, which adopted an asset beta of 0.55 and a debt beta of 0.06 for the Alice Springs to Darwin rail line.[545]

545 Office of the Rail Access Regulator (2003). Weighted average cost of capital to apply to WestNet Rail and the Western Australian Government Railways Commission, 1 July, p.14. We have been unable to locate this decision.

D First principles analysis

The key objective of first principles analysis is to assess the extent to which the firm's net cashflows (revenues less costs) have some sensitivity to movements in the general economy. Lally identifies a number of factors to be considered here, including: nature of the product or service; nature of the customer; pricing structure; duration of contracts; market power; nature of regulation (if any); growth options; and operating leverage.[546]

First principles analysis is largely contextual and can inform an assessment of where the BEE might sit within the range established by the comparator set in respect of its systematic risk exposure (that is, whether a factor puts upward or downward pressure on the systematic risk for the BEE). However, this remains qualitative. Noting the inherent uncertainty in beta estimation, it is not feasible to reliably quantify the impact of every factor on beta in isolation of other factors.[547]

A number of these factors are also interrelated – that is, the impact of one factor on beta could either be increased or lessened by another factor. Hence, while the impact of each factor can be considered in isolation, the overall assessment will reflect the net impact of the factors in combination. The first two factors are inextricably linked and so will be considered together.

D.1 Nature of the product/nature of the customer

Fundamental to understanding a firm's risk profile is identifying and analysing the demand for its core services. The analysis needs to be extended to the services from which the infrastructure's demand is derived, which in this case, is the demand for accessing and usage of channel and wharf assets by shipping companies and related port users. Other issues that may impact on the extent to which the port is exposed to the risk of changes in the demand for port services, such as market power and the structure of PoM's contracts with its customers, are considered separately.

D.1.1 Availability of substitutes

One of the key drivers of a firm's risk profile is the extent to which the demand for its services is exposed to competition from substitutes.

546 Lally, M. (2004). The cost of capital for regulated entities, Report prepared for the Queensland Competition Authority. See also Lally (2000), The cost of equity capital and its estimation, Volume 3 in T.J. Brailsford and R.W. Faff (Eds.), McGraw Hill Companies Inc.

547 This would necessitate being able to have two samples, where the firms in the samples are largely identical other than for the relevant factor.

An appraisal of PoM's competitive pressures is a complex exercise, because the degree of contestability differs both by cargo type and by destination. As demonstrated in Table 64, PoM's liquid bulk, dry bulk and break bulk trades (which account for approximately 13% of total revenue tonnes) are all subject to competition from other ports.

Container traffic is also subject to competition from a variety of Australian ports (Adelaide and Botany for imports and exports, and both Station Pier (to become Geelong Port, which is likely to be a stronger than Station Pier) and direct calls for the Tasmanian trade).

These competitive pressures are not mitigated by any element of PoM's regulatory regime. In fact, as explored below, the nature of the regime is more likely to amplify risk than reduce it.

Table 64 Competitive pressures by cargo type

Cargo type	Revenue contribution (FY18)	Competitive pressures
Containers (TEU)	2.93 million TEU *Approximately 80% of revenue*	We have documented in previous submissions that PoM has lost import container trade to Adelaide. There is also contested trade between PoM and Port Botany.
	Riverina originated containers represent approximately 4% of revenue *Tasmania trade represents approximately 8% of revenue (includes wheeled unitised cargo but not dry and liquid bulk)*	In addition, only 54% of containers exported through PoM originate from Melbourne. This suggests that there is competition between ports for export containers. There is particularly intense competition with Port Botany for containerised exports originating from the Riverina and surrounds, which accounts for approximately 6% of PoM's volumes. This includes some Riverina trade that PoM handled in FY18 (approx. 35000 TEU or 1% of revenue), which has since been lost to Port Botany. PoM also competes with Port Adelaide for exports of containerised agricultural commodities (mainly grain and stock feed) originating from the Mt Gambier region.
		However, the largest element of the container trade subject to competition is in relation to the Tasmanian trade. There are 3 coastal shipping operators between Tasmania and the mainland. The Spirit of Tasmania which operates from Station Pier in Melbourne (but is to move to Geelong Port) and carries freight in competition with the other carriers who operate out of the PoM providing direct port on port competition. It is expected that competition will intensify when TT Lines moves to Geelong Port). Additionally, competition to PoM arises from direct calls from international vessels. These vessel calls enable direct imports into and exports from Tasmania, bypassing PoM. They also provide the opportunity for coastal shipping from Tasmania to other Australian destinations (particularly Sydney, via Bell Bay). Continued growth in the Tasmanian trade increases scope for direct calls to Tasmanian ports.
Motor vehicles	7.4 million revenue tonnes *Approximately 8% of revenue*	The closure of major Australian car manufacturers has had a major impact on motor vehicle exports. Exports decreased 49.3% following the closure of Toyota's Altona manufacturing plant in October 2017. New motor vehicle throughput fell 2.1% overall in 2017-18 and has continued to fall this financial year. Motor vehicles (by units) were lower by 16.7% in April 2020

Cargo type	Revenue contribution (FY18)	Competitive pressures
		compared to April 2019.[548] This highlights PoM's exposure to general economic conditions. Moreover, the Port of Geelong is a potential competitor to the motor vehicle trade. Indeed, prior to privatisation, the State Government carefully examined a proposal to shift the motor vehicle trade to Geelong as an alternative to the reconfiguration of Webb Dock. Port of Geelong is well placed to establish a competing car import facility to PoM.
Liquid bulk	6.3 million revenue tonnes *Approximately 4% of total revenue*	Liquid bulk faces competition from Geelong (import crude) and Hastings (refined products).
Dry bulk	5.0 million revenue tonnes *5% of total revenue*	Dry bulk faces competition from Geelong (especially in regard to grain exports, cement, soda ash and fertiliser). A new clinker grinding and cement facility established at the Port of Geelong highlights the range of trades subject to competition for PoM.
Break bulk	1.1 million revenue tonnes *Approximately 1% of total revenue*	Break bulk faces competition from Geelong and Hastings
TOTAL TRADE	**94.1 million revenue tonnes**	

Source: Port of Melbourne

Modal substitution is limited. Domestically, there is limited competition from rail for inter-city freight movements given the distances between cities and some inherent inefficiencies in the freight rail network (lack of volume, conflict between passenger and freight networks, different track configurations and double handling charges). There is strong road competition. Air services may compete for small time-sensitive freight, but generally, it is too small and expensive for regular freight movements.

D.1.2 Income elasticity of demand for port services

The income elasticity of demand is relevant to this assessment given the relationship between incomes (or GDP) and domestic economic activity. For PoM, the relationship is considered strong as demand for port services is inextricably linked to demand for freight goods.

PoM has indicated that demand for container imports is driven by:[549]

- population growth
- retail activity and consumer confidence
- building investment
- manufacturing industry growth.

548 Port of Melbourne (2020) Trade Summary – April 2020 and MTD May 2020

549 Victorian Ports Corporation (Melbourne) (2016). Reference tariff schedule: Effective 1 July 2016, p.15.

Container exports are predominantly driven by local agricultural production and manufacturing industry growth. All of these factors have a direct correlation with GDP. Accordingly, PoM's revenues and earnings are significantly affected by levels of domestic economic activity.

D.1.3 Exchange rate sensitivities

International trade will be sensitive to exchange rates. This is significant for beta as the exchange rate will be correlated with domestic economic activity.

D.1.4 Market disruption risks

There is a range of market disruption risks for PoM – these risks have both systematic and non-systematic elements:

- Changes to globalisation
- Reduction in demand due to sharing economy (e.g. Uber) and the automation of motor vehicles
- 3D printing
- Miniaturisation/Virtualisation
- Reduced manufacturing and exports (e.g. Ford, Toyota)
- Pandemics (e.g. Coronavirus) – PoM has submitted detailed trade information as part of its TCS that highlights the impact of COVID-19 on trade. In general, the port expects a drop in trade of between 10-15% (motor vehicles are down 16.7% on the previous year). It is unclear when volume will recover.[550]

D.1.5 Broader trends in ports and shipping

Emerging trends within the global shipping industry have a bearing on PoM's competitive outlook as well. The introduction of increasingly larger container ships will lead to increasing concentration in the shipping industry. Over the short to medium term, this is likely to generate greater substitutability between PoM and its closest competitors, such as Port Botany and, to a lesser extent, Port Adelaide.

However, in the medium to longer term, larger vessels present a significant threat to PoM's volumes on account of their impact on accelerating the establishment of a second

550 Port of Melbourne (2020) Trade Summary – April 2020 and MTD May 2020

container port (either at Bay West or Hastings). For example, Swanston Dock is not necessarily well located to accommodate larger vessels and the combination of growth in vessel sizes and PoM's configuration will place increasing pressures on the port's capacity to handle all container traffic currently handled by PoM. The creation of a second container port would present a major threat to PoM.

D.1.6 Implications for PoM's beta

In general, port revenues can be expected to have a strong correlation with domestic economic activity, driven by fundamentals such as:

- the income elasticity of demand for port services and freight goods
- the sensitivity of international shipping to changes in exchange rates
- the sensitivity of demand for freight transport to domestic GDP
- market disruptions
- broader trends in trade and shipping.

Given PoM's beta is being assessed relative to international comparators, consideration needs to be given as to whether these demand characteristics are likely to be more or less sensitive to domestic economic activity compared to other comparators (relative to their own domestic economies).

The relationships described above demonstrate an elevated risk profile for an international port and at least comparable level of risk across the comparator set. This can be seen by examining Qube as well as port entities with lower asset betas.

Clearly the comparator with the closest demand drivers to PoM is Qube, which is more exposed to competition but has a lower operating leverage.

Each of the ports within our comparator set that have lower asset betas than PoM have materially lower exposure to demand fluctuations in their home market. For example:

- the Port of Tauranga is New Zealand's principal export-driven infrastructure asset, and furthermore these exports are concentrated in industries such as timber, which are likely to be less susceptible to fluctuations in economic activity.
- COSCO Holdings and Hutchinson Port Holdings having significant international diversification in their operations – this international diversification serves to reduce the asset beta relative to the BEE. This is because these companies' earnings will be influenced by the economic circumstances of numerous countries (other than

the country of listing), whereas the BEE's entire operations are limited to a single geographic location.

D.2 Pricing structure

Pricing structure refers to the extent to which the firm's pricing arrangements either mitigate or increase its exposure to systematic risk. For example, if a firm's cost structure comprises fixed and variable costs, an important consideration here will be the extent to which prices have a fixed and variable component that reflect this cost structure.

D.2.1 PoM's pricing structure

All of PoM's fees are levied on a usage basis without long term contractual take or pay commitments in place, which increases its risk profile. Both wharfage and channel fees are charged on a per unit quantity, volume or weight basis, which underscores that PoM's revenues are significantly affected by levels of economic activity.

Overall, the pricing structure significantly exposes the port to systematic volume risk, although this risk is characteristic of ports globally and is very unlikely to change during the term of the lease. This is because there is no revenue protection against reductions in port traffic.

However, what distinguishes the BEE from comparator ports is that comparator ports gain the benefit of property leasing income which is typically not volume dependent. In the context of the BEE however, no such revenue is relevant to the assessment of systematic risk because that revenue falls outside of Prescribed Services. As such, PoM's pricing structure must expose it to greater systematic risk than other ports in the comparator set.

D.2.2 Implications for PoM's beta

PoM's pricing structure for the Prescribed Services is not unusual for a port and provides no revenue protection against fluctuations in economic activity, which PoM is particularly exposed to, as demonstrated in Section D.1.

However, the BEE secures no revenue from leasing income, which is typically not volume dependent. Instead the BEE's pricing structure is driven by per unit rate of volume, with no protection against volume fluctuation as might be provided by take or pay contracts, that in turn fully exposes it to economic cycles.

D.3 Market power

D.3.1 Impact of market power on systematic risk

The existence of market power will have a mitigating effect on systematic risk. This assumes that where a firm possesses market power, it is able to exercise that power to its advantage. This in turn is a function of considerations such as the degree of market power held (which in turn will depend on the availability of substitute port facilities of appropriate size and scale), the number of buyers in the market and the extent to which those buyers can exert countervailing power in negotiations.

PoM currently has market power in some of its trades, particularly for the Melbourne catchment. However, there is clear evidence of contestability that further constrains PoM's market power. Even within the limited geographic region where PoM's market power is most relevant, that market power is not without constraints. For example, PoM is constrained in its ability to price discriminate, which means that the benefits of price competition to capture marginal trades are transmitted across the entire PoM customer base. The regulatory environment restricts the ability of PoM to exert market power principally through the application of the TAL.

As presented above, there is clear evidence of contestability given that PoM has lost trade to Adelaide (import containers), Geelong (breakbulk) and Port Botany (agricultural exports). Moreover, PoM competes with Geelong in relation to import crude and refined oil, breakbulk cargo, bulk grain exports, dry bulk import (cement, soda ash and fertiliser) and Station Pier, to become Geelong (Tasmania trade). Nevertheless, a significant proportion of PoM's volumes are not contestable, with 87% and 54% of imported and exported containers, respectively, destined for or originating from the Melbourne metropolitan region.[551]

Moreover, there is clearly the prospect of competition in the form of the development of a second port serving Melbourne. In this respect, PoM is unique – there is no other Australian port that is subject to the threat of an entrant as part of a deliberate Government strategy to develop a new facility.

D.3.2 Prospect of second Melbourne port

The prospect of the second port in the Melbourne region clearly constrains PoM's market power. Whilst it is true that the development of a second port is not currently imminent, the prospect of a second port brings substitution risk as well as potentially providing

551 Port of Melbourne Corporation (2009). Port of Melbourne – Management Presentation, p.16.

PoM's counterparties (shipping, logistics, and, to a certain extent, stevedoring companies) more countervailing power in negotiations.

Moreover, there is clearly scope for the Victorian Government to accelerate the development of a second port towards the second half of PoM's lease period as the State has the ability to bring forward the development of the second port without compensation to PoM. The credible threat of a second port (the development of which can be brought forward in time) is sufficient to impact the beta to the extent that it reduces the market power that PoM would otherwise have. Holding all other factors constant, we consider this should be reflected in a higher value of beta relative to the comparable companies.

In May 2017, Infrastructure Victoria recommended the construction of a new port for Melbourne at Bay West.[552] Infrastructure Victoria's view is that the new port will not be required until 2055, as PoM has a potential capacity of approximately 8 million TEU.

The ESC has contended that the 2055 timeframe is around 40 years into PoM's 50 year lease, and as such the threat of competition is unlikely to impact the rate of return.[553] However, as an infrastructure owner, PoM must make investment decisions across long-term horizons. Therefore, such a significant change in the demand outlook even 40 years into the lease impacts on investment decisions today.

Moreover, the threat of a second port constrains PoM's behaviour today, even though there is only a threat of a second port. Market power only exists where there is an absence of constraint on an incumbent's conduct. To the extent that the threat of a State Government investment in a competing port is credible (as clearly it is), it will magnify the constraints that already exist on PoM. It can also impact the dynamics of negotiations between PoM and counterparties, and in turn, systematic risk.

Mr Michael Masson, the chief executive of Infrastructure Victoria, has stated that the Bay West port could handle overflow container capacity initially, but it would be well suited to becoming Melbourne's future container port in the long term. Planning for the port is likely to begin 15 years before it is required to be operational. In short, it is possible for the State to bring forward the development of the port if it perceives it to be in the public interest to do so.

As such, given the current attention to the issue, there is no guarantee that the 2055 timeline will be maintained. Political considerations could see the implementation of the

552 Ackerman, I., "Go west says IV," *Lloyd's List Australia*, May 25, 2017.

553 ESC, October 2018, Interim Commentary – Port of Melbourne tariff compliance statement 2018-19, pp 70–71.

second port occur even earlier, which presents considerable risk to PoM. In particular, Infrastructure Victoria has noted that:[554]

> Increasing capacity at Webb Dock to accept ships larger than around 7,500 TEU could make it difficult for Swanson Dock's capacity to be fully utilised due to its vessel size restrictions. This may prematurely compromise the viability of Swanson Dock, unnecessarily bringing forward the need to invest in additional capacity. This can be managed through deliberate staging of infrastructure investments at Webb Dock as well as upgrades to navigation infrastructure (channels and swing basins) and changes to regulation of navigation.

Moreover, in one of its recommendations, Infrastructure Victoria highlights that further urban development is likely to hinder capacity enhancement within the existing Port of Melbourne footprint:[555]

> Maintaining the Port's social licence to operate is an important consideration if capacity expansions are to be sustainably achieved. If the amenity impacts of port related freight services are not effectively managed, the Port of Melbourne may be unable to reach its optimal capacity.

Infrastructure Victoria has recommended that the Victorian Government should monitor key indicators relevant to all Victorian ports that impact planning and publish a report every five years. This report will have the objective of identifying whether PoM has the ability to meet demand for 15 years or more. In the meantime, Infrastructure Victoria has recommended measures to optimise capacity at PoM, through augmentations at Swanson and Webb Dock. Infrastructure Victoria has also recommended that the Victorian Government should not enter into any arrangement that restricts the ability to develop a second port after 2031:[556]

> There is an initial 15 year period in the Port of Melbourne lease legislation where there cannot be a second port built without compensation to the lessee. There is considerable value in the State retaining the unfettered option under the current terms of the Port of Melbourne lease legislation to develop a second container port after 15 years.

The ESC disagreed with our assertion that the Port Growth Regime provisions are a significant barrier to the construction of a second port, and that their expiry after 15 years

[554] Infrastructure Victoria (2017). Advice on securing Victoria's ports capacity, p.16.

[555] Infrastructure Victoria (2017), p.17.

[556] Infrastructure Victoria (2017), p.18.

increases the risk of competition.[557] However, if the Port Growth Regime provisions are not a significant barrier to the construction of a second port, then this would actually seem to imply that PoM is indeed exposed to an even greater risk of competition. Moreover, the 15 year period is actually very brief in the context of the planning and investment decisions that need to be made for a second port to become operational.

These considerations make it clear that the Victorian Government can act relatively quickly to develop a new port in the future. This will tend to increase the beta for PoM compared to other Australian capital city ports when considering the investment's 50 year lease horizon. It would put Melbourne in the unique position of being the only capital city in Australia with a competing container port servicing a similar catchment area (the closest example being in Sydney with the Port of Newcastle, which is very unlikely to become a major container port, noting that Port Botany and Port Kembla are under common ownership).

This justifies a higher beta for the port relative to comparables that do not face this same threat of competition.

D.3.3 Market power for Class I railroads

We included a review of the market power of Class I railroads in Section 7.3.1. In summary, Class I railroads carry predominantly bulk freight – this means that road exerts a more limited competitive threat for the bulk of the traffic carried on Class I railroads. Moreover, for many customer traffic tasks there is a railroad that is significantly advantaged relative to other railroads. This is not dissimilar to the nature of the BEE's market power.

D.3.4 Implications for PoM's beta

As is the case for each of the ports in the comparator sample, PoM enjoys market power over much of its trade. It is likely PoM's market power exceeds the market power of stevedoring based comparators in the comparator set.

However, unlike the ports in the comparator set, PoM has a shadow cast over its long term market position by virtue of the detailed planning for a second port and Victorian Government's ability to bring forward development of the second port. Again, this has the effect of ameliorating PoM's market power relative to the port comparators in the comparator set.

557 ESC (October 2018), pp. 70–71.

In our view, the best comparators to understand the market power of the BEE are provided by US Class I railroads.

D.4 Form of regulation

D.4.1 Impact of the form of regulation

The effects of regulation on beta are unclear. In the first instance, regulatory risk is not necessarily in itself systematic to the extent it can be avoided through diversification. However, the issue of relevance here is the extent to which regulation mitigates, or increases, PoM's exposure to systematic volume risk.

Regulation can reduce risk if it increases revenue certainty over a period. Conversely, regulatory risk can be seen as a source of risk to the extent that there is uncertainty as to how it will be applied and/or it reduces the firm's ability to adjust prices in response to changes in costs.

The general practice of Australian regulators is to assume that regulation reduces risk and accordingly will have a dampening effect on beta, noting this dampening effect is limited to where the regulatory arrangements increase revenue stability, such as where a revenue cap is in place.

However, this is not the case for the PoM as it is effectively subject to a price cap form of regulation rather than a revenue cap and this, together with the sensitivity of trade to economic activity means that it is likely to have its revenues significantly affected by levels of economic activity throughout the lease period (refer Section D.1 above). As such, the regulatory arrangements in place for the BEE do not ameliorate the BEE's systematic risk.

Indeed, the regulatory regime constrains PoM from responding to the prevailing economic environment. A less regulated port may be able to adapt its pricing to mitigate economic impacts. Apart from the modest impact of potentially rebalancing charges, PoM's regulatory regime does not provide any meaningful protection against volume risk.

The Pricing Order provides no revenue certainty (whether during or after the period in which the TAL is in place) or mitigation of exposure to systematic risk, particularly when comparing the port against comparables that are either subject to more light handed price monitoring or are unregulated.

Moreover, PoM has not and is never likely to have long term take or pay contracts in place which could mitigate the extent to which its revenues are affected by levels of economic activity.[558]

D.4.2 Impact of the TAL

The risks described above appear to be exacerbated by the nature of the Tariff Adjustment Limit (TAL), which applies a CPI cap to tariffs until at least 2032 (and 2037 at the latest). This structure of the TAL "back-ends" capital recovery. Consequently, much of the Port Licence Holder's return on investment is deferred to a point in time when competitive pressures will be most elevated, especially with the likely prospect of a second Melbourne port. This is a key source of differentiation from other regulated infrastructure assets in Australia, especially utilities, which resemble a poor comparison to PoM's systematic risk exposure. As such, the TAL provides no regulatory based reduction in systematic risk for the foreseeable future. Indeed, there is a question as to whether the regulatory regime will ever reduce PoM's exposure to systematic risk.

D.4.3 Class I rail regulation

Class I railways are subject to a light handed form of regulation involving information disclosure and pricing arbitrations, a materially lighter handed form of regulation than applies to the PoM.

D.4.4 Implications for PoM's beta

In response to the ESC's recommendation that 'a more methodical application of the factors affecting systematic risk in comparative industries is justified[559]', we have undertaken a closer investigation of the regulatory regimes under which PoM's comparators operate.

Stevedores are generally not subject to regulation as they generally operate in competitive markets. Class I railways are subject to very limited regulatory intervention. Virtually all of the port owners and operators are subject to concession agreements that set price caps or stipulate tariff charges. As documented above, PoM's regulatory regime does not ameliorate the BEE's exposure to systematic risk. No downward adjustment to

558 However, even take or pay contracts only reduce variability during the contract period. Post contract, if the business is exposed to volume risk i.e. price cap, then they will simply see a larger change in revenue once re-negotiating their contract. This has been the experience of Arc Infrastructure in Western Australia following the expiry of take or pay commitments.

559 ESC (October 2018), pp. 65–66.

the empirical beta estimate relative to the comparator set would be warranted for the BEE's systematic risk on the basis of this first principles factor.

D.5 Growth options

Growth options refer to the potential to undertake significant new investment, particularly in new areas or products. It is argued that businesses that have a number of valuable growth opportunities in addition to their existing assets will tend to have higher systematic risk compared to firms that have limited growth options.

In the case of PoM, it is likely to undertake a number of capital projects to maintain / upgrade existing assets as well as expand the Port's capacity to service Victoria's increasing freight demand. Synergies understands that examples of these include the following:[560]

- Upgrading rail network and other freight terminal facilities
- Developing new container and dry trade terminal capacity
- Undertaking investment to cater for larger container vessels
- Developing new liquid bulk capacity.

D.6 Operating leverage

A high degree of operating leverage will increase the volatility of a firm's returns relative to the market, which can increase its beta.

D.6.1 Port operating leverage

It is understood that most ports have a relatively high fixed cost base and this is the case in relation to PoM due to the inherently capital intensive nature of the business. However, this is even more significant for PoM - Synergies understands that PoM pays a port licence fee (PLF) of approximately $85 million per annum and a cost contribution amount (CCA) of approximately $16 million per annum. These fees are unrelated to actual port services or costs and are calculated in accordance with the requirements of the PMA and the Port Concession Deed. As fixed costs, these obligations add to operating leverage.

Leaving aside the very significant impact of the port licence fee, PoM's operating leverage may be similar to comparator ports in this regard. However, it could be a

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560 https://www.portofmelbourne.com/facilities-development/port-development-strategy/

distinguishing feature compared to, say, stevedoring services, as they are likely to have lower operating leverage owing to a smaller proportion of fixed capital and infrastructure expenses in their cost base. This means that holding all else constant, this would increase PoM's beta relative to those firms. A second port will materially exacerbate the impact of operating leverage on PoM's cash flow volatility.

D.6.2 Operating leverage for Class I railroads

Frontier Economics has acknowledged that railroad operations of rolling stock will have a higher proportion of operating costs to fixed costs compared to the BEE, thereby suggesting on this factor alone that the BEE would be exposed to greater systematic risk than the Class I railways.

D.7 Implications for PoM's beta

In our view, reliance on average or median asset beta measures of this comparator set is conservative, at least for the port comparators, when account is taken of the first principles assessment, a summary of which is contained in Table 65.

Synergies ECONOMIC CONSULTING

Table 65 First principles analysis of the characteristics of PoM and comparator industries

Risk factor	Port of Melbourne	Marine ports and services	Class 1 railroads	Impact on PoM's systematic risk relative to comparators
Nature of the product/ nature of the customer	Predominantly import-oriented, and majority of trade handled is containerised (80% of revenue FY18), which is driven by factors that have a direct correlation with GDP.	Similar market exposure to container freight trade, albeit with limitations due to issues of comparability with the BEE: Port comparators earn revenue from wider range of services (e.g. property leasing that is significantly less affected by movements in economic activity) Stevedores have similar market exposure, although typically operate in multiple jurisdictions	Freight-focussed business model, Handle relatively more bulk freight than containerised (intermodal) freight than PoM.	Class I railroads exhibit the most similar systematic risk exposure to the BEE
Pricing structure/ contracting environment	PoM's charges are predominantly traffic-based without long-term contracts. This provides less revenue certainty in the event of economy downturns/upturns.	Stevedores - contracts with shipping lines of 1 – 3 years duration Ports – traffic based with no contracts; long term property leases	Contracts are of varying durations	Increases the BEE's systematic risk exposure relative to Class I railroads
Market power (competition environment)	Subject to some competition from other ports, although the degree of contestability differs both by cargo type and by destination.	Terminal operators experience a more intense competitive environment than landlord ports Ports – similar to BEE	Overall Class I railroads face a degree of competition (just as PoM or the BEE is exposed to competition from other Australian ports). However, they do not appear to be exposed to a significant degree of competition, which can be attributed to the high degree of market concentration and customer captivity.	Ports – similar market power to BEE Class I railroads exhibit market power but are in a more competitive environment than BEE Stevedores are in a more competitive environment than BEE
Form of regulation	Regulated (price cap form regulation, which is not cost based and has a long re-set period). Regulatory framework does not provide PoM with a stable revenue stream and does not provide any meaningful protection against volume and cost risks.	Not regulated	Class 1 railroads are subject to very limited regulatory intervention.	BEE does not gain benefit of stability afforded by regulation. Similar systematic risk exposure relative to Class I railroads

Growth options	PoM, is likely to undertake a number of capital projects to maintain / upgrade existing assets as well as expand the Port's capacity to service Victoria's increasing freight demand.	Growth options vary depending on locations	Growth options vary depending on locations	Not determinative
Operating leverage	Most ports PoM has a relatively high fixed cost base due to the inherently capital intense nature of the business. Additionally, PoM is subject to fixed fees which are unrelated to actual port services or costs. As fixed costs, these obligations add to PoM's operating leverage. Prescribed Services do not include property revenue that reduces operating leverage	Terminal operators generally have lower operating leverage (lower fixed capital costs and higher variable costs within their total cost base) than a landlord port, such as PoM	Railroad operations of rolling stock have a higher proportion of operating costs to fixed costs compared to below rail (track only) operations. This reduces railroad operating leverage relative to the BEE, because the BEE will have a lower proportion of incremental or avoidable cost associated with increased or reduced activity and consequently the BEE's earnings will be relatively more affected by activity levels.	BEE's systematic risk exposure higher than all comparators

The key aspects of the first principles is that the BEE is likely to have an asset beta that exceeds the average asset beta of the comparator set, due to:

- Those entities with an asset beta that is lower than average can readily be reconciled as presenting lower systematic risk than the BEE:
  - Port of Tauranga is export focused, with container and non-container volumes materially exceeding imports (the Port of Tauranga is the largest export port in New Zealand by TEU with approximately 38% of total export volumes). Moreover, the port is vertically integrated into stevedoring and transport operations, suggesting a relatively lower operating margin than the BEE and earns significant revenue from property [561]
  - COSCO Holdings and Hutchinson Port Holdings having significant international diversification in their operations – this international diversification serves to reduce the asset beta relative to the BEE. This is because these companies' earnings will be influenced by the economic circumstances of numerous countries (other than the country of listing), whereas the BEE's entire operations are limited to a single geographic location
- US Class I railways forms an important and highly relevant comparator for the BEE
- the Prescribed Services of the BEE being narrowly defined to exclude property related revenue, which increases the likely asset beta relative to the landlord ports contained in our comparator set.

[561] https://www2.deloitte.com/content/dam/Deloitte/nz/Documents/icp/nz-en-2019-Ports-and-Freight-Yearbook.pdf

E Additional commentary on Frontier Economics Report

E.1 Frontier Economics' comments on Synergies' comparator set analysis for other regulated transport infrastructure

The Frontier Economics' report draws attention to two reports that Synergies prepared for regulated rail networks in Australia, namely ARTC and Arc Infrastructure.

Frontier Economics cites the following passage from our report for ARTC:[562]

> An asset beta for ARTC of 0.80 has been estimated based on a comparator set comprised of **North American Class I railroads and Aurizon**. This is in line with the approach adopted by the ACCC in the 2008 IAU, and is also largely consistent with the methodology employed in ERA rail decisions. [emphasis added by Frontier Economics]

Frontier Economics took this statement to imply that we considered railroads were good comparators for ports, but ports were not good comparators for railroads. However, we see no reason why this would be the case - as this quote also reveals, the approach we adopted was consistent with the comparator set used by the regulator for the previous determination. The Synergies reports for these businesses were prepared in the context of an existing regulatory regime, where rail comparators were readily available without the need to also include ports and a comparator set had already been adopted by a regulator that was not contentious. Therefore, it is difficult to draw an equivalence between those exercises, and the exercise being undertaken for PoM here. In stark contrast, there is a lack of suitable landlord port comparators for PoM, such that it is necessary to supplement these port comparators with railroads.

Frontier Economics qualified its remarks in a footnote, acknowledging that:[563]

> This approach would be reasonable if there were many more rail comparators than port comparators. However, that does not appear to be the case.

This is an important qualifier on the part of Frontier Economics, because the reality is that are very few port comparators that are reasonably comparable to the Prescribed Services provided by PoM. While there are many port comparators in the GICS Marine Ports and Services sector, relatively few are directly comparable with the BEE. It is the

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[562] Frontier Economics (2019), p.10, citing Synergies Economic Consulting (2018). The rate of return to apply to ARTC's Interstate Network, February, p.3.

[563] Frontier Economics (2019), p.10.

underlying relevance of the comparators to informing the rate of return required to attract capital to the BEE that is the critical consideration – not the number of available comparators in a GICS sector where those comparators do not inform the relevant assessment which is being undertaken. Comparability is the key criterion. If a sufficient number of properly comparable firms were readily available in the GICS Marine Ports and Services sector then clearly those entities could be sufficient to inform a beta estimate for the PoM without regard to rail companies.

Frontier Economics acknowledges elsewhere that:[564]

> However, if faced with too small a sample of ports comparators, it would be reasonable to supplement the sample with a next-best set of comparators drawn from other industries with similar risk characteristics.

Therefore, although Frontier Economics has reached a different conclusion regarding the availability of suitable comparators, its statement on a possible rationale for including rail comparators is consistent with well-accepted regulatory approach, and our approach conforms with it. We consider it useful to understand how Frontier Economics has approached this issue for other Australian regulated transport infrastructure.

In July 2018, Frontier Economics recommended an asset beta of 0.77 for Queensland Rail.[565] Notably, Frontier Economics' beta methodology assigned a 30% weighting to a ports comparator set.[566] The midpoint asset beta estimate from this sample was 0.74 (from a range of 0.68 to 0.81 defined by 5- and 10- year weekly and monthly beta estimates). Class I railroads were assigned only a fractionally larger weighting, at 40%, with the balance of the weighting allocated to airports (15%) and toll roads (15%). Accordingly, Frontier Economics informed its assessment for the BEE in this case from a considerably wider comparator set.

However, the QCA did not agree with Frontier Economics' approach. The QCA said:

> In identifying appropriate comparators for Queensland Rail, we have considered the extent to which the proposed industry group comparators are exposed to similar levels of systematic risk (that is, covariance of their returns with market returns) as Queensland Rail's West Moreton coal business. We consider that this approach will identify an appropriate set of firms with systematic risk that is comparable to that of

564 Frontier Economics (2019), p.9.

565 Because Frontier Economics adopted the QCA's Conine levering formula which includes a debt beta, this corresponds to an equity beta of 0.98 (28% gearing assumption).

566 Frontier Economics (2018). Estimates of asset beta and equity beta for Queensland Rail – Report prepared for Queensland Rail, July.

West Moreton coal, and is preferable to Frontier's approach of assigning weights to different industry groups that were selected on the basis of physical or operational characteristics that are similar to Queensland Rail's. While similarity of physical or operational characteristics could also indicate similar covariance risk, this will not necessarily be the case.[567]

In its report for the ESC, Frontier Economics stated that:[568]

> The decisions of other regulators in relation to rail businesses do not support a view that railroads and ports are necessarily good comparators, with recent freight rail decisions either excluding or placing very little weight on ports. Our analysis further suggests that while there are some broad similarities, there are some clear points of difference between the Port and North American railroads which mitigate against their inclusion as comparators.

However, as discussed in Section 7.2.2, regulators consider a range of industries, other than the industry of the regulated firm, to form a view on the beta for the firm. As stated by the QCA, the aspect that matters in identifying relevant comparator industry is whether the proposed industry group comparators are exposed to similar levels of systematic risk as the regulated business. As we have explained in Section 7.3.1, railroads are exposed to a similar level of risks as the PoM, and hence they are appropriate comparators for the PoM. Frontier Economics' statement misses this fundamental point.

E.2 Frontier Economics comments on R2

Frontier Economics motivates the problem using the example of a stock whose true beta is zero. Mathematically, its R^2 will be zero, because the slope of the regression will be zero (essentially, no variation in returns is explained by the regression line).

Aside from the fact that a stock whose beta is truly zero is likely to be irrelevant to virtually any regulated asset in Australia, let alone the BEE (otherwise it would earn only the risk-free rate), the example is actually somewhat limited. What Frontier Economics describes for a firm with a beta of *exactly* zero is theoretically valid.[569] However, it does not necessarily apply for firm with a beta *slightly above* zero (say even 0.01). This is because R^2 is concerned with the proportion of the variation in a stock's movements that is *explained* by the market's returns. As observed by Lonergan Edwards, R-squared is a statistical measure of how well the regression line approximates the real data points.

567 QCA, April 2019, Draft Decision, Queensland Rail's 2020 Draft Access Undertaking, p. 134.

568 Frontier Economics (2019), p.23.

569 Essentially, the numerator (top half) of the R^2 formula will be zero by definition.

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Therefore, if a stock has a very low beta (essentially meaning its returns are not very responsive to those of the market), it is still possible for R^2 to be high if the line of best fit matches the data well.

Frontier Economics also noted that there was a disjoint between the statistical threshold for the t-statistic and the threshold for the R^2 depending on the sample size used. Specifically, requiring an R^2 of 0.10 corresponds to a t-statistic of 2.54 rather than 2.00 when a 5-year monthly beta estimate is used (i.e. 60 months of observations). However, this correspondence varies depending on the number of observations, so it would differ again for a 10-year estimate, or a 5-year estimate based on weekly data, and so forth. For this reason, we have previously specified a fixed R^2 of 0.1 (i.e. 10% of variation explained) as a supporting indicator to the t-statistic, because the R^2 serves as a useful point of reference with varying sample sizes. In this regard, we note in Section 7.2.5 that financial experts such as Grant Thornton and EY explicitly use a fixed R^2 in their beta analysis.[570]

Nevertheless, as we have emphasised in previous TCS submissions, we place primary emphasis on the t-statistic threshold of 2, which is less sensitive to sample size than R^2. Moreover, the number of firms with t-statistics that fall exactly within the range of 2 to 2.54 tends to be limited, and we have always examined the sensitivity of including beta estimates when the t-statistic is in the vicinity of 2.[571]

Finally, it is also important to keep in mind that any of Frontier Economics' conceptual arguments about low betas and R^2 apply to the *equity* beta and not the *asset* beta. So, the case for a low *equity* beta (e.g. 0.2 or 0.3) for PoM is significantly less compelling than the case for a low *asset* beta, considering most regulatory decisions in Australia assign an *equity* beta of at least 0.4 (IPART's *equity* beta for the Valuer-General, at 0.45, is the lowest equity beta currently applied by an Australian regulator).[572]

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570 In addition, the interpretation of an R^2 (which is bounded between 0 and 1, or 0% and 100%) is likely to be more tractable than expressing a filtering criterion in terms of a t-statistic, which may require more statistical background.

571 Frontier Economics also sought to highlight examples of comparators where we had appeared to apply the statistical filtering rules inconsistently (specifically for Aurizon, Global Ports Investments and Tradia Corporation). As part of the ESC's information request on beta, we provided a spreadsheet that explained these inclusions/exclusions (usually because the t-statistics/R^2 values had been oscillating above and below the thresholds over time. Frontier Economics cites the spreadsheet that contains these clarifications elsewhere in its report, so presumably the ESC provided these explanations to Frontier Economics, but Frontier Economics has not acknowledged or otherwise responded to them in its report.

572 IPART (2019). Review of prices for land valuation services provided by the Valuer General to councils – Final Report, May.

F DBCT and PoM risk profile comparison

F.1 DBCT and PoM comparison

Risk factor	DBCT	Port of Melbourne
Form of regulation	DBCTM's cost-based regulatory framework with a revenue cap and take-or-pay contracts provides it with relatively fixed revenues. From a systematic risk perspective, DBCT's revenue cap regulatory framework makes its asset beta fundamentally the same as regulated energy and water businesses.	Relative to DBCT's cost-based regulatory framework (with revenue cap) and take-or-pay contracts, PoM is subject to a price cap form regulation, which is not cost based, has no take or pay contracts and has a long re-set period. Therefore, PoM's regulatory framework does not provide it with a stable revenue stream and does not provide any meaningful protection against volume and cost risks.
Market power (competition environment)	DBCTM has a strong monopoly position due chiefly to DBCT being the lowest-cost coal terminal with high cost of switching to other terminals.	Relative to DBCT, PoM is subject to some competition from other ports, although the degree of contestability differs both by cargo type and by destination. Therefore, PoM's systematic risk is higher.
Industry environment (i.e. whether there is demand sensitivity to changes in market returns or real GDP)	Wholly export oriented, and handles predominantly metallurgical coal, whose demand is being driven by industrialisation and urbanisation in Asia. As per Incenta, even if the economic cycle turns against coal miners and the price of coal falls, as long as the miners are at the lower end of the international cost curve, they have an incentive to continue shipments as long as they are still making a surplus over cash costs. Incenta's view was that demand for DBCT's services is likely to be relatively insensitive to the economic cycle, which is also supported by the existence of take-or-pay contracts that impose a cost if shipments are not made.	Predominantly import-oriented, and majority of trade handled is containerised (80% of revenue FY18), which is driven by factors that have a direct correlation with GDP. Therefore, PoM's systematic risk is higher.
Pricing structure (i.e. whether pricing structure results in a stable revenue stream)	The cost-based regulatory framework (with revenue cap) and take-or-pay contracts provide DBCT with a stable revenue stream; so pricing structure is not relevant.	At PoM, all fees are levied on a usage basis without long term contractual commitments in place, which exposes the port to material systematic (cyclical) volume risk relative to DBCT.
Duration of contracts (i.e. whether contract duration or price flexibility will impact on stability of revenue stream)	DBCT's exposure to the risk of contract expiry is low. This is because (i) revenue cap protections (ii) there is no practical alternative than to ship through DBCT, and therefore a strong incentive to roll-over contracts; (iii) User default would not necessarily trigger subsequent defaults, because underlying economic fundamentals of DBCT's Bowen Basin catchment are sound (coal production lies at the lower end of the international cost curve), (iv) DBCT's volumes have been rising even as the coal price has been falling, are close to capacity, and are expected to stay close to capacity in the foreseeable future.	PoM has not and is never likely to have long term take or pay contracts in place. PoM has very few contracts for prescribed services, which account for less than 1% of annual prescribed revenue. Relative to DBCT, PoM faces some competition from other ports, and is exposed to economic cycle shock. Therefore, PoM's systematic risk is higher.
Operating leverage	Majority of operating costs at DBCT are incurred by DBCT Pty Ltd (owned by a group of users), and so its operating leverage is high because opex is low. However, in practice it does not matter because DBCT's cost-based regulatory framework and take-or-	Like most ports PoM has a relatively high fixed cost base due to the inherently capital intense nature of the business. Additionally, PoM is subject to fixed fees which are unrelated to actual port services or costs. As fixed costs, these obligations add to PoM's operating leverage.

Risk factor	DBCT	Port of Melbourne
	pay contracts reduce its revenue volatility to a minimum.	Therefore, PoM's systematic risk is higher.

Source: QCA, November 2016, final decision: DBCTM's 2015 DAU and Incenta, March 2016, DBCT 2015 DAU: Review of WACC parameters (for DBCT); Synergies, May 2019.

G Beta diagnostics

The purpose of this attachment is to present estimates that reinforce the robustness of our beta analysis. We have estimated portfolio betas for each of the industry sectors (Marine Ports and Services, and Railroads), and we have also experimented with different monthly starting days for the monthly returns used in our beta estimates.

G.1 Further information on FTSE country classifications

The classification of countries into Developed, Advanced Emerging, Secondary Emerging and Frontier are displayed in Figure 29.

Figure 29 Developed, Advanced Emerging, Secondary Emerging and Frontier classifications

Developed	Advanced Emerging	Secondary Emerging	Frontier
Australia	Brazil	Chile	Argentina
Austria	Czech Republic	China	Bahrain
Belgium/Luxembourg	Greece	Colombia	Bangladesh
Canada	Hungary	Egypt	Botswana
Denmark	Malaysia	India	Bulgaria
Finland	Mexico	Indonesia	Côte d'Ivoire
France	South Africa	Kuwait	Croatia
Germany	Taiwan	Pakistan	Cyprus
Hong Kong	Thailand	Peru	Estonia
Ireland	Turkey	Philippines	Ghana
Israel		Qatar	Jordan
Italy		Russia	Kazakhstan
Japan		Saudi Arabia*	Kenya
Netherlands		UAE	Latvia
New Zealand			Lithuania
Norway		**China A Shares	Macedonia
Poland			Malta
Portugal			Mauritius
Singapore			Morocco
South Korea			Nigeria
Spain			Oman
Sweden			Palestine
Switzerland			Romania
UK			Serbia
USA			Slovakia
			Slovenia
			Sri Lanka
			Tunisia
			Vietnam
			***Iceland

*Saudi Arabia reclassification to Secondary Emerging market status commenced from March 2019 and to be completed by March 2020.

**China A Shares to be reclassified as Secondary Emerging commencing from June 2019 and to be completed by March 2020.

***Iceland to be reclassified as Frontier, effective with the annual review of the FTSE Frontier index in September 2019.

Data source: FTSE

The criteria comprising the Quality of Markets Matrix used to assign countries to the various classifications is displayed in Figure 30.

Figure 30 FTSE Quality of Markets Matrix

Criteria	Developed	Advanced Emerging	Secondary Emerging	Frontier
World Bank GNI Per Capita Rating				
Credit Worthiness				
Market and Regulatory Environment				
Formal stock market regulatory authorities actively monitor market (e.g., SEC, FSA, SFC)	X	X	X	X
Fair and non-prejudicial treatment of minority shareholders	X	X		
No or selective incidence of foreign ownership restrictions	X	X		
No objection to or significant restrictions or penalties applied to the investment of capital or the repatriation of capital and income	X	X	X	X
Free and well-developed equity market	X	X		
Free and well-developed foreign exchange market	X	X		
No or simple registration process for foreign investors	X	X		
Custody and Settlement				
Settlement - Rare incidence of failed trades	X	X	X	X
Custody-Sufficient competition to ensure high quality custodian services	X	X	X	
Clearing & settlement - T+2 / T+3	X	X	X	X
Settlement - Free delivery available	X			
Custody - Omnibus and segregated account facilities available to international investors	X	X		
Dealing Landscape				
Brokerage - Sufficient competition to ensure high quality broker services	X	X	X	
Liquidity - Sufficient broad market liquidity to support sizeable global investment	X	X	X	
Transaction costs - implicit and explicit costs to be reasonable and competitive	X	X	X	
Stock Lending is permitted	X			
Short sales permitted	X			
Off-exchange transactions permitted	X			
Efficient trading mechanism	X			
Transparency - market depth information/visibility and timely trade reporting process	X	X	X	X
Derivatives				
Developed Derivatives Market	X			

Note: "X" indicates that the criterion must be satisfied
Data source: FTSE

G.1.1 Use by financial practitioners

FTSE classifies all countries included in its global indexes into one of three categories: Developed, Advanced Emerging and Secondary Emerging. Frontier countries do not typically feature in these indices.

The following indices (and associated ETFs) use the country inclusion criteria:

- FTSE Emerging Markets All Cap China A Inclusion Index
  - Vanguard FTSE Emerging Markets ETF (VWO)

- Invesco FTSE RAFI Emerging Markets ETF (PXH) is based on the FTSE RAFI Emerging Markets Index. The Fund will generally invest at least 90% of its total assets in the securities that comprise the Index as well as American Depository Receipts (ADRs) and global depositary receipts (GDRs) that represent securities in the Index.

- FTSE Developed All Cap ex US Index
  - Schwab International Equity ETF (SCHF)
  - Vanguard FTSE Developed Markets ETF (VEA)
- FTSE Developed Asia Pacific All Cap Index
  - Vanguard FTSE Pacific ETF (VPL)
- FTSE Developed Europe All Cap Index
  - Vanguard FTSE Europe ETF (VGK)
- FTSE All-World ex US index
  - Vanguard FTSE All-World ex-US ETF (VEU)
- FTSE Global All Cap Index
  - Vanguard Total World Stock ETF (VT)
- FTSE Global Small Cap ex US Index
  - Vanguard FTSE All-World ex-US Small-Cap ETF (VSS)
- FTSE Global All Cap ex US Index
  - Vanguard ESG International Stock ETF (VSGX)
- FTSE High Dividend Yield Index
  - Vanguard High Dividend Yield ETF (VYM)
- FTSE Developed high dividend yield index
  - Vanguard International High Dividend Yield Index Fund (VYMI)

This suggests that FTSE classifications are sufficiently well accepted by financial markets such that they are used in high profile indices. Considering that Vanguard has US$5.3 trillion in assets under management (second highest in the world), as of September 2018, this suggests that the FTSE classifications are influential on investor behaviour.

G.1.2 Use in academic literature

The FTSE country classifications are also recognised in the academic community as a robust way of delineating countries. For instance, Borges (2010) uses the FTSE classifications to test the validity of the Efficient Markets Hypothesis (EMH) in European stock markets that were defined as developed.[573] The choice of developed stock markets stemmed from the expectation that these markets would be most likely to adhere to the EMH. Kim and Shamsuddin (2008) conduct a similar exercise for Asia, finding that the FTSE country classification is a key determinant of whether the EMH is likely to hold for a particular country.[574] More recently, Uzhegova (2015) employed the FTSE country classifications to investigate the determinants of bank performance and profitability across countries.[575]

G.1.3 Media attention

While less authoritative than academic evidence or financial market practice, we have uncovered articles that suggest country classifications may help guide investors in portfolio formation. For example, when Poland was reclassified to Developed status last year, this received substantial coverage by business news outlets such as Forbes and Bloomberg.[576] [577]

G.2 Portfolio Betas

An informative robustness test for our beta estimates is to evaluate the beta for each sector using a value-weighted portfolio of the comparable companies, rather than averaging across the firms in each sector. The returns of each stock in the portfolio were weighted by market capitalisation in each month. In a similar way, the monthly market return was calculated as the weighted average of the monthly returns for each company's home country benchmark. Likewise, each company's gearing ratio was also weighted by its market capitalisation. The results from these estimates are presented in Table 66.

573 Borges, Maria Rosa. "Efficient Market Hypothesis in European Stock Markets." The European Journal of Finance 16, no. 7 (October 2010): 711–26. https://doi.org/10.1080/1351847X.2010.495477.

574 Kim, Jae H., and Abul Shamsuddin. "Are Asian Stock Markets Efficient? Evidence from New Multiple Variance Ratio Tests." Journal of Empirical Finance 15, no. 3 (June 2008): 518–32. https://doi.org/10.1016/j.jempfin.2007.07.001.

575 Uzhegova, Olga. "The Relative Importance of Internal Factors for Bank Performance in Developed and Emerging Economies." Mediterranean Journal of Social Sciences 6, no. 3 (May 1, 2015): 277.

576 Aitken, R. (2018). Polish Stocks: Should You 'Fill Your Boots' On FTSE's Developed Market Upgrade? Forbes, 22 September. Accessed from: https://www.forbes.com/sites/rogeraitken/2018/09/22/polish-stocks-should-you-fill-your-boots-on-ftses-developed-market-upgrade/#67cc4f392880

577 Krasuski, K. (2018). Poland Targets New Investors as Stocks Jump After FTSE Promotion. Bloomberg, 25 September.

Table 66 Portfolio Asset Beta Estimates

Timeframe	Marine Ports and Services	Railroads	All firms
5 Year Portfolio	0.73	0.93	0.91
10 Year Portfolio	0.77	0.89	0.88

Source: Bloomberg, Synergies calculations

For the Marine Ports and Services sector, the 5-year portfolio beta is 0.73, while the 10-year portfolio beta is 0.77. These estimates are higher than those that result from simple averages or medians of the sample (see Chapter 7). This can be attributed to the weighting of firms according to their market capitalisations. For example, China Merchants Port Holding Company (which has a 5-year asset beta of 0.79 and 10-year asset beta of 0.76) accounts for approximately 30% of total market capitalisation for the 7 Marine Ports and Services firms. As such, this entity will receive a larger weighting than it would in an assessment of the average or median asset beta for the sector, thereby influencing the overall estimate.

In regard to the Railroads sector, the 5-year and 10-year portfolio betas (0.93 and 0.89, respectively) are similar to the corresponding median asset betas for the sector (0.85 and 0.90 over 5 and 10 years, respectively). The portfolio betas for the full sample of firms (i.e. both Marine Ports and Services and Railroads) are closer to the portfolio beta estimates for Railroads than for Marine Ports and Services. 92% of the total market capitalisation of the comparator set is accounted for by the Railroads sample. As a result, the overall portfolio beta will more closely resemble the estimate for this sector.

G.3 Beta estimates using different monthly starting days

By default, the monthly returns used in our beta analysis are calculated at the end of each month. To add robustness to our beta estimates, we have compiled supporting beta estimates using every other day of the month, and have averaged across these individual estimates. Results over both a five-year and ten-year time frame are displayed in Table 67, and reinforce that an asset beta value of 0.7 (from a range of 0.70 to 0.75) represents a conservative assessment.

Table 67 Beta estimates averaged across different starting days

Timeframe	31-day Average	31-day Median
5 Years	0.82	0.78
10 Years	0.81	0.79

Note: To accommodate different month lengths throughout the year, we have also taken averages over 28 days. This causes no difference in the 10 year estimates, and a difference of only 0.01 in the median for the 5 year estimates.

Source: Bloomberg, Synergies

The results presented in the table above are based on 31-day averages. If the given starting date falls on a weekend or public holiday in a particular month, we use the most recent trading day as an approximation. For example, where the starting day is set to be the 15th of the month, if the 15th falls on a weekend, the value from the previous trading day is used as an approximation. To accommodate different month lengths throughout the year, we have also taken averages over 28 days. This has virtually no impact on the findings.

G.4 Comparator descriptions

The following two tables present descriptions of the comparators that we have included in our sample.

Table 68 Marine Ports and Services comparators

Company	Country	Description
Qube Holdings	Australia	Qube Holdings Ltd. is a logistics company. The Group operates in divisions covering Automotive, Bulk and General Stevedoring, Landside Logistics and Strategic Development Assets.
Port of Tauranga	New Zealand	Port of Tauranga Limited activities include the provision of wharf facilities, back up land for the storage and transit of import and export cargo, berthage, cranes, tug and pilotage services for exporters, importers and shipping companies and the leasing of land and buildings. The Group also operates a container terminal and has bulk cargo marshalling operations.
Hamburger Hafen und Logistik	Germany	Hamburger Hafen und Logistik AG (HHLA) provides services to the port in the European North Range. The Company's container terminals, transport systems, and logistic services provide a network between overseas port and European hinterland.
China Merchants Port Holding Company	Hong Kong	China Merchants Port Holdings Company Limited, through its subsidiaries and associated companies, operates ports, airports, and other container and cargo terminals around the world. The Company also manages toll roads, properties, and assets management.
COSCO Shipping Ports	Hong Kong	Cosco Shipping Ports Limited, through its subsidiaries, provides ports services worldwide. The Company operates container terminals, and provides container handling, storage, transportation, management, and stevedoring services.
Dalian Port	Hong Kong	Dalian Port (PDA) Company Limited provides international and domestic cargo handling, transportation, transit, warehousing and other port operations and logistics services. The Company also provides oil and liquid chemicals terminal and related logistics services, tugging, pilotage, cargo handling and information technology services.
Hutchinson Port Holdings Trust	Singapore	Hutchison Port Holdings Trust is a container port business trust. The Trust invests in, develops, operates, and manages deep-water container ports in the Pearl River Delta. Hutchison Port Holdings also invests in other types of port assets such as river ports, as well as undertake certain port ancillary services that include warehousing and distribution services.

Source: Bloomberg

Table 69 Railroad comparators

Company	Country	Description
CSX Corporation	US	CSX Corporation is an international freight transportation company. The Company provides rail, intermodal, domestic container-shipping, barging, and contract logistics services around the world. CSX's rail transportation services are provided principally throughout the eastern United States.
Kansas City Southern	US	Kansas City Southern, through its subsidiary, is the holding company for transportation segment subsidiaries and affiliates. The Company operates a railroad system that provides shippers with rail freight services in commercial and industrial markets of the United States and Mexico.
Norfolk Southern Corporation	US	Norfolk Southern Corporation provides rail transportation services. The Company transports raw materials, intermediate products, and finished goods primarily in the Southeast, East, and Midwest and, via interchange with rail carriers, to and from the rest of the United States. Norfolk Southern also transports overseas freight through several Atlantic and Gulf Coast ports
Union Pacific Corporation	US	Union Pacific Corporation is a rail transportation company. The Company's railroad hauls a variety of goods, including agricultural, automotive, and chemical products. Union Pacific offers long-haul routes from all major West Coast and Gulf Coast ports to eastern gateways as well as connects with Canada's rail systems and serves the major gateways to Mexico.
Canadian National Railway Company	Canada	Canadian National Railway Company operates a network of track in Canada and the United States. The Company transports forest products, grain and grain products, coal, sulfur, and fertilizers, intermodal, and automotive products. Canadian National operates a fleet of locomotives and railcars.
Canadian Pacific Railway	Canada	Canadian Pacific Railway Limited is a Class 1 transcontinental railway, providing freight and intermodal services over a network in Canada and the United States. The Company's mainline network serves major Canadian ports and cities from Montreal to Vancouver, and key centers in the United States Midwest and Northeast.

Source: Bloomberg

G.5 Excluded comparators

The following tables provide a list of firms that were excluded from our sample, whether because of low market capitalisation, insufficient data, or incompatibility with the BEE.

Table 70 Marine Ports and Services comparators excluded from sample

Firm	Comments
Piraeus Port Authority	FTSE Advanced Emerging classification
Thessaloniki Port Authority	FTSE Advanced Emerging classification
Sociedad Matriz SAAM	FTSE Secondary Emerging classification
Luka Koper	FTSE Frontier classification
Global Ports Investments	Listed in UK, but operates in Russian, Finland and Estonia
Isewan Terminal Service	Market capitalisation less than $US200 million
Dongbang Transport Logistics	Market capitalisation less than $US200 million
Rinko Corporation	Market capitalisation less than $US200 million
Sakurajima Futo Kaisha	Market capitalisation less than $US200 million
Wilson Sons	FTSE Advanced Emerging classification

Firm	Comments
ADSEZ	FTSE Secondary Emerging classification
Asian Terminals	FTSE Secondary Emerging classification
International Container Terminal Services	FTSE Secondary Emerging classification
Kingston Wharves	No FTSE classification
Prumo Logistica	Now delisted
Pakistan International Container Terminal	FTSE Secondary Emerging classification
DP World	FTSE Secondary Emerging classification
Alexandria Containers & Goods	FTSE Secondary Emerging classification
China Container Terminal Corporation	FTSE Advanced Emerging classification
Summit Alliance Port Ltd	FTSE Frontier classification
United Arab Shipping Co SAG	FTSE Secondary Emerging classification
Bremer Lagerhaus-Gesellschaft AG	Market capitalisation less than $US200 million
Eurokai GmbH	Low trading volume
Logistec Corporation	40% of revenue from environmental services
Essar Ports	FTSE Secondary Emerging classification
Salalah Port Services Company SAOG	FTSE Frontier classification
Puerto Ventanas S.A.	FTSE Secondary Emerging classification
Tradia Corporation	Market capitalisation less than $US200 million
Lyttelton Port Company Limited	Incomplete data
South Port New Zealand Limited	Market capitalisation less than $US200 million
Point Lisas Industrial Port Development Corporation Limited	No FTSE classification
Namyong Terminal	FTSE Advanced Emerging classification
Mercantile Ports and Logistics Limited (MPL)	Market capitalisation less than $US200 million
Shanghai International Port	Chinese-listed (issues with openness of capital markets)
Ningbo Zhoushan Port Company	Chinese-listed
Kamigumi	Significantly diversified
Tianjin Port Development Holdings	Sale of materials accounts for majority of revenue
Tianjin Port Co.	Chinese-listed
Mitsubishi Logistics Corporation	Significant diversification, port and harbour operations only 10% of revenue
Nissin Corporation	28% travel services and real estate, and port services are only a subset of its logistics business
Sumitomo Warehouse Co.	Revenue is substantially diversified
Xiamen Port Development Co.	Chinese-listed
Qingdao Port International Co.	Missing observations

Firm	Comments
Xiamen International Port Company	Trading business of merchandise accounted for 61.5% of revenue in FY2016.
Guangzhou Port Company Limited	Chinese-listed
Anhui Wanjiang Logistics Group Co	Chinese-listed
COSCO SHIPPING International (Hong Kong)	Shipping
Novorossiysk Commercial Sea Port	Handles mainly crude oil
Tangshan Port Group Co.	Chinese-listed
Qinhuangdao Port Company Limited	Some observations missing
Rizhao Port Co.	Chinese-listed
Sebang	Some diversification
Meiko	Diversification beyond port operations
Yingkou Port Liability	Chinese-listed
Westports Holdings Berhad	Insufficient observations
Ocean Wilsons Holdings	Holding company – listed in the UK, but operates in Bermuda and Brazil
Beibuwan Port Co.	Chinese-listed
Touax	Unrelated operations
EMS Seven Seas	Unrelated operations
Jinzhou Port Co.	Chinese-listed
National Marine Dredging Company	Not relevant – dredging
Chongqing Gangjiu Co.	Chinese-listed
Toyo Wharf and Warehouse	Port and harbour operations only 23% of revenue
Shenzhen Chiwan Wharf Holdings	Chinese-listed
Bintulu Port Holdings Berhad	FTSE Advanced Emerging classification
Muehlhan	Surface protection solutions
Contracting & Marine Services Company	Services and maintenance
Zhuhai Port Co.	Chinese-listed
Societe d'Exploitation des Ports, dba Marsa Maroc	Missing data
Westshore Terminals	Single commodity exposure
Santos Brasil Participacoes S.A.	Missing data
Andino Investment Holding	FTSE Secondary Emerging classification
Braemar Shipping Services	Unrelated operations
Daito Koun	Imports frozen foods
Jiangsu Lianyungang Port Co.	Chinese-listed
Saudi Industrial Services Company (Sisco)	Unrelated services

Firm	Comments
Gemadept Corporation	Shipping company
Vostochney Port	Missing data
Kuwait & Gulf Link Transport Co. (K.S.C)	Unrelated services
Sical Logistics Ltd.	Diversified into trucking and rail
Zhangjiagang Freetrade Science & Technology Group Co.	Chinese-listed
Global Ports Holding Limited	Insufficient observations
Fushiki	Also runs liners
Sinwa Limited	Unrelated - supply, logistics and services
Port of Hai Phong	Missing data
Gujarat Pipavav Port Ltd.	FTSE Secondary Emerging classification
China Dredging Environment Protection Holdings	Unrelated – dredging
Puertos y Logistica	Has unrelated subsidiaries
Dredging Corporation of India	Unrelated - dredging
Overseas Commerce Ltd.	Missing data
Novorossyisk Grain Plant PJSC	Missing data
Suria Capital Holdings Berhad	FTSE Advanced Emerging classification
Gateway Distriparks Limited	Limited port exposure
Navkar Corporation Limited	Missing data
Portuaria Cabo Froward	Also involved in construction
Gold Bond Group	Market capitalisation less than $US200 million
General Silos & Storage	Single commodity exposure
Perak Corporation Berhad	FTSE Advanced Emerging classification
Nanjing Port Co.	Chinese-listed
Zhuhai Winbase International Chemical Tank Terminal Co.	Chinese-listed
Dinh Vu Port Investment & Development	FTSE Frontier classification
Harbor Star Shipping Services, Inc.	Shipping services, FTSE Secondary Emerging classification
CIG Yangtze Ports Plc	Missing data
Luka Ploce d.d.	FTSE Frontier classification
Uljanik Plovidba DD	FTSE Frontier classification
Pelayaran Nasional Bina Buana Raya Tbk	Unrelated operations
DaNang Port Joint Stock Company	Insufficient observations
Globalport 900, Inc.	Incomplete data
Hai An Transport & Stevedoring JSC	FTSE Frontier classification
Luka Rijeka dd	Primarily support services

Firm	Comments
Dong Nai Port JSC	FTSE Frontier classification
Odessos Shiprepair Yard AD	Repair services
VMS Industries Ltd.	Ship dismantling
Comvex SA	FTSE Frontier classification
Socep S.A.	FTSE Frontier classification
Starlog Enterprises Ltd	Unrelated operations
exactEarth Ltd.	Satellite data services
Cat Lai Port JSC	FTSE Frontier classification
Vietnam Maritime Development JSC	FTSE Frontier classification
PT Indo Straits Tbk	Unrelated operations
Sutton Harbour Holdings	Market capitalisation less than $US200 million
Camper & Nicholsons Marina Investments	Marinas
Marine Supply and Engineering Service JSC	Unrelated services
PT ICTSI Jasa Prima Tbk	Statistically insignificant
Canal Shipping Agencies Company	Shipping agency
Cia de Remorcare Maritima Coremar SA Constanta	Unrelated services, missing data
Sino-Global Shipping America Ltd.	Shipping agency
Jadroagent D.D.	Shipping agency
Doan Xa Port Joint Stock Company	FTSE Frontier classification
Western India Shipyard Limited (WISL)	Repair services
Bangpakong Terminal Public Company Limited	Missing data
Taiwan Allied Container Terminal Corp.	FTSE Advanced Emerging classification
Marsden Maritime Holdings Limited	Market capitalisation less than $US200 million
The Vegetexco Port JSC	FTSE Frontier classification
Natura Hue Chem Ltd.	Unrelated operations
C Security Systems AB	Communications and technology
JITF Infralogistics Limited	Repair services
Companhia Docas de Imbituba	Missing data
Movis Cote d'Ivoire	Ivory Coast
Pakistan International Bulk Terminal Limited	FTSE Secondary Emerging classification
Yangtze River Development Limted	Real estate
Quayside Holdings Ltd	Missing data

Source: Bloomberg, Synergies analysis

Table 71 Railroad comparators excluded from sample

Firm	Comments
Globaltrans Investment	Listed in UK, but operates in Russian, CIS countries and the Baltics
Container Corporation of India Limited	FTSE Secondary Emerging classification
Aurizon Holdings	Central Queensland Coal Network has lower risk exposure than the BEE
VTG AG	Trading volume has dropped off sharply over last 12 months
Center for Cargo Container Traffic TransContainer PJSC	FTSE Secondary Emerging classification
East Japan Railway Company	Passenger, too diversified
Central Japan Railway Company	Diversified, not freight
West Japan Railway Company	Too Diversified
Kintetsu Corp	Too Diversified
Tokyu Corporation	Too Diversified
Daqin Railway Co., Ltd.	Chinese-listed
Hankyu Hanshin Holdings, Inc.	Passenger
MTR Corporation Limited	Public Transport
Nagoya Railroad Co., Ltd.	Passenger
Go-Ahead Group PLC	Buses and Taxis as well
Tobu Railway Co., Ltd.	Passenger
Odakyu Electric Railway Co., Ltd.	Passenger, Diversified
Keio Corporation	Passenger, Diversified
Kyushu Railway Company	Passenger, Diversified
Nishi-Nippon Railroad Co.	Passenger, Diversified
Keikyu Corporation	Passenger, Diversified
Guangshen Railway Company Limited	Chinese-listed
Sotetsu Holdings, Inc.	Passenger, Diversified
Keisei Electric Railway Co., Ltd.	Passenger, Diversified
Nankai Electric Railway Co., Ltd.	Passenger, Diversified
Cosan Logistica SA	Incomplete Data
Rumo S.A.	FTSE Advanced Emerging classification
Rumo Logistica Operadora Multimodal S.A.	FTSE Advanced Emerging classification
PKP Cargo S.A	Market capitalisation less than $US200 million
China Railway Tielong Container Logistics Co., Ltd.	Diversified, Chinese-listed
BLS AG	Market capitalisation less than $US200 million
China High-Speed Railway Technology Co., Ltd.	China, Maintenance

Firm	Comments
FNM S.p.A	Strong public transport emphasis
Kobe Electric Railway Co., Ltd.	Passenger, other diversified services
Berner Oberland-Bahnen AG	Incomplete Data, Mountain Railways
Shin-Keisei Electric Railway Co., Ltd.	Bus, Real Estate
Jungfraubahn Holding AG	Tourism-related
BTS Group Holdings	Public Transport
BVZ Holding AG	Passenger railway
Shanghai Shentong Metro Co. Ltd.	Subway Transit Systems
Keifuku Electric Railroad Co., Ltd.	Diversified
Forestiere Equatoriale	Ivory Coast
Chichibu Railway Co., Ltd.	Passenger and Bus as well as freight
The Central Provinces Railways Co. Ltd.	Construction
Las Vegas Railway Express	Passenger
GMexico Transportes	Insufficient data – listed only in November 2017

Source: Bloomberg, Synergies analysis

H Gearing Ratios

The purpose of this attachment is to provide further details on the comparator companies that Synergies has used to develop its gearing and asset beta assumptions for the BEE.

H.1 Characteristics of a benchmark efficient entity

The various determinants of capital structure for port service providers present challenges when defining an ideal capital structure. In defining the BEE, several key characteristics must be considered.

H.1.1 Cash Flow Volatility

PoM is a landlord port as opposed to a port / terminal operator. As such, its business model in the context of the provision of Prescribed Services is characterised by relatively high operating leverage, which is a capital-intensive business model with relatively low variable costs. All else equal, a business with high operating leverage has greater sensitivity of earnings to changes in sales volumes and revenues compared to entities with low operating leverage.

PoM's historical cash flow profile has been significantly affected by levels of economic activity, which is reflective of the nature of trade activity at the port (e.g. services provided to facilitate import and export trades, which in turn are driven by domestic demand and international trade activity).

Moreover, there is some contestability in the broader trade catchment areas serviced by PoM and, in the longer term, it is expected the port may be subject to increased competition in the Melbourne market, should the Victorian Government proceed with procuring a second container port as is contemplated in the study completed by Infrastructure Victoria. In its October 2017 *Victorian Infrastructure Plan*, the Victorian Government announced that it would "undertake strategic planning to identify and prioritise future freight investment, including consideration of a second container port."[578]

H.1.2 Investment Needs

Capital investment needs for port infrastructure assets can be characterised as "lumpy," in the sense that capacity expansions generally can only be undertaken in relatively large

[578] Victorian Government (2017). Victorian infrastructure plan, October, p.43.

increments. This can lead to a material variation in capital structure over time in line with the need to upgrade and expand port facilities.

H.1.3 Debt Serviceability

The assessment techniques of credit rating agencies also provide guidance on the characteristics of a BEE. In Moody's rating methodology for Privately Managed Port Companies, their considerations include, but are not limited to, the following:[579]

- Market Position:
  - How large is the port, and to what extent does it form an essential part of the local economy?
  - Does it have an effective monopoly on port services in the region, or is it a major transhipment hub?
  - What is the quality of the connecting road and/or rail infrastructure? Are there any operational restrictions? (For example, unable to accept certain ship types, or other capacity limitations)
- Diversity of Customer Base
  - How exposed is the port to volume variation?
  - How dominant are its main customers?
- Capital Program and Financial Profile
  - How much expansion capital expenditure is planned?
  - What proportion of revenues come from non-core activities?
- Nature of Asset Ownership
  - Are all key port assets held outright in perpetuity and controlled by port management, or are they subject to short term operating leases?
- Key Credit Metrics
  - How does the port perform against key credit metrics, the most important of which are:
    - funds from operations (FFO) to debt ratio. FFO can be defined as cash flow from operations prior to movements in working capital. A lower FFO/Debt ratio indicates that the firm is more highly leveraged. FFO / Debt is particularly relevant to credit rating agencies – a cashflow-based

[579] Moody's (2016). Privately managed port companies rating methodology, 15 September.

gearing metric is seen to be more relevant for high cash yielding infrastructure businesses;

- interest coverage ratio is typically defined as the ratio of EBIT to interest payable on debt. As such, it measures a firm's ability to service its debt. Evaluating the interest coverage ratio of comparable companies provides an indication of the necessary interest cover required for an efficient benchmark entity.

H.2 Comparator Companies

Table 72 lists the 5-year gearing estimates for the 13 comparator companies that emerged from the process set out in the beta assessment set out in Chapter 7.

Table 72 Gearing for full list of comparators (13 entities)

Company	Country	Sector	Gearing
Qube Holdings	Australia	Marine Ports and Services	19%
Port of Tauranga	New Zealand	Marine Ports and Services	4%
Hamburger Hafen und Logistik	Germany	Marine Ports and Services	23%
China Merchants Port Holding Company	Hong Kong	Marine Ports and Services	32%
COSCO Shipping Ports	Hong Kong	Marine Ports and Services	41%
Dalian Port	Hong Kong	Marine Ports and Services	32%
Hutchinson Port Holdings Trust	Singapore	Marine Ports and Services	57%
CSX Corporation	US	Railroads	24%
Kansas City Southern	US	Railroads	20%
Norfolk Southern Corporation	US	Railroads	22%
Union Pacific Corporation	US	Railroads	16%
Canadian National Railway Company	Canada	Railroads	12%
Canadian Pacific Railway	Canada	Railroads	20%
		Median	**22%**
		Average	**25%**

Source: Bloomberg

Table 73 lists the median and average gearing ratios for our full sample of companies.

Using the full sample, the median gearing level is 22% and the average gearing level is 25%. We also present results by sector.

Table 73 Gearing by sector (full sample of 13 entities)

	Sector Average	Sector Median	Sector Minimum	Sector Maximum
Marine Ports and Services	30%	32%	4%	57%
Railroads	19%	20%	12%	24%

Source: Bloomberg

I Detailed response to ESC commentary on academic evidence for gamma

I.1 2018 ESC interim commentary on academic evidence

In the 2018 interim commentary, the ESC was concerned that the academic literature that we compiled was not compatible with the foundational papers on gamma in Australia. In the 2019 interim commentary, the ESC noted our responses to these concerns, but did not provide any further substantive commentary on these issues. As such, this section largely restates our views from the 2019-20 TCS submission.

In the 2018 interim commentary, the ESC stated that:[580]

> Synergies' view of what is accepted in the academic literature is also not derived from the principal academic papers relating to gamma, namely Officer, Monkhouse and Lally and van Zijl which provide derivations of the model in which gamma appears. None of these papers assert that gamma is zero by reference to empirical evidence.

It is helpful to present the context and the key passages from the papers that the ESC has referenced in order to gain a proper perspective on the ESC commentary. In the case of Officer (1994) and Monkhouse (1993), there was insufficient empirical data to make any informed appraisal of the value of imputation credits. This was because dividend imputation had been only recently been introduced in 1987. Consequently, none of these papers assert any specific value for gamma by reference to empirical evidence. These data deficiencies have been resolved as time has progressed, including via dividend drop-off studies.

Officer (1994)

In a footnote of his seminal paper, Officer states the following:[581]

> For example, if the shareholder can fully utilize the imputation credits then ("value") gamma = 1, e.g. a superfund or an Australian resident personal taxpayer. On the other hand, a tax exempt or an offshore taxpayer who cannot utilize or otherwise access the value in the tax credit will set gamma = 0. Where there is a market for tax credits one could use the market price to estimate the value of gamma for the marginal shareholder, i.e. the shareholder who implicitly sets the price of the shares and the price of gamma and the company's cost of capital at the margin, but where there is only a covert market, estimates can only be made through dividend drop-off rates.

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580 ESC (2018), p.75.

581 Officer, R.R. (1994). The cost of capital of a company under an imputation tax system, Accounting and Finance

Understandably, this wording has generated significant debate in the regulatory setting – a debate to which the ESC refers in its interim commentary. Energy Networks Australia (ENA) made the following observation on the Officer framework in its response to the AER's draft decision:[582]

> Officer (1994) is not a model. There is no set of assumptions and no derivation of a market-clearing equilibrium. Rather, Officer provides a useful set of formulas for a *given* gamma – he provides no mathematical framework for determining what gamma means or what it should be. Thus, it would be wrong to suggest that a particular estimate of gamma is 'consistent with the Officer model.' *Every* estimate of gamma is consistent with Officer, so long as the same estimate is used in the cash flows and the corresponding estimate of the discount rate. [Italicised emphasis in the original]

Monkhouse (1994)

In the conclusion to his paper, Monkhouse writes the following:[583]

> This paper set out to derive a CAPM consistent with a cash flow measured after corporate tax but before investor-level taxes in the context of the Australian dividend imputation tax system. This question has considerable significance since it relates directly to the issue of specifying the discount rate that firms in Australia should use to value risk cash flows. The answer derived in this paper is given by equation (7.2) which presents a CAPM that contains two terms that capture the effects of the dividend imputation tax system.

Equation 7.2 in Monkhouse (1994) is the following expression:

$$\mathbf{E}(\mathbf{r_j}) = \mathbf{r}_f + \beta_j [\mathbf{E}(\mathbf{R_m}) - \mathbf{r}_f] - \theta_j^d D_j' t_{jf} - \theta_m^r RIC_j'. \tag{7.2}$$

where the two theta terms correspond to retained and distributed imputation credits, respectively. Monkhouse reported in 1994 that these two theta terms "cannot be readily measured." He proposes the following:

> In a practical application, an analyst could estimate the values of these terms on the basis of "market experience" and an assessment of the investor base of the firm. While the values of theta(d,j) and theta(r,m) must ultimately be determined empirically, in

[582] Energy Networks Australia (2018). AER Review of the Rate of Return Guideline – Response to Draft Guideline, 25 September, p.144.

[583] Monkhouse, P.H.L. (1993). The cost of equity under the Australian dividend imputation tax system.

most of the comments that follow it has been assumed that both theta(d,j) and theta(r,m) are greater than zero.

The cost of equity capital for an Australian tax-paying firm with predominantly Australian investors is lower than if the same firm were owned by offshore investors. In the latter case, theta(d,j) and theta(r,m) = 0 and the CAPM reverts to the "classical" CAPM.

Consequently, although Monkhouse does favour a non-zero gamma, and the Monkhouse framework is more readily associated with non-market approaches to gamma, the paper does not rule out the possibility of a zero gamma either, especially where the marginal investor is a foreign investor.

Lally and van Zijl (2003)

As raised by the ESC in the interim commentary, Lally and van Zijl (2003) argue that theta is equal to 1. The AER has recently opted not to rely on this approach,[584] and we have not uncovered any financial practitioner evidence to substantiate it either.

584 AER (2018), p.376.

J WACC benchmarking

The purpose of this attachment is to set out an analysis of the factors relevant to a comparison between PoM and the regulated entities in our sample. It goes on to disclose a range of comparison metrics for benchmarking purposes, some of which are less relevant, but nevertheless supplement the analysis of WACC and cost of equity margins in Chapter 11. The attachment concludes with additional information on the Bloomberg-generated WACC estimates for listed comparators.

J.1 Relevance of regulatory comparisons

This section evaluates the relevance of the regulatory comparators that we have included in our benchmarking analysis for the BEE.

J.1.1 Arc Infrastructure (ERA)

In its 2015 decision on WACC, the ERA summarised some aspects of its 2008 WACC decision, where it explicitly recognised that Arc Infrastructure's (formerly Brookfield Rail) asset beta should sit below that of a business whose revenue source was driven by domestic-based freight operations, such as a Class I Railroad (as opposed to longer term contract-based export bulk mineral hauls) being offset by considerations of operating leverage:[585]

> In 2008 for the WestNet Rail (now Brookfield Rail) WACC determination, the Authority took the view that the equity beta for the freight network is 1.0. This was also based on the advice of ACG, who recommended a range of 1.0 to 1.15 based on 35 per cent gearing and an asset beta of 0.65 to 0.75. The sample of comparable firms included rail infrastructure businesses in the United States and Canada and listed transport infrastructure services firms in Australia and New Zealand.
>
> ACG's view was that an assumed asset beta in this range would overstate an asset beta for the freight rail system in Western Australia. This was because the above comparator companies were thought to have a higher proportion of revenues derived from intermodal traffic, which is expected to have a higher beta than the freight rail system in Western Australia. Accordingly, ACG recommended an asset beta of 0.6 at a 35 per cent gearing level, giving an equity beta of 0.92.
>
> The Authority also acknowledged submissions that the high operating leverage (ratio of variable to fixed costs) of the freight-network business may, all other things being equal, contribute to a relatively high sensitivity of profits to changes in levels of

585 ERA (2015a), p.147. Paragraph numbers and footnote references omitted.

demand and a higher beta value for the freight network business. However, the Authority was of the view that the Western Australian freight network is likely to have a lower beta than the comparators due to the predominance of bulk grain and minerals freight which were found to have asset betas closer to 0.45. Based on this, its view was that there was limited justification to adopt a beta value outside of the range derived from comparator businesses.

In other words, the ERA acknowledged that the high operating leverage of the freight-network business offset a relatively lower risk profile on account of Brookfield Rail's (as it then was) reliance on export related freight activity. The ERA observed that around 85% of Brookfield Rail's freight task related to the transport of either export commodities or inputs to commodities, such as grain and alumina, with the remainder being accounted for by general freight. The ERA's 2018/2019 rail WACC review does not provide such granular commentary on systematic risk; rather, the current determination reiterates observations made in previous reviews. Whilst we do not endorse the ERA's approach, it is appropriate we adopt the reasoning for current purposes given we are essentially reconciling our proposed WACC with the outcomes of relevant regulatory processes.[586]

In this context, it is noted that PoM exhibits a much higher sensitivity to domestic economic activity than Arc Infrastructure due to its reliance on imports (over 60% in revenue terms) which are inherently correlated with domestic economic activity. Moreover, PoM's cost structure is such that costs vary insignificantly with throughput across a broad range of demand and, in this respect, it varies from rail infrastructure which has a higher level of variable cost due to throughput-driven maintenance and scheduling activities.

Adopting the ERA's logic, the nature of the trade mix and the absence of long-term contracts exposes PoM to volume risk to a greater extent than Arc, especially once regard is had to PoM's inability to adjust expenditure in response to volume fluctuations.

J.1.2 Pilbara Railways (ERA)

Pilbara Railways, being single-commodity focused, is sensitive to fluctuations in commodity prices (specifically iron ore) and has a concentrated customer base, which amplifies volume risk. However, as detailed in our first principles analysis, PoM is also subject to high levels of systematic volume risk arising from the correlation of underlying demand with economic activity as well as arising from competitive pressures

586 Contract cover may indeed provide revenue certainty and mitigate volatility in the short to medium term. However, this has the consequence of masking underlying systematic risk, effectively crystallising this risk at discrete points in time.

from other ports (including the Port of Geelong, Port Botany and Port Adelaide), which compete with PoM for import containers, agricultural exports, and various other commodities and raw materials. This is compounded further by the prospects for a second Melbourne port (see Attachment D).

It is clear that both Pilbara Railways and PoM face material systematic risk. However, there is no reason to believe that the BEE's systematic risk profile would be less than that for Pilbara Railways. Whilst Pilbara Railways operates with a single commodity risk, it is for an export product; Pilbara Railways is not vulnerable to the BEE's import dependence and consequential exposure to economic cycles increasing its systematic risk.

J.1.3 NSW Rail Access Undertaking (IPART)

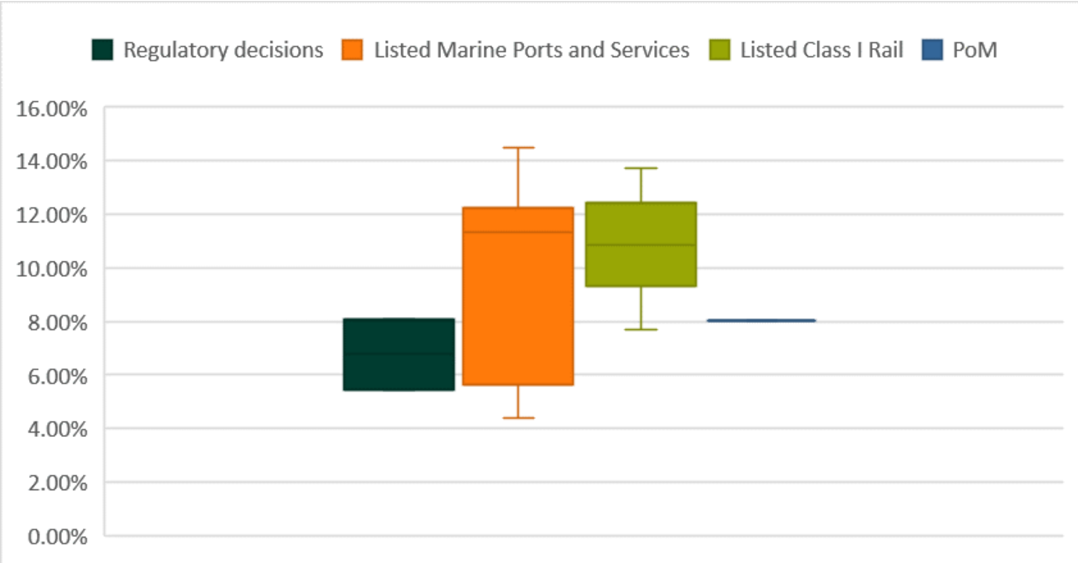
In the case of the IPART draft decision for the NSW Rail Access Undertaking, it is noteworthy that PoM's WACC is almost 50 basis points lower than the IPART decision. This is despite some parts of the network in the IPART decision having systematic risk exposure limited by long term contracts, such as electricity generation-related activities and export activity (such as grain). All of these factors are likely to contribute to significantly lower systematic exposure as it is typically assessed by regulators.

J.2 Benchmarking outcomes

J.2.1 Pre-tax nominal WACC margins

Figure 31 displays the pre-tax nominal WACC margins from Chapter 11. As discussed there, comparison with listed comparators on this metric is complicated by the low cost of debt margins that Bloomberg adopts for these estimates. Nevertheless, PoM's WACC sits towards the lower end of the WACC ranges for Class I railroads and Marine Ports and Services. An adjustment for the cost of debt is addressed in section J.2.6 below.

Figure 31 Regulatory and listed comparator pre-tax nominal WACC margins

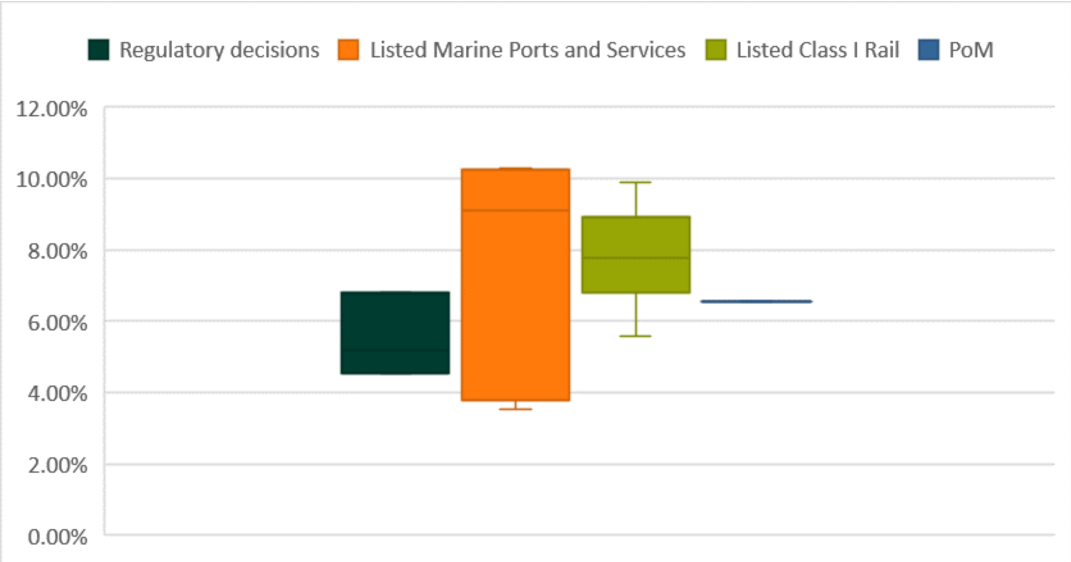


Data source: Synergies calculations, various regulatory decisions, Bloomberg

J.2.2 Post-tax nominal WACC margins

Although the Pricing Order stipulates that the WACC for the BEE should be calculated on a pre-tax nominal basis, a comparison of post-tax nominal WACC margins is informative for distinguishing the impact of differing gamma assumptions. In contrast to the pre-tax nominal WACC margins, PoM's post-tax nominal WACC margin sits below the upper end of the regulatory range. This can be attributed to the difference in gamma values that are adopted (0.33 in the case of PoM, 0.25 in the case of IPART, and 0.50 in the case of the ERA decisions).

Figure 32 Regulatory and listed comparator post-tax nominal WACC margins



Data source: Synergies calculations, various regulatory decisions, Bloomberg

J.2.3 Cost of equity margins

Cost of equity margins can be presented using a number of specifications, each with their own merits:

- **Pre-tax or post-tax** – the Pricing Order requires the WACC to be calculated on a pre-tax nominal basis, but post-tax comparisons are also useful, particularly in relation to international comparisons given the most relevant workably competitive market for a consideration of the appropriate WACC is an international capital market. For Australian regulatory comparisons, pre-tax is relevant for distinguishing the impact of differing gamma assumptions. For international listed comparators, it is necessary to ensure that differences in corporate taxation rates and imputation credit schemes across countries do not impact heavily upon the results and a post-tax comparison is most appropriate.
- **Levered or unlevered** - two firms with the same asset beta (i.e. underlying systematic risk exposure) may have different equity betas due to differences in leverage. This may be consequential when comparing the cost of equity. Unlevered cost of equity comparisons (which assume zero gearing for all comparators) are likely to be the most relevant for informing PoM's benchmarking, but levered cost of equity estimates may provide a useful starting point.

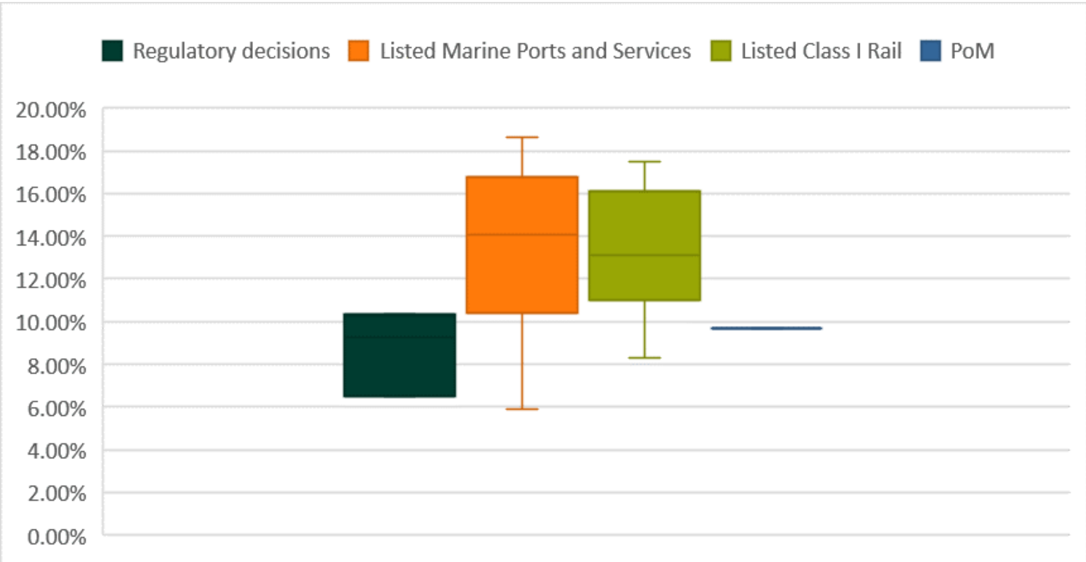
We consider each of these approaches in turn.

J.2.4 Pre-tax cost of equity margins

Levered

Figure 33 displays pre-tax cost of equity margins on a levered basis. This means that part of the difference in cost of equity margins could still be attributable to differences in gearing (i.e. financial risk) rather than differences in asset betas (i.e. systematic risk). In any case, PoM's cost of equity margin estimate is at the lower end of the range defined by listed comparators, and sits within the range of regulatory comparators. however, this comparison is affected by there being no allowance made for differing gearing levels. This issue is addressed if we compare equity margins on an unlevered basis.

Figure 33 Regulatory and listed comparator pre-tax cost of equity margins (levered)

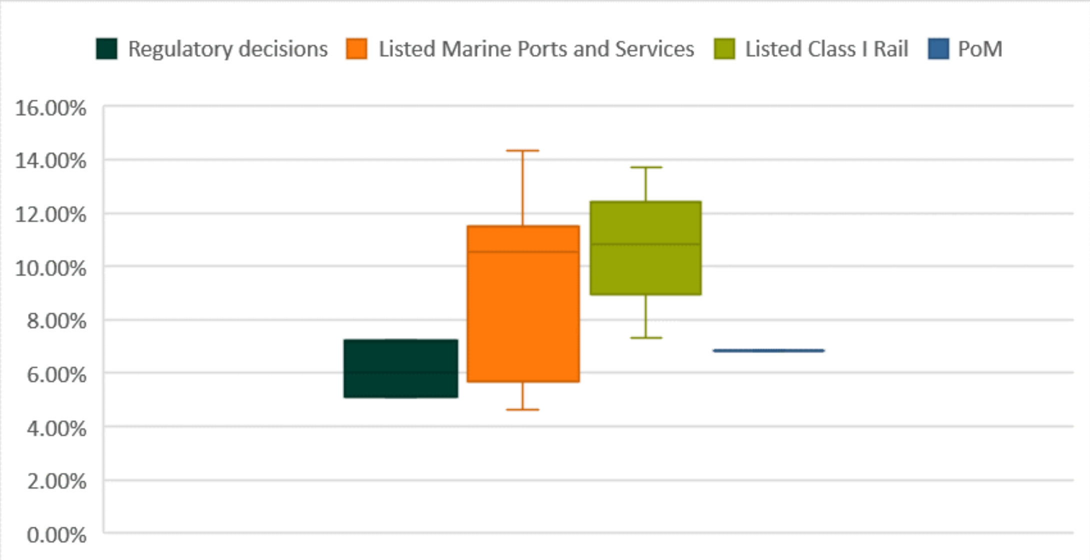


Data source: Synergies calculations, various regulatory decisions, Bloomberg

Unlevered

Figure 34 presents the same cost of equity margins as in Figure 33, but instead calculated on an unlevered basis. In other words, they have been calculated assuming zero gearing (i.e. asset beta = equity beta) to eliminate the impact of gearing from the comparison. The previous comparison is confounded by the impact of gearing, because two entities with the same asset betas could have different equity betas (and in turn, have a different cost of equity) depending on their gearing assumptions. Again, PoM's estimate is towards the lower end of the range for the listed comparators, and lies within the range of regulated post-tax cost of equity margins (being Pilbara Railways) now that the difference in gearing (30% for PoM versus 20% for Pilbara Railways) has been accounted for.

Figure 34 Regulatory and listed comparator pre-tax cost of equity margins (unlevered)



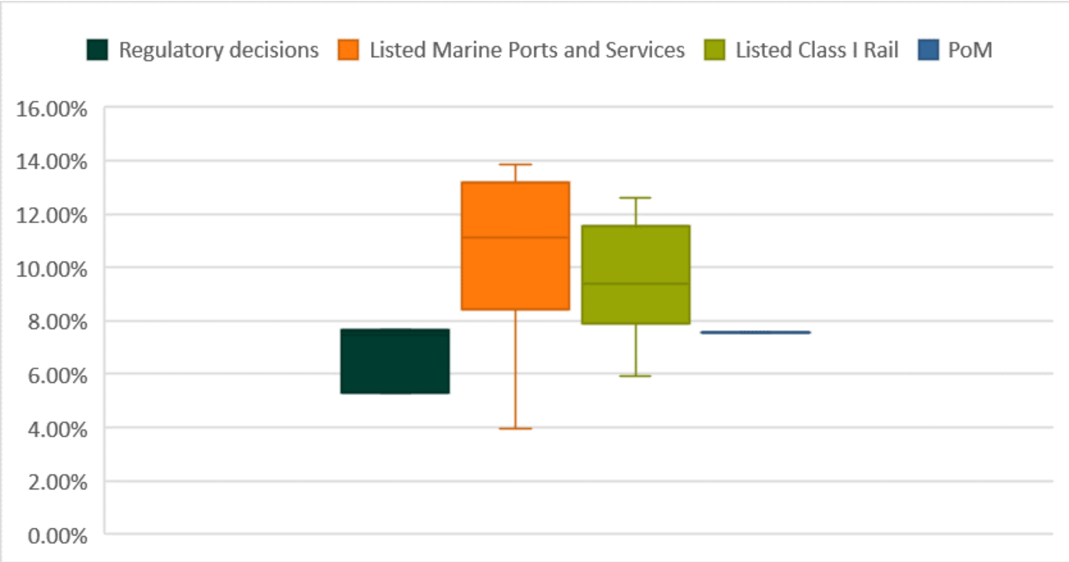
Data source: Synergies calculations, various regulatory decisions, Bloomberg

J.2.5 Post-tax cost of equity margins

Levered

As shown in Figure 35, PoM's post-tax cost of equity margin estimate is well below the majority of listed comparators on a levered basis. PoM's post-tax cost of equity margin sits below the upper end of the range of regulated post-tax cost of equity margins (defined by Pilbara Railways). Noting the impact of gearing expressed above, this suggests that the cost of equity for PoM and Pilbara Railways are more comparable once we account for differences in gamma, which are not firm-specific.

Figure 35 Regulatory and listed comparator post-tax cost of equity margins (levered)

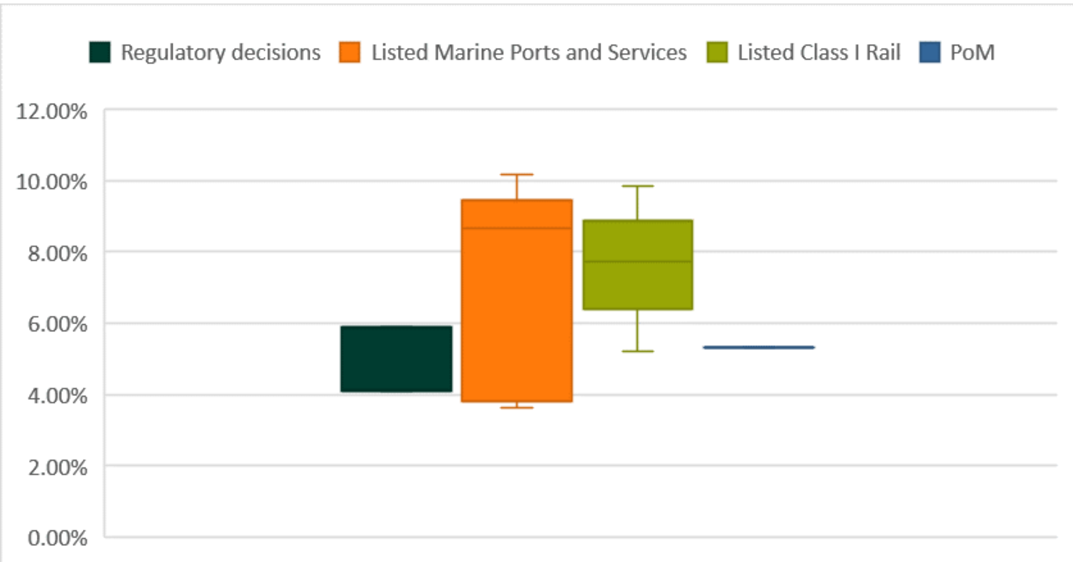


Data source: Synergies calculations, various regulatory decisions, Bloomberg

Unlevered

On an unlevered basis, PoM's post-tax cost of equity margin is below the upper end of the range of regulated post-tax cost of equity margins (being Pilbara Railways), as shown in Figure 36. In effect, the post-tax cost of equity margin comparison removes the impact of differences in gearing as well as gamma.

Figure 36 Regulatory and listed comparator post-tax cost of equity margins (unlevered)

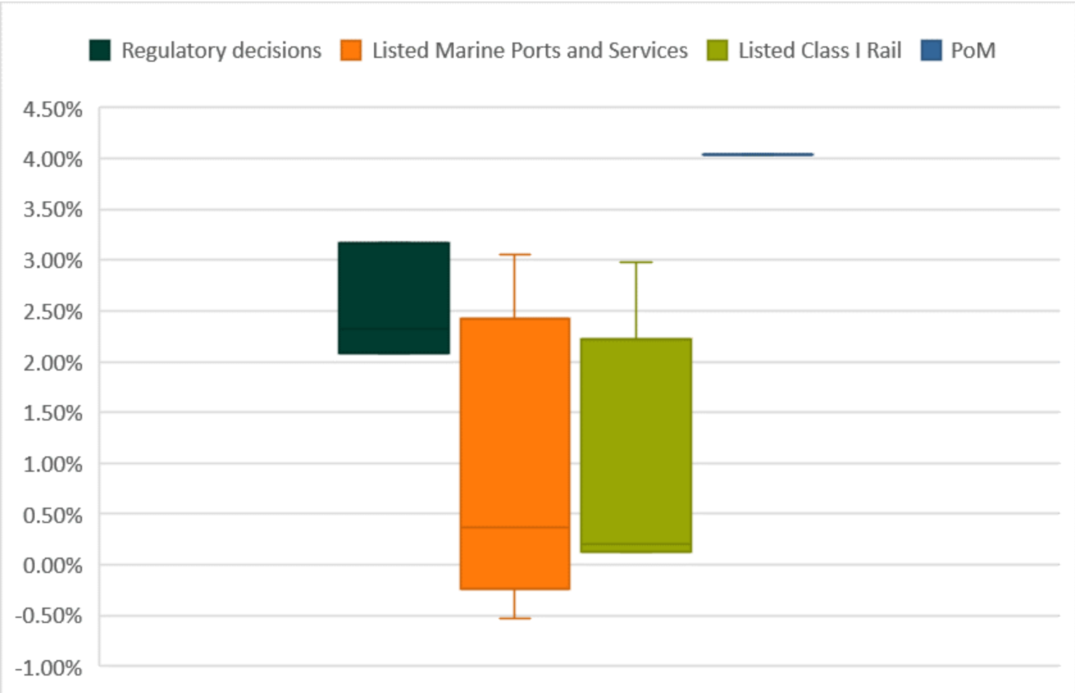


Data source: Synergies calculations, various regulatory decisions, Bloomberg

J.2.6 Comparison of DRPs

The significantly lower WACC margins for listed Marine Ports and Services entities is due to anomalies in Bloomberg's cost of debt estimation. Figure 37 shows the debt risk premia (DRPs), measured as the cost of debt less the risk-free rate, for regulated and listed comparators.

Figure 37 Regulatory and listed comparator debt risk premia (DRP)



Data source: Synergies calculations, various regulatory decisions, Bloomberg

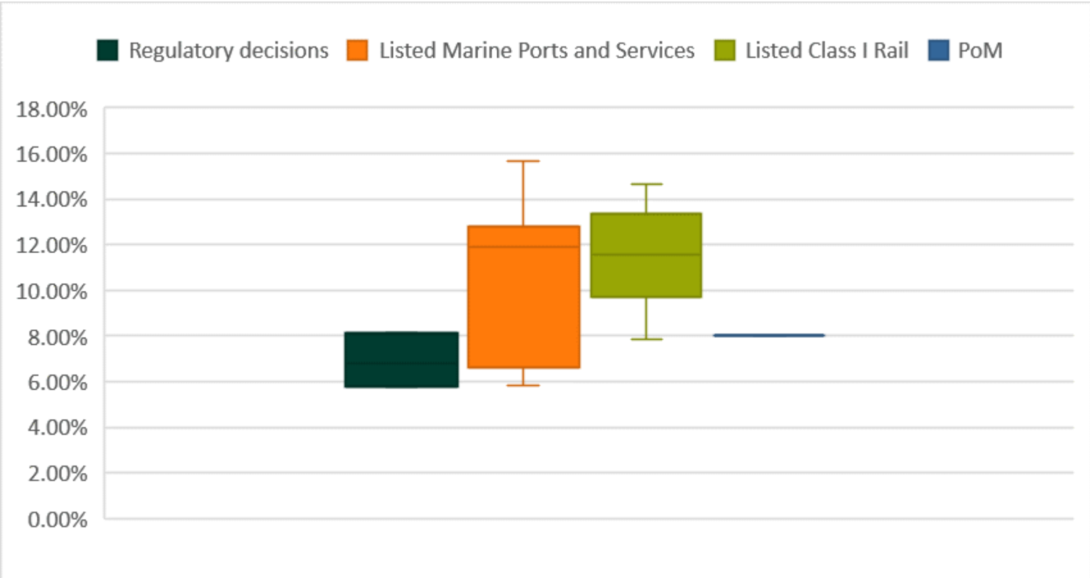
The median DRP for listed Marine Ports and Services is only 0.37%, while the margin for Class I railroads is only 0.20%. In the case of Hamburger Hafen und Logistik, Bloomberg applies a cost of debt of 0%. The reported risk-free rate for Germany is -0.47%. This means that Bloomberg is unable to apply its methodology of applying a debt adjustment multiple to the risk-free rate. Accordingly, in order to compare WACC margins, it is necessary to address the cost of debt on a comparable basis.

J.2.7 Adjusted WACC margins adopting the cost of debt applicable to PoM

The results in Figure 37 make clear that Bloomberg-generated debt margins for listed comparators are unlikely to be commensurate with those required by the BEE in its provision of the Prescribed Services. The majority of these debt margins are well below any current regulatory allowance in Australia. As a result, a more informative comparison can be made by re-calculating the WACC margins adopting the same cost of debt as that which we have applied for the BEE. We address adjusted pre-tax and post-tax WACC margins in turn.

J.2.8 Adjusted pre-tax WACC margins

Figure 38 Pre-tax WACC margins adjusted for the BEE's trailing average cost of debt



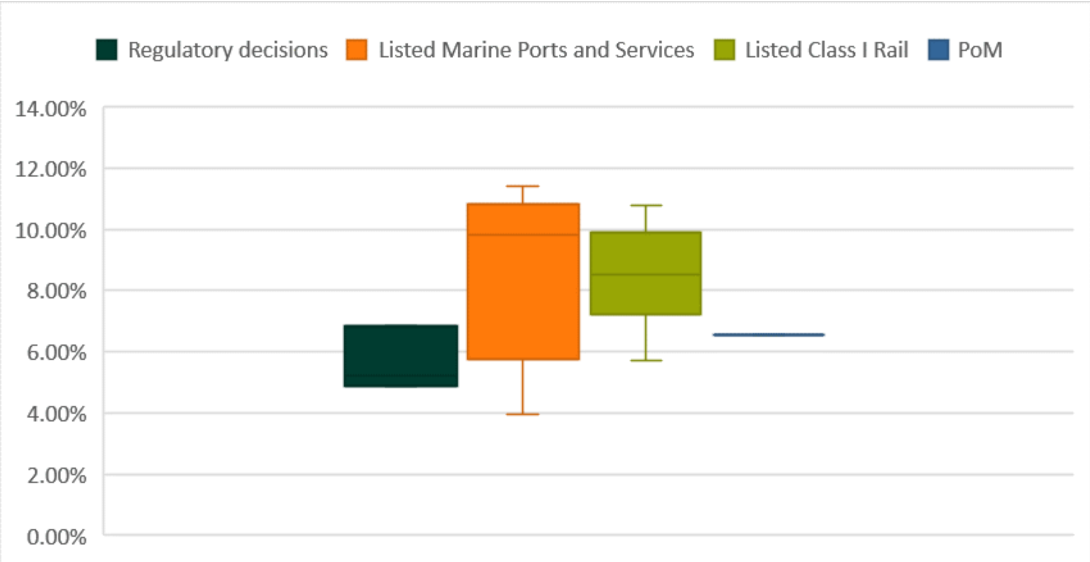
Data source: Synergies calculations, various regulatory decisions, Bloomberg

A comparison of pre-tax nominal WACC margins after adjusting for the cost of debt is likely to be the most suitable basis on which to benchmark the required return for the BEE. The median WACC margins for Marine Ports and Services and Class I railroads are now more than 300 basis points above PoM, with PoM situated towards the lower end of the range for both sectors. PoM's WACC margin is within the regulatory range.

J.2.9 Adjusted post-tax WACC margins

It is also informative to examine post-tax WACC margins after adjusting for the use of a trailing average for the cost of debt. Interestingly, the WACC margin ranges across sectors are more similar on a post-tax basis.

Figure 39 Post-tax WACC margins adjusted for the BEE's trailing average cost of debt



Data source: Synergies calculations, various regulatory decisions, Bloomberg

J.3 Supplementary information on listed comparator methodology

The purpose of this section is to provide further detail on the methodology for the Bloomberg-generated listed comparator WACC estimates that we presented in Chapter 11.

J.3.1 Country risk premium

Bloomberg calculates country-specific market risk premium estimates. Bloomberg estimates do not provide full transparency, but the country risk premium is calculated as the return on the domestic market less the risk-free rate. The return on equity is therefore calculated as the risk-free rate plus the country risk premium multiplied by the equity beta.

J.3.2 Return on debt

Bloomberg calculates the return on debt for each company by multiplying the risk-free rate by a debt adjustment factor. The debt adjustment factor is proprietary, but it is described by Bloomberg as a debt premium specific to the credit-rating of the company. Because the risk-free rate in many countries remains low, it appears that this approach may underestimate the true return on debt for these companies. This makes the WACC estimates relying on this data more conservative in nature.

J.3.3 Bloomberg-generated WACC estimates

Pre-tax WACC estimates for North American Class I railroads and Marine Ports and Services companies have been calculated using country specific corporate tax rates. PoM's estimated WACC margin is 8.03%, which is situated materially below the Class I railroad and Ports WACC margins. Note that the WACC margins presented here are before applying the trailing average cost of debt methodology used for the BEE.

Table 74 North American Class I railroad WACC estimates

	Bloomberg country risk premium	Bloomberg return on debt	Pre-tax nominal WACC	Risk-free rate	WACC margin
CSX Corporation	9.05%	0.96%	12.63%	0.67%	11.96%
Kansas City Southern	9.05%	0.90%	10.87%	0.67%	10.20%
Norfolk Southern Corporation	9.05%	0.89%	12.14%	0.67%	11.47%
Union Pacific Corporation	9.44%	3.78%	8.37%	0.67%	7.67%
Canadian Pacific Railway	9.44%	2.76%	10.58%	0.70%	9.88%
Canadian National Railway Company	9.44%	0.96%	12.63%	0.70%	11.96%
Average	**9.25%**	**1.71%**	**11.20%**	**0.68%**	**10.52%**
Median	**9.25%**	**0.96%**	**11.51%**	**0.67%**	**10.84%**

Source: Bloomberg, Synergies calculations

Table 75 Marine Ports and Services WACC estimates

	Bloomberg country risk premium	Bloomberg return on debt	Pre-tax nominal WACC	Risk-free rate	WACC margin
Qube Holdings	8.01%	1.19%	12.29%	0.76%	11.53%
Port of Tauranga	6.33%	0.65%	6.73%	1.08%	5.65%
Hamburger Hafen und Logistik	12.81%	0.00%	14.00%	-0.47%	14.47%
China Merchants Port Holding Company	12.35%	1.14%	5.68%	0.78%	4.39%
COSCO Shipping Ports	12.35%	1.19%	12.29%	0.78%	11.53%
Dalian Port	12.35%	0.65%	6.73%	0.78%	5.65%
Hutchinson Port Holdings Trust	7.35%	0.00%	14.00%	1.29%	14.47%
Average	**10.22%**	**0.69%**	**10.25%**	**0.71%**	**9.67%**
Median	**12.35%**	**0.65%**	**12.29%**	**0.78%**	**11.53%**

Source: Bloomberg, Synergies calculations

K Black CAPM and FFM cross-check estimates

K.1 Black CAPM estimate cross-check

We have estimated the Black CAPM return on equity as a cross-check on the SL CAPM return on equity estimate.

The updated zero-beta premium estimate, using a dataset that extends to the end of 2019, is 4.56%. The zero-beta return is the sum of the risk-free rate and the zero-beta premium. Hence, our SL CAPM estimate can be combined with this zero-beta premium to estimate the Black CAPM return on equity using the following formula:

$$Re = Rz + \beta_e * [E(R_m) – Rz]$$

Where

Rz = risk-free rate plus zero beta premium

β_{e} = beta

E(Rm) = market return

Parameter values:

Zero beta premium = 4.56% (updated Synergies estimate using data to 2019)

Risk-free rate = 0.90% (refer Chapter 6 of our report)

Market return = 8.47% (risk-free rate of 0.90% plus MRP of 7.57% from Chapter 6)

Equity beta of 1.00 (refer Chapter 7 of our report)

Substituting the parameter values into the Black CAPM formula:

Post-tax Re = (0.90% + 4.56%) + 1.00*(7.57% - 4.56%) = 5.46% + 3.01%

Post tax Black CAPM Re = 8.47%

K.1.1 Pre-tax return on equity

Given the Pricing Order requires that the WACC estimate be expressed in pre-tax nominal terms, the following formula grosses up the post-tax Re for gamma-adjusted corporate tax to generate a pre-tax Re:

$$\text{Pre-tax Re} = \text{Post tax Re} / (1 – t * (1 - \gamma))$$

Where

t = corporate tax rate = 0.3

γ = gamma = 0.33 (refer Chapter 10 of our report)

Substituting the parameter values into the above formula:

Pre-tax Re = 8.47% / (1 – 0.3 * (1 - 0.33)) = 8.47% / 0.8

Pre-tax Black CAPM Re = 10.60%

Therefore, our estimate of the pre-tax return on equity for the benchmark port entity based on the Black CAPM is 10.60%.[587]

K.2 Fama-French estimate cross-check

The FFM is based on the principle that excess returns to the market must be assessed having regard to the following three explanatory factors:

- the returns on the market as a whole;
- HML (High Minus Low) is the average return on two value portfolios minus the average return on two growth portfolios; and
- SMB (Small Minus Big) is the average return on three small portfolios minus the average return on three big portfolios.

K.2.1 Estimating the FFM cost of equity

The companies examined in the FFM are the same as those used for the SL CAPM analysis. Estimates of the factor premiums for the US were sourced from Professor Kenneth French's website, an internationally recognised source.[588] However, country-specific factors are not available for all firms in our sample. In these instances, we have employed global factor estimates, also acquired from the website of Professor Kenneth French. The global factor estimates are used for the SMB and HML returns, but the returns for the market as a whole are based on the company's local market return, rather than the global market return. This is likely to result in a more robust and stable estimate over time. Moreover, the market beta estimate for the FFM will more closely resemble the beta estimate for the CAPM.

[587] If an asset beta of 0.75 (equity beta of 1.07) is adopted, the Black CAPM pre-tax return on equity estimate would be 10.87%, which sits below the SL CAPM pre-tax return on equity estimate of 11.27% for the same asset/equity beta assumption.

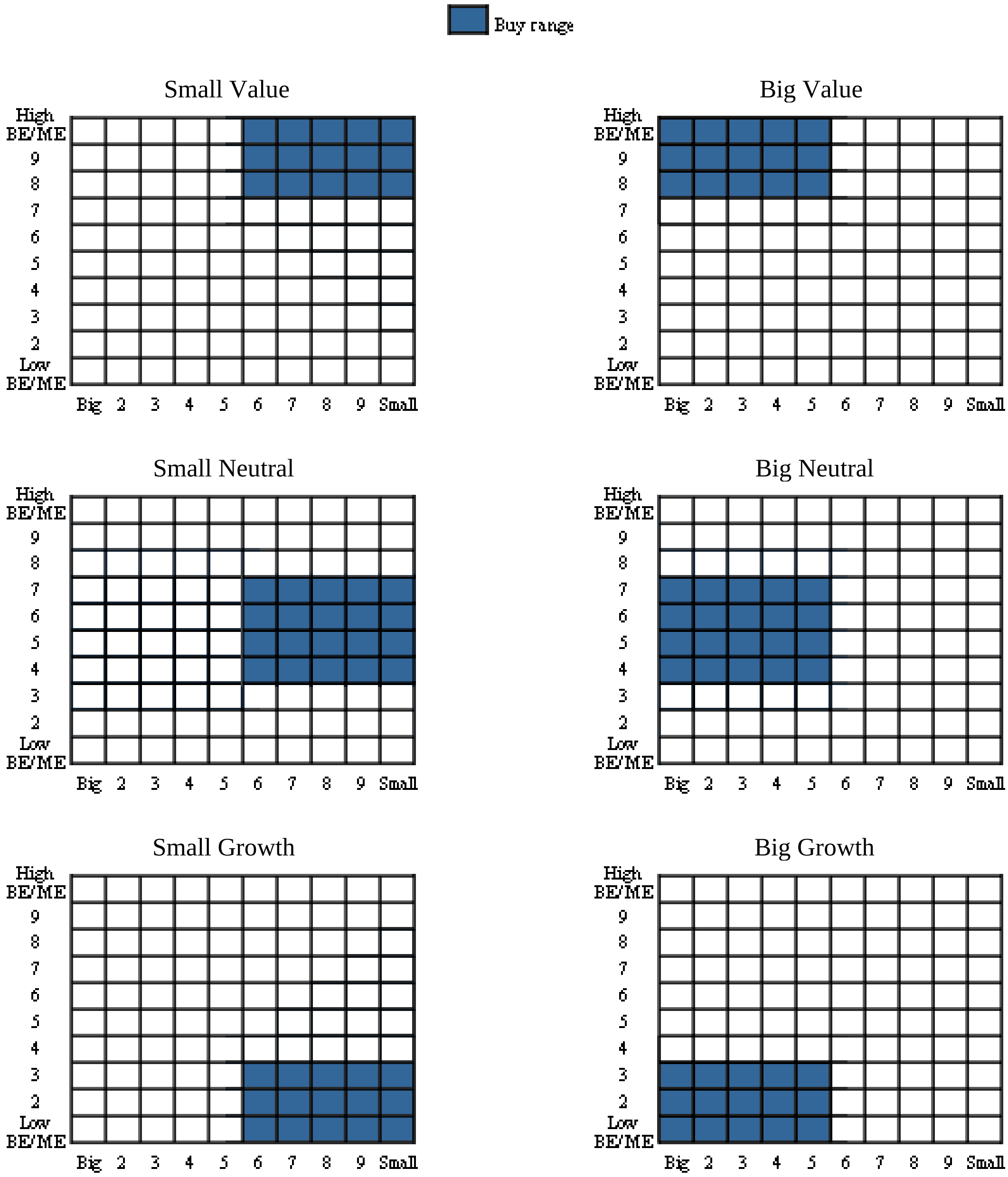
[588] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

In the case of Australia, estimates of the factor premiums must also be constructed. For the estimates in this report, we have extended the factor premium dataset to the end of 2018, following the methodology set out in SFG Consulting (2014), which is in turn based on the approach of Brailsford, Gaunt and O'Brien (2012).

The Australian context requires careful consideration. Estimation of the small-minus-big premium involves construction of SMB portfolios, which partition the sample of firms according to market capitalisation. In Australia, this is complicated by the fact that only a small proportion of stocks can be considered "large cap." Considering this issue, Brailsford, Gaunt and O'Brien (2012) define the large stocks portfolio as the top 90% according to market capitalisation, while the small stocks portfolio comprises the smallest 10% of the market.

In regard to book-to-market ratios, firms are sorted into three categories, partitioned at the 30th and 70th percentiles. Another important consideration is the interaction between size and book-to-market factors. Following SFG Consulting (2014) and Brailsford, Gaunt and O'Brien (2012), our SMB and HML factors have been constructed to be independent of each other. In other words, the small and large stock portfolios have similar book-to-market values of equity, while the high and low book-to-market stocks are of similar size. This enables us to properly identify the true impact of each factor. Figure 40 illustrates the various portfolios that are created in the model.

Figure 40 Buy ranges of Fama French Benchmark portfolios



Data source: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/bench_m_buy.html

K.2.2 Model specification

Data on monthly returns, market capitalisation and book-to-market ratios for all listed firms in Australia from 1985 to 2019 (including both currently listed and now delisted) were sourced from Datastream.

Once this data was compiled, the monthly returns of each firm over five years (December 2014 to December 2019) were regressed on the monthly measures of the market risk premium, size premium and value premium for the specific country (or the global premiums if country-specific premiums were not available), using OLS multiple regression. This does not apply to the Australian factor premium data.

These regressions yield estimates of the three Fama-French betas. These betas must then be de-levered using the firm-specific leverage. The unlevered betas are averaged across all firms in the sample, then re-levered using the benchmark port entity's target gearing of 30%.

Table 76 presents our estimated FFM asset betas.

Table 76 Fama-French asset beta estimates, by company

Company	Country	Sector	Beta (MRP)	Beta (HML)	Beta (SMB)
Qube Holdings	Australia	Marine Ports and Services	1.07	0.08	0.24
Canadian National Railway Company	Canada	Railroads	0.75	-0.57	-0.88
Canadian Pacific Railway	Canada	Railroads	0.95	-0.19	-0.19
Hamburger Hafen und Logistik	Germany	Marine Ports and Services	0.67	0.19	0.55
China Merchants Port Holding Company	Hong Kong	Marine Ports and Services	0.689	-0.02	0.51
COSCO Shipping Ports	Hong Kong	Marine Ports and Services	0.49	-0.07	-0.11
Dalian Port	Hong Kong	Marine Ports and Services	0.58	0.23	0.03
Port of Tauranga	New Zealand	Marine Ports and Services	0.53	-0.17	0.02
Hutchinson Port Holdings Trust	Singapore	Marine Ports and Services	0.45	0.09	0.19
CSX Corporation	US	Railroads	0.82	0.09	0.51
Kansas City Southern	US	Railroads	0.81	0.28	0.04
Norfolk Southern Corporation	US	Railroads	0.89	0.23	0.35
Union Pacific Corporation	US	Railroads	0.68	0.22	0.47
Average asset betas			**0.72**	**0.03**	**0.13**

Note: The betas presented here have been de-levered using the same debt-to-equity ratios applied in the standard beta analysis
Source: Bloomberg, Synergies Calculations

We have estimated the Fama-French return on equity as a cross-check on the SL CAPM return on equity estimate. The Fama-French return on equity is calculated as follows:

$$Re = Rf + \beta j * [E(R_m) - R_f] + \beta k * [HML] + \beta l * [SMB]$$

Where:

Rf = the risk-free rate of return

E(Rm) = the expected return on the market

[E(Rm) – Rf] = the market risk premium (Australian estimate: 7.57%)

HML = expected high-minus-low risk premium (Australian estimate: 5.03%)

SMB = expected small-minus-big risk premium (Australian estimate: 2.63%)

βj = market excess returns beta

βk = high-minus-low factor beta

βl = small-minus-big factor beta

Note that the risk-free rate and MRP under this model match the values used in the SL CAPM. As for the SL CAPM, the FFM restricts the zero-beta rate to be the risk-free rate.

Table 77 provides our updated FFM risk factor premium estimates.

Table 77 FFM equity betas and risk factor premiums

Risk factors	Estimated equity betas	Risk factor premiums
Market risk premium	1.03	7.57%
High minus low (HML) premium	0.04	5.03%
Small minus big (SMB) premium	0.19	2.63%

Source: Synergies, Brailsford, T., Gaunt, C. and O'Brien, M (2012)

K.2.3 Post-tax return on equity

As noted in the preceding section, the post-tax FFM formula is as follows:

$$Re = Rf + \beta j * [E(R_m) - R_f] + \beta k * [HML] + \beta l * [SMB]$$

Substituting the parameter values into the FFM formula as follows:

Rf = 0.90%

βj = 1.03

$[E(R_m) - R_f]$ = 7.57%

βk = 0.04

[HML] = 5.03%

βl = 0.19

[SMB] = 2.63%

Post-tax Re = 0.90% + (1.03 * 7.57%) + (0.04 * 5.03%) + (0.19 * 2.63%)

Post-tax FFM Re = 9.40%

K.2.4 Pre-tax return on equity

Given the Pricing Order requires that the WACC estimate be expressed in pre-tax nominal terms, the following formula grosses up the post-tax Re for gamma-adjusted corporate tax to generate a pre-tax Re:

Pre-tax Re = Post tax Re / (1 – t * (1 - γ))

Where

t = corporate tax rate = 0.3

γ = gamma = 0.33 (refer Chapter 10 of our report)

Substituting the parameter values into the above formula:

Pre-tax Re = 9.40% / (1 – (0.3 * (1 - 0.33))

Pre-tax Re = 9.40% / 0.8

Pre-tax FFM Re = 11.77%

Our estimate of the pre-tax return on equity based on the FFM is 11.77%. This is higher than the SL CAPM and Black CAPM estimates (10.60%), reflecting the incorporation of two additional risk factors that, along with systematic overall market risk, explain investors' expected return on equity for the benchmark port entity.