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Review of Regulators' Approaches to Determination of the Market Risk Premium

Port of Melbourne

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1. Introduction & Summary

1.1. Instructions and Declaration

My name is William Selden Taylor. I reside at 6 Esmeralda Avenue, Avondale, Auckland, New Zealand. I am an Associate Director at NERA Economic Consulting, a global firm of expert economists that is head quartered in White Plains, New York. NERA has 25 offices around the world and more than 500 staff. I am a member of NERA's Energy, Environment, Communications and Infrastructure practice.

I have an undergraduate degree majoring in economics and finance, completed an honours program in finance for which I was awarded 1st class honours and a PhD in Economics, all from Victoria University of Wellington. My PhD thesis examined how a lack of diversification (due to executive compensation being in the form of non-tradeable stock/options) might alter the theoretical models of investment decision making, such as the capital asset pricing model (CAPM) and Real Options Analysis (ROA), that are typically deployed by finance practitioners and regulators.

I have over 10 years' experience providing expert advice on the design and operation of economic regulation, including in relation to financial issues such as the cost of capital and the estimation of parameters used in the CAPM. This includes leading NERA's work addressing a joint terms of reference from Energy Networks Australia (ENA) and the Australian Energy Regulator's Consumer Reference Group (CRG) on cost of capital issues during the 2018 Binding Rate of Return Instrument process.

I have been asked to prepare an expert report in connection with the Port of Melbourne's (PoM) Tariff Compliance Statement (TSC) for 2020-2021 that will be submitted to the Essential Services Commission of Victoria (ESC). My instructions by PoM's legal counsel are attached in Appendix D of this document. I have been asked to prepare an expert report which:

a. Identifies regulatory regimes, both within Australia and overseas, that I consider are contextually similar or analogous to the regulatory regime applying to PoM (having regard to the background and framework set out above) (relevant regimes) and the reasons why, including the relevant features of each regime such as its regulatory objectives.
b. Reviews and summarises the current approaches to estimating the MRP taken by regulators in the relevant regimes, and identifies:
    i. which approaches are commonly utilised by those regulators to estimate the MRP and risk free rate and/or total market return (as the case may be) (whether as a direct input into the estimation of these, or indirectly such as a cross-check) and the reasons why;
    ii. how those approaches are implemented by those regulators in estimating the MRP and risk free rate and/or total market return, including whether used as direct input or a cross-check, and the methodologies applied in their implementation;
    iii. which approaches (if any) for estimating the MRP have been expressly rejected by those regulators and the reasons why,

    with a particular focus on:

    iv. what is commonly known as the 'Wright approach'; and
    v. dividend discount models (DDMs) and dividend growth models (DGMs).

I have been assisted in preparing this report by James Grayburn, an Associate Director in NERA's London office who specialises in regulatory finance and has over 20 years' experience as a professional economist, including time spent at the UK Energy regulator (Ofgem) leading the RIIO-GD1 gas distribution price control. Junior members of staff in NERA's London and Auckland offices

have also provided research assistance. However, the views expressed in this report are my own. The documents I have relied upon in preparing this report are all referenced in footnotes in the appendices to this report.

Counsel for PoM have provided me with copies of:

- Form 44A to the *Supreme Court (General Civil Procedure) Rules 2015*, the Expert Witness Code of Conduct (the **Code of Conduct**); and
- Victorian Civil & Administrative Tribunal Practice Note – PNVCAT2, *Expert Evidence* (the **Practice Note**)

Pursuant with the requirements of these documents I can confirm that:

- I have read both the Code of Conduct and the Practice Note and agree to be bound by them;
- Outside of my engagement to prepare this independent expert report, I have no personal or business relationships with PoM; and
- I have made all the inquiries that I believe are desirable and appropriate and that no matters of significance which I regard as relevant have to my knowledge been withheld from the Tribunal/Court.

Date: 25/05/20

Signed: 

Name: William Taylor

1.2. Summary of Findings

In summary, our survey shows that most Australian regulators rely on historical excess returns (HER) to estimate the MRP, i.e. relying on historical MRP and current market estimates for the risk free rate (RFR). By contrast, there is mixed evidence for our survey of international transport, energy and water regulators, with many drawing on the Wright approach but also a large number drawing on historical excess returns (HER), as well as making use of Dividend Discount Model (DDM)[1] and survey evidence. US regulators rely heavily on a discounted cash-flow (DCF) approach and in Canada a bespoke "formula" approach. Neither of these approaches specifically identify an MRP, and therefore the evidence tends to be less relevant to informing the approach to the MRP for PoM. While most US regulators do not employ the capital asset pricing model (CAPM),[2] of which the MRP is a parameter, the DCF approach is essentially using the DDM approach to directly estimate the cost of capital. Therefore, it is relevant precedent on the extent to which DDM models are used by regulators. Of the regulators we have surveyed that rely on the DDM as part of their MRP estimation they generally rely on a "multi-stage" DDM model.[3]

With respect to the RFR, in Australia the HER method is typically paired with a current risk free rate estimate. However, IPART's historic method and many European regulators (France, Germany, the Netherlands, Spain and Sweden) that use HER pair it with a historical average RFR. Where the

[1] Note that the phrases Dividend Discount Model (DDM) and Dividend Growth Model (DGM) are used interchangeably in this report.

[2] The US regulators we have surveyed do employ the CAPM as part of their WACC estimation process.

[3] By "multi stage" we mean two or more dividend growth rates are used over time. The only regulator we surveyed that uses a "single stage" DDM as a direct input into their MRP estimation is the Commission for Aviation Regulation (CAR) in Ireland.

TMR/Wright approach is deployed (e.g. in the UK) it is typically paired with a current estimate of the RFR.

We consider that all of our surveyed regulatory regimes are relevant *in principle* to the determination of an MRP for PoM, given that the MRP should be based on a market based measure (i.e. "*a return commensurate with the risks involved*"). In a small number of cases, the regulators surveyed have an explicit objective to set a market based return (e.g. in the case of Ofwat, US, Canadian regulators), and in all cases in practice interpret their respective objectives as consistent with setting a market based rate of return, albeit some methodologies are less relevant, e.g. Canada's bespoke model. It would only be regimes that did not adopt market based estimates that would not be relevant to the PoM.

Table 1: Overview of findings of MRP methodology survey

Regulator	Relevant sector(s)	Last decision	Wright vs HER vs DDM*	RFR method**
Australian regulators				
AER	Electricity & Gas	2019	HER approach	Current estimate (20 to 60 day average)
West Australia, ERA	Electricity, Gas & Railway	2019	HER approach, and some weight on DDM	Current estimate (Energy = 20 day average, Rail = 40 day average)
New South Wales, IPART	Water	2018	Equal weighting on "historical" MRP (HER) and "current" MRP (2/3 DDM, 1/3 market indicator)	Mix of historic and current (10 years for historic, 40 days for current)
Queensland, QCA	Rail, DBCT, Water	2020	Ibbotson (25%), DDM (25%), Surveys (20%), Siegel (15%) and Wright (15%)	Current estimate (20 day average)
South Australia, ESCOSA	Water	2020	HER approach	Current estimate (60 day average + annual update)
ACT, ICRC	Water	2018	HER approach (follows AER)	Current estimate (40 day average)
Tasmania, OTTER	Water	2018	Greatest weight to HER (follows AER)	Mix of current and historic, weighted towards current
ACCC	Rail, Telecom, Post, Ports	2015, 2017-2019	Greatest weight to HER	Current estimate (Rail & telco = 20 day average)
Transport sector regulatory decisions				
UK, CAA	Airports	2019	Wright approach, cross-checked by DDM	Current estimate
UK, CMA	Air Traffic Control	2020	Wright approach, cross-checked by DDM	Current estimate
Ireland, CAR	Airports	2019	Wright approach and DDM	Current (1-year average)
Italy, ART	Airports	2017	HER approach	Current (1-year average)
New Zealand, Commerce Commission	Airports, Electricity & Gas	2018	Median of 5 estimates: HER (Siegel and Ibbotson), Wright (referred to as "Siegel 2"), DGM and survey evidence	Current estimate (3 month average)
Energy/Water sector regulatory decisions				
US (California, New York, Pennsylvania)	Electricity, Gas & Water	2019	DCF/DDM used directly to estimate RoE	DDM used to directly estimate CoE.
Canada (Ontario)	Electricity & Gas	2020	Bespoke "formula approach" with no clearly defined ERP/MRP	Bespoke "formula approach" with no clearly defined RFR
France, CRE	Electricity & Gas	2020	HER approach, surveys	Historic average (Gas = 10 years, Electricity – 8 years)
Germany, BNetzA	Electricity & Gas	2016	HER approach	Historic average (10 year average)

Regulator	Relevant sector(s)	Last decision	Wright vs HER vs DDM*	RFR method**
Italy, ARERA	Electricity & Gas	2020	Wright approach	Current estimate (12 month average)
Netherlands, ACM	Electricity & Gas	2019	HER approach	Historic (3 year average)
Spain, CNMC	Electricity & Gas	2019	HER approach	Historic estimate (6 year average)
Sweden, EI	Electricity & Gas	2019	*Elec:* Survey *Gas:* HER	*Elec:* Historic (4-year) and current estimate *Gas:* LR estimate
Switzerland, SFOE	Electricity & Gas	2020	HER approach, but bounded values	Current estimate (1-year average) The applicable RFR is bounded by 2.5% as the lower bound and 6.5% as the upper bound
UK, Ofgem	Electricity & Gas	2019	Wright approach, using DDM as cross-check	Current estimate (one month)
UK, Ofwat	Water		Wright and DDM approach	Current estimate (one month)

* HER = Historic Excess Returns, DDM = Dividend Discount Model, aka Dividend Growth Model (DGM)
** Current estimate = forward rate that has been averaged over a historic period of less than 1 year. Historic = forward rates averaged over a period of more than 1 year.

1.3. Structure of Report

The remained of the report is structured as follows:

- Section 2 provides an overview of our approach to selecting comparator regimes for inclusion in our survey
- Section 3 provides summaries of the objectives of the regulatory regimes and the methods employed to estimate the MRP

2. Scope of Work and Selection of Regulatory Regimes

In this section, we briefly describe the scope of work and our selection of regulatory regimes included in our survey.

2.1. Scope of Work

PoM commissioned us to provide an independent review of approaches to setting the Market Risk Premium (MRP) taken in overseas regulatory regimes that are analogous to the regulatory regime applying to PoM. Of particular interest is the extent to which the Wright approach is accepted (or rejected) in such regulatory regimes. The full terms of reference we address in this report are set out in Section 1.1 above and our letter of instruction from PoM's legal counsel is attached to this report as Appendix D. Broadly, the two key components of the work comprised:

- Identification of regulatory regimes that are similar to the regime that applies to PoM. To do so, we have reviewed the objectives of comparator regimes, as set out in legal and regulatory documents, to consider how they compare to the objective of the PoM regulatory framework
- Identification of recent decisions on the MRP by those by regulators (or appellant bodies) that demonstrate either acceptance or rejection of a particular approach to estimating the MRP, with a particular focus on whether the regulator has accepted or rejected the Wright approach. We define the Wright approach and the other potential approaches to the estimation of the MRP (or more widely, the total market return, TMR) in section 3.1.

2.2. Selection of Comparators

We have identified regulatory decisions for sectors which share similar objectives to the ESC in its regulation of the PoM. The applicable regulatory regime to the PoM includes a number of Acts and legislative instruments. The two key Acts are[4]:

- the ESC Act 2001, which establishes the powers and functions of the ESC
- the Port Management Act (PMA) 1995, which establishes the ports legislative framework.

Section 48 of the PMA 1995 sets out the following objectives for that part of the Act that regulates port services (including pricing)[5]:

- to promote efficient use of, and investment in, the provision of prescribed services for the long-term interests of users and Victorian consumers; and
- 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; 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; and
- to facilitate and promote competition — (i) between ports; and (ii) between shippers; and (iii) between other persons conducting other commercial activities in ports; and
- to eliminate resource allocation distortions by prohibiting a State sponsored port operator from providing a relevant service at a price lower than the competitively neutral price for that service.

[4] ESC (March 2017), THE PORT OF MELBOURNE REGULATORY REGIME: Overview of the Port of Melbourne and the Essential Services Commission's Regulatory Roles, para.2.1, p.9

[5] See: http://classic.austlii.edu.au/au/legis/vic/consol_act/pma1995169/ for The PMA 1995

The ESC must have regard to the above objectives when performing its functions or exercising its powers in relation to the port industry. This is in addition to the objective of the ESC under section 8 of the Essential Services Commission Act 2001 (ESC Act)[6]:

> *In performing its functions and exercising its powers, the objective of the ESC is to promote the long-term interests of Victorian consumers.*

We also focus on comparator sectors where the regulator determines a market based allowed rate of return consistent with the ESC's objectives. For example, Clause 4.1.1 of the Pricing Order provides requirements for the determination of the cost of capital for PoM:

> *4.1.1 For the purposes of determining its Aggregate Revenue Requirement, the Port Licence Holder must apply an accrual building block methodology over the Regulatory Period comprising:*
>
> *(a) an allowance to recover a return on its capital base, commensurate with that which would be required by a benchmark efficient entity 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 (see clauses 4.2 and 4.3)*

Finally, we also focus on case studies where the regulator's decision is published so we can identify the approach to the MRP.

2.2.1. Our selection of regimes

The MRP is an economy-wide parameter of the capital asset pricing model (CAPM). This point has been explicitly made by the New Zealand Commerce Commission, a multi-sector regulator with responsibility for electricity and gas networks, airports, telecommunications and competition enforcement:

> *TAMRP[7], by definition, is an economy-wide parameter which should not vary by sector, service or company.[8]*

We therefore do not need to restrict our survey to port sector decisions or comparable transport sectors. Instead, we have identified the following categories to structure our review of relevant decisions: i) relevant decisions in Australia across all sectors; ii) transport sector (rail and aviation) decisions worldwide; and iii) decisions by energy and water regulators in selected markets, to ensure sufficient geographic coverage.

As our first category, we include the following Australian regulators' decisions within our study:[9]

- Australian Energy Regulator (AER)
- Queensland Competition Authority (QCA)
- Independent Pricing and Regulatory Tribunal, New South Wales (IPART)

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6 See: http://www8.austlii.edu.au/cgi-bin/viewdoc/au/legis/vic/consol_act/esca2001327/s8.html for ESC Act 2001

7 Note that in New Zealand the MRP is referred to as the Tax Adjusted Market Risk Premium (TAMRP) which reflects the fact that a tax adjustment is required to the MRP for consistency with the version of the CAPM used by the New Zealand Commerce Commission.

8 NZCC, *Fibre input methodologies: Draft decision – reasons paper* 19 November 2019, par. 3.956

9 Note that we reviewed the NT Utilities Commission, but they do not appear to calculate the cost of capital as part of any of their current regulatory functions.

- Economic Regulation Authority, Western Australia (ERA)
- Essential Services Commission of South Australia (ESCOSA)
- Independent Competition and Regulatory Commission, ACT (ICRC)
- Office of the Tasmanian Economic Regulator (OTTER)
- Australian Competition and Consumer Commission (ACCC)

In each case, we reviewed the most recent "WACC methodology" document where available, or the latest regulatory decision for the sector alternatively. We have not identified any relevant Australian aviation regulatory decisions as airports are principally regulated under a price monitoring system, which does not specify an estimation methodology for the market based rate of return.[10]

As our second category, we have identified other relevant rail and airport/aviation decisions worldwide. We have not identified relevant regulatory decisions in the port sector elsewhere in the world,[11] but we have identified relevant decisions in the aviation sectors in UK, Ireland, Italy, and NZ.[12] In the UK, we will review two transport sector regulatory decisions: CAA's decision for London Heathrow as well as the UK's CMA recent decision for NATS. While there are regulated rail decisions in Australia, in most other countries rail is not subject to formal regulation of its revenues. While rail is regulated in some countries, a mix of state ownership and public subsidy means that the regulatory question is the division of cost recovery between user charges and public subsidy.

As a third category, and in order to ensure a sufficiently wide sample, we include examples from the energy and water sectors: US (covering water and energy), Canada (energy), Australia (as noted above), and a range of major European economies: Germany, France, Italy, Netherlands, Spain, Sweden, Switzerland, UK (water and energy). Note that the UK is the main country outside of Australia where water is subject to independent economic regulation – in most countries water is typically provisioned by an arm of government and not subject to economic regulation.

Table 2.1 summarises the regulatory regimes that we include in our survey, covering relevant Australian regulators, transport regulators as well as energy and water regulators worldwide.

[10] That is to say, the ACCC monitors Australian airport pricing on an annual basis, but does not regulate the prices an airport can charge, or form a view on the returns they are earning by estimating a WACC. See: ACCC (Feb 2020), Airport monitoring report 2018-29, p.5.

[11] In that sense that economic regulation of port infrastructure is not common, so we have been unable to find public decisions on the cost of capital for ports.

[12] We have also reviewed a number of other airport regulatory regimes, including AdP (France), Brussels Airport, and AENA (Spain). For these cases, we only have the value for the allowed return but there is no published regulatory documents that identifies the MRP or the methodology for setting the MRP.

Table 2.1: Overview of regulatory regimes

Regulator	Relevant sector(s)	Last decision	Decision(s)[1] [2]	Case study appendix
Australian regulators				
AER	Electricity & Gas	2019	2018 ROR Instrument	Appendix A.1
West Australia, ERA	Electricity, Gas & Railway	2019	Western Power Network, Dampier to Burnbury Pipeline, Goldfields Gas, Mid-West and South West Gas Distribution System, Freight and Urban Networks, and the Pilbara Railways	Appendix A.2
New South Wales, IPART	Water	2018	Sydney Water	Appendix A.3
Queensland, QCA	Rail, DBCT, Water	2020	QR, DBCT, GAWB	Appendix A.4
South Australia, ESCOSA	Water	2020	SA Water	Appendix A.5
Australian Capital Territory, ICRC	Water	2018	Icon Water	Appendix A.6
Tasmania, OTTER	Water	2018	TasWater	Appendix A.7
ACCC	Rail, Telecom, Post, Ports.	2015, 2017-2019	Hunter Valley rail, Fixed line access FAD, Australia Post, Glencore/PON arbitration.	Appendix A.8
Transport sector regulatory decisions				
UK, CAA	Airports	2019	Heathrow H7	Appendix B.1
UK, CMA	Air Traffic Control	2020	NERL	Appendix B.2
Ireland, CAR	Airports	2019	Dublin Airport	Appendix B.3
Italy, ART	Airports	2016	All airports, exc those subject to bilateral contracts	Appendix B.4
New Zealand, Commerce Commission	Airports, Electricity, Gas and Fibre	2018	Pan sector “Input Methodologies”	Appendix B.5
Energy/Water sector regulatory decisions				
US (California, New York, Pennsylvania)	Electricity, Gas & Water	2019	Californian energy utilities: PG&E, SCE, SDG&E and SoCalGas; NY: Orange & Rockland; Penn: Twin Lakes	Appendix C.1
Canada (Ontario)	Electricity	2020	Ontario gas DSO elec. DSO &TSO	Appendix C.2
France, CRE	Electricity & Gas	2020	Elec and gas DSO & TSO	Appendix C.3
Germany, BNetzA	Electricity & Gas	2016	Elec and gas DSO & TSO	Appendix C.4
Italy, ARERA	Electricity & Gas	2020	Elec and gas DSO & TSO	Appendix C.5
Netherlands, ACM	Electricity & Gas	2019	Elec and gas DSO & TSO	Appendix C.6
Spain, CNMC	Electricity & Gas	2019	Elec and gas DSO & TSO	Appendix C.7
Sweden, EI	Electricity & Gas	2019	Elec and gas DSO & TSO	Appendix C.8
Switzerland, SFOE	Electricity & Gas	2020	Elec DSO&TSO	Appendix C.9
UK, Ofgem	Electricity & Gas	2019	Elec TSO and Gas DSO & TSO	Appendix C.10
UK, Ofwat	Water	2019	E&W water wholesale licensees	Appendix C.11

Source: NERA analysis
Notes: (1) For European energy and water regulators, the methodology statements and decisions apply to a large number of licensees. In the Table, we have indicated the sectors that the decisions apply to. (2) DSO = distribution system operator; TSO = transmission system operator; E&W = England and Wales

3. Summary of Survey Results

In this section, we categorise and define the different approaches to estimation of the MRP (namely, the Wright approach or historical TMR, DDM or forward looking TMR,[13] and "HER approach"). We then provide summaries of the regulatory objectives and approaches to the estimation of the MRP for our three categories: i) Australia, ii) selected regulated transport sectors worldwide, and iii) to ensure a comprehensive survey, a survey of energy and water regulators' approaches in Europe, US and Canada.

3.1. Categorisation of Approaches to estimating MRP

Most Australian and European regulators use the CAPM to estimate the cost of equity, sense checked against other approaches. The familiar CAPM can be written as:

1. $Ri = RFR + \beta i*(TMR-RFR)$

Where Ri is the expected return on equity; βi is the equity beta which measures the systematic risk of the equity of the regulated firm; RFR is the risk free rate; and TMR is the total market return.

Defining the market risk premium (MRP) as the TMR minus RFR, the CAPM is commonly expressed as follows:

2. $Ri = RFR + \beta i*MRP$

One approach to the implementation of the CAPM is to estimate the RFR based on short-run market data (e.g. estimated over the most recent one year period), and the MRP separately, based on long-run historical returns and interest rates. This introduces an inconsistency in how the RFR is estimated, i.e. in equation 1 RFR appears twice but the first term is based on short run market data and the latter term is based on a long-term average. Sometimes this inconsistency is dealt with by estimating the first term using long run historical averages, resulting in the RFR being estimated consistently. For the purposes of our survey of regulatory regimes, we refer to this approach of estimating the MRP directly as the **historical excess returns (or HER) method**.

Through a simple re-arrangement, the CAPM can also be formulated as follows:

3. $Ri = (1- \beta i)*RFR + \beta i*TMR$

As the third equation shows, in the CAPM, the expected return on equity can be expressed as a weighted average of the RFR and the TMR with the weights depending on the equity beta. Where the equity beta is close to 1, or the average for the market, the weight on the RFR is low and the far greater the weight rests on the TMR. Note also that the RFR now only appears once in the equation, removing the time inconsistency issue discussed above.

The approach to determining the RFR and MRP by first estimating the TMR has been proposed by UK academics (Wright et al), in a report commissioned by UK economic regulators. In the 2003 report, Wright et al concluded:

> *"There is considerably more uncertainty about the true historic equity premium and (hence the risk-free rate) than there is about the true cost of equity capital. For this reason we regard the standard approach to building up the cost of equity, from estimates of the safe rate and the equity premium, as problematic. We would recommend, instead, that estimates should*

[13] The Wright and DDM approach are also sometimes referred to as the TMR approach.

be derived from estimates of the aggregate equity return (the cost of equity for the average firm), and the safe rate."[14]

Wright et al have since affirmed this position in recent further studies for UK regulators, most recently in a report for UK regulated networks (UKRN report) in 2018. Specifically, Wright recommends that the TMR is estimated based on long-run historical market returns.[15] Wright recommends that the RFR is based on current market evidence[16] and the MRP derived as the residual, i.e. TMR minus RFR. This is sometimes referred to as the **Wright method** or total market return method to estimating the MRP. A key implication of the Wright method is that the allowed return on equity does not materially decline with a decline in RFR, as a lower RFR assumption is offset by an increase in the implied MRP (as MRP = TMR- RFR). That is, the Wright approach is based on the assumption that the MRP and RFR negatively co-vary. The RFR under the Wright method can be estimated using either long run historical averages or current market rates, although Wright recommends the latter.[17]

As an alternative to using historical data, the TMR can also be estimated directly using the **dividend discount model (DDM)**, which is a forward-looking approach. The DDM (or dividend growth model, DGM)[18] is based on the theory that the present day stock market value is equal to the sum of all future dividend payments when discounted back to their present value, where the discount rate is the TMR. The approach provides an estimation of investors' expectations of the TMR, as opposed to the estimation of the MRP directly, and in that sense can be seen as a forward-looking Wright/TMR approach.[19]

DGMs can be classified as one-stage or multi-stage based on the number of dividend growth assumptions they employ. One-stage or simple models utilise a single dividend growth assumption to derive TMR/MRP. Conversely, multi-stage models utilise different growth rate assumptions for the short run and long run, e.g. analyst forecasts over the short-run and GDP growth rates as a long run

[14] Wright et al. (2003), A study into certain aspects of the cost of capital for regulated utilities in the UK, pp.27-28.

[15] Wright et al (2018) Estimating the cost of capital for implementation of price controls by UK Regulators, p. 8. "Recommendation 5 (The Expected Market Return): We recommend that regulators should continue to base their estimate of the EMR on long-run historic averages, taking into account both UK and international evidence, as originally proposed in MMW [2003 study]." (Here, the authors use the term EMR instead of TMR).

[16] For the RFR, Wright recommends: "Recommendation 4 (The Risk-Free Rate): Regulators should use the (zero coupon) yield on inflation-indexed gilts at their chosen horizon to derive an estimate of the risk-free rate at that horizon." In terms of horizon, Wright states that they are in favour of relatively long term horizons, e.g. 10 years, i.e. the RFR should be based on ILG of 10 years maturity. Wright et al (2018) Estimating the cost of capital for implementation of price controls by UK Regulators, pp. 7-8.

[17] For example, Wright cites evidence that UK regulators have in the past estimated the RFR based on long-run historical averages, although as we show in our case studies UK regulators (including CMA, Ofgem, Ofwat) now use current market evidence (see Table 1.) Wright et al (2018) Estimating the cost of capital for implementation of price controls by UK Regulators, p. 34.

[18] We note some regulators use the terminology DGM and others use DDM. For the purposes of this report, the two are interchangeable.

[19] Indeed, most UK regulators that employ the Wright approach also employ the DDM as a cross-check. See Table 3.3 and Table 3.5.

assumption.[20] Regulators also commonly rely on third-party sources for TMR and MRP estimates derived from DDM, such as the Bank of England, Damodaran and Bloomberg.[21]

A number of regulators also rely on **survey evidence** to estimate the TMR, as well as to derive estimates for the MRP. Survey evidence involves surveys, typically conducted by academics or market practitioners, of the MRP/TMR estimate used by market participants. In this sense it provides a forward-looking expectation of the MRP or TMR.

Finally, US regulators commonly use a **discounted cash-flow (DCF)** approach to estimation of the cost of equity, which is similar to the DDM. In this case, the DCF is based on assumption that the present day value of the regulated firm's equity stock is equal to the future stream of dividends when discounted back to their present value, with the discount rate providing an estimate of investors' cost of equity.[22] Therefore, rather than the DDM being used to estimate the MRP as an input into the CAPM, the DDM is the primary model that is used to directly estimate the cost of equity.

3.2. Summary of Case Studies

3.2.1. Australian regulatory decisions

Table 3.1 and Table 3.2 summarise the regulatory objectives and the approach to the estimation of the MRP by Australian regulators.

Our review of Australian regulators' objectives identifies common themes: the promotion of the efficient provision of regulated services, the requirement to allow regulated entities to recover efficient costs including a return commensurate with risk, as well as the protection of consumers from monopoly abuse. These seem to us, to be broadly similar to the objectives governing the PoM, as described in section 2.2.

In terms of MRP methods, our survey shows that Australian regulators typically rely on the HER approach, i.e. estimate the MRP based on long-run historical excess returns and RFR based on relatively current averages of government bond yields.

In Australia, the AER and ERA have explicitly considered and rejected the Wright approach. In rejecting the approach, they note both empirical and theoretical concerns, such as their view that the approach is less likely to reflect current market conditions over time, and it assumes a perfectly negative correlation between the RFR and the MRP.[23] Other regulators have noted there is a lack of consensus on the relationship between the RFR and MRP (ESCOSA and ACCC) or relied upon regulatory precedent in Australia (ICRC) as a justification for not using the Wright approach.[24] The

[20] For a discussion of the use of different methods to estimate short and long run dividend growth, see Ofwat (2017) Delivering Water 2020: Our methodology for the 2019 price review Appendix 12: Aligning risk and return, pp. 44-45. Link: https://www.ofwat.gov.uk/wp-content/uploads/2017/12/Appendix-12-Risk-and-return-CLEAN-12.12.2017-002.pdf

[21] For example, see Bank of England (2017) An improved model for understanding equity prices. Link: https://www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2017/an-improved-model-for-understanding-equity-prices.pdf?la=en&hash=F0385353B45A130A1AA557165FBEC5E326FD57FB

[22] For example, see Makholm, Jeff (15 November 2015) A Half-Century of Computing the Cost of Capital for Utilities at NERA, p. 13

[23] The AER has summarised these views in section 9.2.4 of the explanatory paper for the 2018 Rate of return instrument. See AER (Dec 2018), Rate of return instrument – Explanatory statement, p.231.

[24] In contrast to these approaches, OTTER's most recent decision simply adopts TasWater's proposal to use the MRP parameter determined by the AER for TasNetworks, on the basis that the state-owned regulated monopolies shouldn't have different MRPs.

QCA on the other hand places explicit weight (15%) on the Wright approach when calculating its weighted average MRP estimate. In addition, IPART, the QCA and ERA place explicit weight on "current" or "forward looking" MRP estimates, which use a DDM approach. As noted earlier, DDM estimates are essentially a forward looking application of the Wright approach.

Regarding the use of the DDM, a number of Australian regulators place some weight on results from the DDM, or use it as cross check, but criticise that its results are sensitive to the underlying model assumptions, and that results might be upwardly biased.[25] The exceptions to this are IPART, the QCA and the ERA who each explicitly invoke the DDM in their MRP estimates:

- IPART calculates the cost of capital as the average of a historic (HER) and current (DDM) based cost of capital;
- the QCA calculates the MRP as weighted average of 5 estimates, with DDM and Wright having a combined weight of 40 per cent; and
- the ERA uses the DDM to set the top end of its MRP range with HER setting the bottom end of the range.[26]

3.2.2. Transport regulatory decisions

Table 3.3 sets out our review of selected transport regulators. Our review of transport identifies common objectives around the promotion of the consumer or user interest. For example, all the regulatory regimes surveyed refer to duties in relation to furthering or protecting the interests or benefits of users and/or reference to ensuring cost containment or consistency with competitive market outcomes (in the case of the NZCC). The regimes also reference the promotion of cost efficiency and economy on the part of the regulated entity. The regulators duties also require them to ensure that the licensee can finance its functions (in the case of UK's CAA and CMA), to enable financial viability (for Ireland's CAR), and to ensure the economic equilibrium of the operator (Italian airport's operator), and the NZCC has duties around providing incentives to invest. Most of the regimes also include duties around promoting competition and avoiding discrimination. These duties or objectives are analogous in economic terms to those described in the PMA, as set out in section 2.2.

Of the five transport related decisions, UK's CMA, UK's CAA and Irish Commission for Aviation Regulation (CAR), primarily rely on the Wright approach, that is estimating the TMR based on long-run historical market returns, and a relatively current RFR based on government bond yields, with the MRP derived as the residual. Within their broad application of the Wright approach there are many detailed differences. For example, there are differences in the historical series used to determine the TMR, with UK's CAA and CMA focussing mainly on UK historical evidence, whereas the Irish regulator reviews Irish and wider European evidence. There are also differences in the tenor (e.g. 10 or 20 year gilts) and averaging period (e.g. spot or one year average) used to define the RFR. There are also different views on the reliability of DDM. The UK's CAA and Ireland's CAR place some emphasis on TMR derived from DDM models, e.g. as a cross-check on the historical TMR, whereas the UK's CMA does not place reliance on the DDM evidence.

We consider that all of these regimes are relevant to setting of the MRP for PoM, as the regulators interpret their duties/objectives as consistent with setting a market based rate of return consistent with the objectives for PoM (to set "a return commensurate with the risks involved").

[25] For example, the DDM approach has been criticised by the AER (see Section A.1.2.2 of this report).

[26] Historically the ERA took the midpoint of this range, though in recent decisions it selected a point slightly below the midpoint reflecting concerns about the DDM. See section A.2.2.2 of this report.

In their consideration of the Wright approach, these regulators generally observe that the TMR is a more stable parameter than the MRP, TMR and RFR are more readily observable than the MRP, and the direct use of MRP can result in error because it is often unclear how it is measured, e.g. with respect to which tenor of bonds.

The NZCC relies on a wide range of approaches: HER, DDM, survey evidence and the Wright approach. The NZCC is also explicit that there is no consensus on the "correct" way to calculate the MRP and therefore considers a broad range of evidence. However, the Italian airports regulator relies on the HER approach, although does not provide any discussion of the relative merits of this approach relative to others in its decision documents.

3.2.3. Energy and water regulators

3.2.3.1. Europe

Table 3.4 and Table 3.5 summarise a range of European and US regulatory decisions for energy and water.

As with the transport sector, the European energy and water regulators have similar objectives to those set out in the PMA. For example, all of the regimes surveyed include objectives analogous to those of the PMA around the protection of consumers. For example, the Dutch energy regulator has to "ensure that consumers are protected and treated with due care"[27]; the Swedish regulator must ensure "fair prices to consumers"[28] and UK energy and water regulators have to "protect the interests of consumers".[29] The regimes also have analogous provisions for the promotion of efficiency, e.g. the Swedish regulator has to "retain efficient operations",[30] the Swiss regulator has to create conditions for "efficient electricity and gas markets".[31] Many of the regulators also have objectives and/or duties relating to ensuring regulated entities are financially viable, e.g. Italian energy, Ofgem, Ofwat. Ofwat, for example, has to explicitly allow firms to secure "reasonable returns on their capital".[32] As with the transport regulators, we consider that all of the surveyed regimes are relevant to setting the MRP for the PoM as the regulators determine market based rates of return.

By contrast, there is no general theme in their approach to the estimation of the MRP, and we identify a number of distinct groups.

Three energy and water regulators (UK energy, UK water, Italy) rely on the Wright approach, with the regulators drawing principally on long-run historical market returns and a relatively current market RFR. As with the transport regulators, there are many differences in the application of the Wright approach. Notably, for the RFR, the Italian regulator has imposed a floor of +0.5 per cent on its value, whereas the UK energy and water regulators have recently determined negative values for the RFR based on market yields for 10 or 15 year government bonds. The UK water and energy regulators also undertake DDM analysis at least as a cross-check, as well as review survey evidence. However, the Italian regulator does not rely on the DDM.

In summary, all UK economic regulators that we have surveyed (Ofgem, Ofwat, CAA and CMA) place weight on the Wright approach, and all bar the CMA draw as well on DDM evidence. The common approach in part reflects the recommendations of the study from Wright et al. in 2003 on the

27 See Appendix C.6.

28 See Appendix C.8.

29 See Appendix C.10 and Appendix C.11.

30 See Appendix C.8.

31 See Appendix C.9.

32 See Appendix C.11.

estimation of the cost of capital, which was jointly commissioned by UK regulators, and Wright's more recent report in 2019, although Ofwat did not form part of the consortium of UK regulators for the 2019 update. The regulators were not, however, compelled to accept the recommendations of the Wright report, and indeed in some cases they have not adopted Wright's recommendations, e.g. in relation to other CAPM parameters. Moreover, the regulators have commissioned their own studies and undertaken separate consultations on the cost of capital methodology for their respective reviews.

In Switzerland, the regulator applies the HER approach but imposes bounds to limit the minimum and maximum MRP and RFR values. The setting of the bounds can be seen as a response to the currently prevailing low-interest rate environment, as the nominal risk-free rate in particular cannot fall below 2.5 per cent, thus shielding the network operators from some of the downside associated with the current low RFR environment.

The Swedish regulator takes different approaches to electricity and gas. For electricity, it acknowledges the importance of time-consistency in the estimation of RFR and MRP and consequently estimates both the RFR and MRP based on the average of a "current" estimate and the average of four years of historical data (with four years being the price control period). The MRP is based on survey evidence, and thus historical evidence in this context is historical survey estimates. Based on evidence suggesting the TMR is relatively stable but the MRP and RFR fluctuate significantly, the Swedish regulator concludes that from a regulatory point of view, a reduction in the RFR necessitates an increase in the MRP. For gas, it determines the MRP based on HER and survey evidence, and the RFR based on long-run expectations.

The regulators in Germany, France, Netherlands and Spain all adopt a HER approach, with the MRP based on long-run historical data, and the RFR on government gilts but with varying averaging periods and bond maturities. For example, the German regulator draws on a 10 year average of bond yields of more than 3-years maturity whereas the Dutch regulator uses a 3-year averaging period of bonds of 10-year maturity. In Spain, the regulator uses an average of the last 6 years of bonds with 10-years maturity, and has also included an upward adjustment of 80 bps for the gas determination to reflect the impact of quantitative easing on the historically low RFR.

3.2.3.2. US and Canada

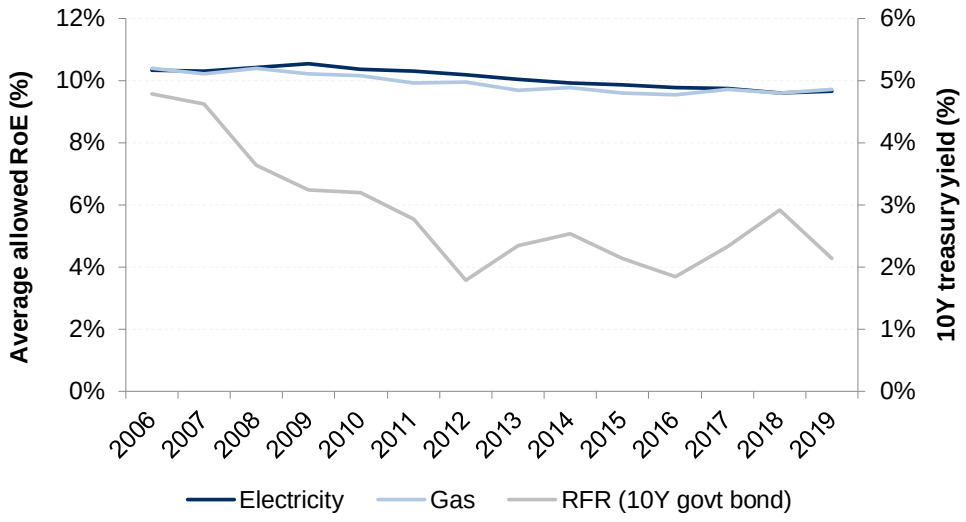
For the US, we cover the most recent regulatory decisions by Public Utility Commissions in the states of California, New York and Pennsylvania. These regulators share the same national/federal legal framework for rate setting, established by Supreme Court decisions in the so-called "Hope" and "Bluefield" cases. These court decisions set the standard for determining just and reasonable returns for investor-owned utilities with a fair rate of return based on the return for other businesses facing commensurate risk, and the need to ensure the financial integrity of the regulated entity.

The US regulators typically set overall revenues, including an allowed rate of return on capital, through rate case applications, in which utilities file tariff applications and the regulator decides on the overall revenue requirement including the reasonable rate of return on a case-by-case basis. In most instances, the US regulators do not use a CAPM approach but instead determine the allowed return using a discounted cash-flow (DCF) model, akin to the DDM. Under a DCF approach, the cost of equity is estimated directly and there is no requirement to separately identify RFR and MRP. In those instances where they also rely on CAPM, the rate case decisions do not discuss the estimation of the CAPM parameters.

The use of a DCF model which directly estimates the cost of equity and the lack of published information around the CAPM means that the US case studies are in some sense less useful in informing the approach to MRP estimation for the PoM. However, the US approach can effectively be characterised as using DDM in place of the CAPM, so it still provides useful precedent on the acceptability of the DDM by regulators.

S&P conducted a survey of all major rate case decisions in the US until 2019. Figure 3.1 below shows that the allowed return on equity has remained relatively stable between 2006 and 2019, despite declining US government yields. This shows that the DCF approach does not tend to provide returns which decline with declining yields.

Figure 3.1: US regulators kept stable cost of equity allowances despite falling treasury yields



Source: S&P Global Market Intelligence (2020), RRA Regulatory Focus – Major Rate Case Decisions 2019
Note: We show overall return on equity as information on individual parameters is not available, given the US regulators' reliance on the DCF as a primary model, which produces a return on equity directly.

Canadian regulation shares a similar legal framework to US, with their equivalent of the US "Hope" and "Bluefield" cases providing the legal standard providing for a fair return. Indeed, the US Supreme Court decisions are also cited in Canadian cases. Our review also shows that the Boards (e.g. Ontario Energy Board) have specific responsibilities around protecting consumers, and promoting efficiency.

Although the legal framework is similar in Canada as the US, Canadian regulators draw on a "formula approach" to estimate the cost of capital, as opposed to the CAPM or DDM approaches. The formula approach is the sum of the "equity risk premium" and a Long Canada Bond Forecast (LCBF) rate, and therefore analogous to the CAPM. However, the ERP is defined as a "utility-specific risk premium"[33] as opposed to a generic market parameter used in the CAPM, and there are no detailed publications setting out methods used for its estimation. The LCBF is also not defined as a proxy for the RFR. Therefore, Canada does not provide any directly useful evidence to inform the approach to the estimation of the MRP or RFR for PoM.

In summary, with their explicit requirement to set a market based rate of return, we consider that the US and Canada regimes are relevant *in principle* to the approach for setting the MRP for the PoM. However, in practice the published cost of capital decisions for the US States surveyed are not sufficiently detailed to be relied upon, other than as useful precedent on the acceptability of the DDM, and the Canadian model appears to be an adapted CAPM and therefore does not use a directly comparable MRP/RFR.

[33] OEB (11 December 2009), EB-2009-0084 Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, Chapter. Appendix A, p.I-II

Table 3.1: Comparison of Australian regulators AER, ERA, IPART, QCA & ESC objectives and recent approach to TMR/MRP methodology

	AER	ERA (West Australia)	IPART (NSW)	QCA (Queensland)	
Case study appendix	Appendix A.1	Appendix A.2	Appendix A.3	Appendix A.4	
Background and objectives of the regime					
Sector	Electricity & Gas	Electricity, Gas & Rail	Water & Wastewater	Rail & DBCT	Water
Regulatory Period	Gas: 2018-2022 Electricity: 2019-2024	Electricity: 2017/18-2021/22 Gas DSO: 2020-2024 Rail: 2018-2019	2020-2024	2020-2025	2020-2025
Regime objectives	Objective of AER's decision-making is to promote efficient investment in, and efficient operation and use of, the relevant electricity or gas services, for the long term interests of consumers with respect to the price, quality, safety, reliability and security of supply A price or charge for the provision of a regulated service should allow for a return commensurate with the regulatory and commercial risks involved in providing the service	*Electricity:* Price control must (among other things) provide the service provider with an opportunity to earn revenue sufficient to cover its forward-looking and efficient costs of providing covered services, including a return on investment commensurate with the commercial risks involved *Gas:* Objective is to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas *Rail:* Objective is to establish a rail access regime that encourages the efficient use of, and investment in, railway facilities by facilitating a contestable market for rail operations	IPART must have regard to the cost of providing the services provided; the protection of consumers from abuses of monopoly power; the appropriate rate of return on public sector assets; the need for greater efficiency in the supply of services so as to reduce the costs for the benefit of consumers and taxpayers; the impact on pricing policies of borrowing, capital and dividend requirements of the government agency concerned	Objective to promote economically efficient use of and investment in the service to promote effective competition The QCA must take into account a number of matters including pricing principles and public interest.	In monitoring prices, the QCA must take into account defined pricing principles and other economic and non-economic factors including social welfare.
MRP and RFR methodology					
Wright vs. DDM vs. HER approach	HER approach	"Historical" (HER) approach sets bottom end of MRP range, Forward looking (two stage DDM) sets top end. More weight placed on HER.	Equal weighting on "historic" MRP (HER) and "current" MRP (2/3 DDM, 1/3 Market indicator approach)	Ibbotson (25%), three-stage Cornell DDM (25%), Surveys (20%), Siegel (15%) and Wright (15%)	
Reasoning for approach	The Wright approach is less likely to reflect market conditions over time as Wright	Notes theoretical and empirical concerns with Wright approach raised by AER and	Does not comment on why it uses the HER approach, but notes that the RFR and MRP negatively co-vary, which is an	Weightings relative to the strengths and weaknesses of the approaches. The QCA notes that Wright and Ibbotson represent two theoretical extremes and empirical evidence indicates neither approach is likely to perfectly characterise the MRP and	

Case study appendix	AER Appendix A.1	ERA (West Australia) Appendix A.2	IPART (NSW) Appendix A.3	QCA (Queensland) Appendix A.4
	approach implies largely stable return on equity Unconvinced about perfect negative relationship between MRP and RFR	its advisors Partington and Satchell.	argument in favour of the Wright approach	therefore both provide relevant information. Most weight is placed on DDM and Ibbotson as they are the two methods that are "entirely independent of each other" as "doing so maximises the use of the information available".
View on DDM	Requires subjective assumptions. Analyst forecasts and sticky dividends can upwardly bias the MRP estimate	Gives some weight to two-stage DDM, but concerned with the form of the model, input assumptions, sensitivity to assumptions and upward bias	Gives some weight to DDM results obtained from Damodaran, BoE and Bloomberg methods (which are all multi-stage DDM models), but concerned with reliance on several assumptions	Uses a three-stage Cornell DDM to inform view of MRP but notes it should be used with caution due to sensitivity to assumptions and inputs.
MRP parameter methodology	Arithmetic and geometric averages of historical excess returns. Point estimate of MRP set equal to arithmetic average over the time period the AER considers most relevant (1988-2017).	Historical (HER) estimate determined as average of the lowest arithmetic and highest geometric average of historical excess returns for a matrix covering six overlapping time periods. Forward looking (DDM) estimate determined using a two stage DDM model. More weight placed on historical approach by selecting point below the mid-point of the range.	Essentially a 50:50 weighting between HER and the "current" MRP. Where the current MRP gives a 2/3 weight to DDM results and 1/3 weight to economic market indicators approach.	Calculates MRP using a weighted average of a number of approaches (see above for weightings).
RFR parameter methodology	20 to 60 day average of the yield on 10-year Commonwealth Government Securities	*Electricity & gas:* Yield of five-year Commonwealth Government securities, averaged over 20 days *Rail:* Yield of the 10-year Commonwealth Government bonds, averaged over 40 days	RFR based on 10-year Commonwealth Government securities, averaged over 10 annual observations for its historic estimate and averaged over 40 days for its current estimate	Uses 10-year Commonwealth Government Securities and a 20-day averaging period.

Source: NERA analysis.

Table 3.2: Comparison of Australian regulators ESCOSA, ICRC, OTTER & ACCC objectives and recent approach to TMR/MRP methodology

	ESCOSA (South Australia)	ICRC (Australian Capital Territory)	OTTER (Tasmania)	ACCC			
Case study appendix	Appendix A.5	Appendix A.6	Appendix A.7	Appendix A.8			
Background and objectives of the regime							
Sector	Water	Water	Water	Rail	Port of Newcastle	Post	Telecom
Regulatory Period	2020-2024	2018-2023	2018-2021	2017-2026	2018-2031	2020-2021	2015-2019
Regime objectives	"[E]ncourage economically efficient behaviour that is in consumers' long-term interests." Must have regard to a number of objectives including facilitating market entry when making a determination.	Objective when making a determination is to "promote the efficient investment in, and efficient operation and use of regulated services for the long-term interests of consumers in relation to the price, quality, safety, reliability and security of the service"	Regulates prices and service standards with regard to defined pricing principles, including providing incentives to promote economic efficiency and reduce costs.	ACCC regulates rail and ports where there is no state based access regime. Access undertaking will be accepted if it takes into account certain matters including pricing principles and promotion of economically efficient investment in infrastructure.		ACCC is the national regulator for telco and post. For post, ACCC must determine whether prices reflect a cost base that is efficient and provide incentives for efficient investment For telco, an access determination, must take into account a list of objectives including promotion of long-term interests of users.	
MRP and RFR methodology							
Wright vs. DDM vs. HER approach	HER approach	Greatest weight to HER (follows AER)	Greatest weight to HER (follows AER)	Greatest weight to HER			
Reasoning for approach	Following service provider proposal and previous determinations. Uses surveys as a cross check. Notes there is some evidence for the Wright approach, but hard to improve on historic excess returns.	Other Australian regulators haven't assumed a relationship between RFR and MRP. Followed AER's 2013 guidelines and previous decisions.	OTTER accepted service provider proposal to adopt MRP from AER decision for TasNetwork (which was based on AER's 2013 guidelines.)	Does not consider the TMR or the Wright model. Following methodology in previous decisions by considering historic excess returns, and surveys.		Does not mention Wright model.	States that there is no clear consensus on the relationship and citing evidence suggesting there is no direct correlation between RFR and MRP.
View on DDM	Not used, stating high sensitivity to assumptions.	Multi-stage DDMs used to inform judgement on MRP.	AER 2013 guidelines use DGM to inform MRP	Does not give weight to DDM		Used to inform judgement on MRP.	Does not give weight to DDM
MRP parameter methodology	Based on long-run historical estimates.	Essentially adopts AER approach/value.	AER 2013 guidelines use judgement based on evidence from historic excess returns, survey evidence, DDM, etc. .	*Rail*: Considers historical estimates, surveys, and previous regulatory decisions with most weight put on historical estimates. *PoN*: Considers historical excess returns, surveys and		Followed AER 2018 guidelines which used a range of evidence including historic returns, DDM, surveys, etc.	Considers a range of evidence including historical excess returns, surveys, previous decisions

Case study appendix	ESCOSA (South Australia) Appendix A.5	ICRC (Australian Capital Territory) Appendix A.6	OTTER (Tasmania) Appendix A.7		ACCC Appendix A.8	
				previous regulatory decisions.		
RFR parameter methodology	Annually updated RFR, based on 10-year Commonwealth Government Securities and using a 60-day averaging period.	Uses 10-year Commonwealth Government Securities and a 40-day averaging period.	Calculates the average of 10-year Commonwealth Government bonds using a 40 trading day average and the time weighted historical average of yields on the same bonds over the last 10 years	*Rail:* 10-year Australian Commonwealth Securities and using a 20 day averaging period *PoN:* Based on submissions	Does not state methodology.	10-year Australian govt. bonds and uses an averaging period of 20 business days.

Source: NERA analysis.

Table 3.3: Comparison of Transport regulators objectives and recent approach to TMR/MRP methodology

Case study appendix	**CAA (UK)** Appendix B.1	**CMA (UK)** Appendix B.2	**CAR (Ireland)** Appendix B.3	**ART (Italy)** Appendix B.4	**NZCC (New Zealand)** Appendix B.5
Background and objectives of the regime					
Sector	Aviation	Aviation	Aviation	Aviation	Airports, Electricity & Gas
Regulatory Period	2020-2024	2020-2024	2020-2024		
Regime objectives	Primary duty is to further interests of users of air transport services regarding range, availability, continuity, cost and quality Must have regard to other matters, including: each licensee able to finance its licensed activities; promoting economy and efficiency on the part of licensees	Must further the interests of operators and owners of aircraft etc To promote efficiency and economy on the part of licence holders To secure that licence holders will not find it unduly difficult to finance activities authorized by their licences	To facilitate the efficient and economic development and operation of Dublin Airport to meet requirements of users To protect interest of current and prospective users To enable DAA to operate and develop Dublin Airport in a sustainable and financially viable manner	To promote competition, productive efficiency and cost containment for users, businesses and consumers and fair and non-discriminatory access to infrastructure In setting tariff methodology, must also ensure economic equilibrium of the airport operator.	Legislative purpose statement for price control provisions is promoting the long-term benefit of consumers by promoting outcomes that are consistent with outcomes produced in competitive markets. Outcomes include incentives to invest/innovate, incentives to improve inefficiency, sharing efficiency gains and limited ability to extract excess profits.
MRP and RFR methodology					
Wright vs. DDM vs. HER approach	Wright approach, cross-checked by multi-stage DDM estimates from Ofwat, Ofcom and Ofgem prepared by their advisors Europe Economics, CEPA and PwC.	Wright approach	Wright approach and DDM	HER approach	Median of 5 estimates: HER (Siegel and Ibbotson), Wright (referred to as "Siegel 2"), three-stage DGM and survey evidence
Reasoning for approach	TMR is more stable than the MRP Other regulators have adopted the Wright approach	MRP depends on the class of risk-free instrument used in the calculation, and therefore greater scope for error under HER approach TMR less volatile than the MRP. MRP seems to be negatively correlated with Treasury rates over the short term, and TMR ensures time-consistent parameters.	TMR and RFR are more readily observable than MRP TMR is a more stable parameter than the RFR Evidence that MRP and RFR are negatively correlated, and therefore TMR ensures time consistency of parameters	Not available.	Considers there is no consensus on "correct" way to estimate the MRP so takes into account broad range of methods.
View on DDM	Relevant evidence, corroborating historical TMR	CMA considers the estimates of various parties for the DDM, which include the multi-stage DDM analysis by Ofwat, Ofcom, Europe Economics, CEPA and PwC as well as BoE analysis cited	DDM relied upon, forms the lower-bound of TMR range. DDM follows the Gordon model (1962). It is a one-stage DGM which assumes a constant dividend growth rate	Not available.	It relies partly on the three-stage DDM, giving equal weight to all considered methods, but notes that none of its models is optimal

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Case study appendix	**CAA (UK)** Appendix B.1	**CMA (UK)** Appendix B.2	**CAR (Ireland)** Appendix B.3	**ART (Italy)** Appendix B.4	**NZCC (New Zealand)** Appendix B.5
		by NERA. Estimated, but not directly relied upon as depends on assumptions and produces a broad range of TMR estimates.			
MRP parameter methodology	TMR based on historical realised returns, consultant's advice, and recent regulatory precedent	TMR based on long-term average historical returns, drawing on DMS and Fama and French (2002)	TMR based on long-term historical averages (DMS), and DDM	Based on long-term historical averages (DMS) and regulatory precedent	Median of 5 estimates: HER (Siegel and Ibbotson), Wright (referred to as "Siegel 2"), DGM and survey evidence Estimate is rounded to the nearest 0.5%
RFR parameter methodology	ILG yields with maturities 5, 10,15 and 20 years, cross-checked against regulatory precedent	Spot 10-year ILG yield, plus forward rate adjustment	1-year average of 10-year Irish and 5-year average German govt. bonds, plus forward rate adjustment	12-month average of the 10-year Italian government bond yields (BTP), as published by the Bank of Italy in the year prior the start of airport operator's consultation with users.	Yields on government bonds with a maturity that matches term of price control (typically 5 years). Spot rates averaged over a 3 month window prior to date at which estimate occurs.

Source: NERA analysis.

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Table 3.4: Comparison of US, Canada, and European Energy regulators (ACM, CRE, BNetzA, ARERA) objectives and recent approach to TMR/MRP methodology

Case study appendix	**US rate cases** Appendix C.1	**Canada** Appendix C.2	**CRE (France)** Appendix C.3	**BNetzA (Germany)** Appendix C.4	**ARERA (Italy)** Appendix C.5	**ACM (Netherlands)** Appendix C.6
	Background and objectives of the regime					
Sector	Electricity, Gas & Water	Electricity and gas	Electricity & Gas	Electricity & Gas	Electricity & Gas	Electricity & Gas
Regulatory Period	Various	Various	Gas: 2020-2023 Electricity: 2017-2021	Gas: 2018-2022 Electricity: 2019-2023	2016-2021	2017-2021
Regime objectives	Court decisions "Hope" & "Bluefield" set legal standard: "The return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and attract capital."	Equivalent to US "Hope" and "Bluefield" set legal standard providing for a fair return, as measured by cost of capital. Ontario Energy Board (OEB) has specific responsibilities around protecting consumers, and promotion of efficiency.	Tariffs have to be established in a transparent and non-discriminatory manner to cover all costs borne by efficient operators Encourage operators to improve their performance related in particular, to the quality of service provided, integration of the internal gas market, the security of supply and productivity efforts.	Tariff ordinances give instructions on MRP and RFR methodology, specifying the series and averaging period to be used for estimating the RFR and includes guidance on the MRP	The tariff regulations must: Be "certain, transparent, and based on predefined criteria"; Protect the interests of users and consumers Ensure the promotion of competition and efficiency in public utility services, as well as adequate levels of quality in the services themselves in terms of economy and profitability, ensuring their usability and diffusion in a homogeneous way nationally. Balance operators' economic and financial objectives with general social objectives of environmental protection and the efficient use of resources.	Ensure that consumers are protected and treated with due care Ensure that markets function well and that market processes are orderly and transparent To the pursuit of this mandate, the ACM will guard, promote and protect effective competition and a balanced playing field as well as remove any obstacles to its objectives
	MRP and RFR methodology					
Wright vs. DDM vs. HER approach	DCF/DDM, and used directly to estimate RoE, as well as CAPM but approach not defined	OEB, in common with other state regulators, uses a "formula" approach rather than the CAPM per se.	HER approach, surveys	HER approach	Wright approach	HER approach
Reasoning for approach	-	No discussion	No discussion	Criticises Wright approach because of no clear relationship between the MRP and RFR	Considers that estimating TMR directly would overall enhance stability of its cost of equity estimation	No discussion, but considers that using the Wright approach would lead to the same result
View on DDM	US regulators mainly rely on evidence from the DCF/DDM, CAPM usually only used as cross-check. New York and Pennsylvania consider a two-stage DCF/DDM. In California, CPUC allows for different methods to be used by the	No discussion	Consultant considers that DDM results are sensitive to assumptions, no weight on DDM results	Notes that model-based forecasts and surveys are driven by subjective assumptions	Considers that DDM is not easy to implement, and it is not adopted in international regulation	DDM used as cross-check; DDM results are variable and depend on its assumptions

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Case study appendix	**US rate cases** Appendix C.1	**Canada** Appendix C.2	**CRE (France)** Appendix C.3	**BNetzA (Germany)** Appendix C.4	**ARERA (Italy)** Appendix C.5	**ACM (Netherlands)** Appendix C.6
	parties, which include constant growth and multi-stage growth assumptions					
MRP parameter methodology	US Public Utility Commissions set the return on equity directly, mainly drawing on evidence from the DCF, cross-checked against CAPM Usually no specific discussion about MRP and RFR parameter estimation in the court decisions. DCF does not require the separate identification of MRP/RFR, but instead ROE estimated directly	The formula approach involves estimation of an ERP term, however, defined as "utility specific premium" as opposed to market premium and therefore not identical to MRP estimated as part of CAPM. ERP is based on historical and forward-looking evidence, but no further details.	*Gas*: Roughly 50% weight on historical returns in France and 50% weight on Fernandez's survey *Electricity:* 100% weight on historical returns in France and Europe, cross-checked against regulatory precedent	Long-term global equity returns relative to medium-term government bonds, with 50% weight on the arithmetic mean and 50% weight on the geometric mean	TMR estimated using long run historical market returns, with 20% weight on the geometric mean and 80% weight on the arithmetic mean	Long-run historical equity risk premiums, based on the mean of the arithmetic and geometric average
RFR parameter methodology		No term is designated as RFR, but approach draws on a 30-year sovereign bond yield forecast for the regulatory year.	*Gas*: 10-year average yield of French govt. bonds with maturity of 10 years *Electricity*: 8-year average yield of French govt. bonds with maturity of 10 and 30 years, more weight to 10 year maturity bond yields	10-year average of the yield of government bonds with an average maturity of more than three years.	Highest value between 0.5% and the 12 month average of 10-year govt. bond yields of AA-rated European countries	Average of Dutch and German govt. bond yields with 10 years maturity, both averaged over three years

Source: NERA analysis.

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Table 3.5: Comparison of Energy regulators CNMC, EI, SFOE & Ofgem objectives and recent approach to TMR/MRP methodology

Case study appendix	**CNMC (Spain)** Appendix C.7	**EI (Sweden)** Appendix C.8	**SFOE (Switzerland)** Appendix C.9	**Ofgem (UK)** Appendix C.10	**Ofwat (UK)** Appendix C.11
Background and objectives of the regime					
Sector	Electricity & Gas	Electricity & Gas	Electricity & Gas	Electricity & Gas	Water
Regulatory Period	*Electricity:* 2020-2025 *Gas:* 2021-2026	*Electricity*: 2020-2023 *Gas:* 2019-2022	2020	*Electricity DSO:* 2015-2023 *Electricity TSO & Gas:* 2013-2021	2020-2025
Regime objectives	Conserve, safeguard and promote the correct operation, transparency and the existence of effective competition in all markets and productive sectors in the interests of consumers and users	EI's principal objective is to ensure that network operators do not make monopoly profits while retaining efficient operations of the grid with a good quality of supply, thus ensuring high quality and fair prices for the consumers	Ensuring a sufficient, well-diversified and secure energy supply that is both economical and ecologically sustainable; creating the necessary conditions for efficient electricity and gas markets and an adapted infrastructure	Protect the interests of existing and future electricity and gas consumers Have regard to the need to secure that licence holders are able to finance their activities Promote efficiency and economy on the part of persons authorised by licences.	To protect the interests of consumers, wherever appropriate by promoting effective competition Secure that undertakers are able to finance the proper carrying out of their functions, in particular by securing reasonable returns on their capital
MRP and RFR methodology					
Wright vs. DDM vs. HER approach	HER approach	*Elec:* survey for MRP *Gas:* HER, with long-term RFR and survey evidence	HER, with bounded values	Wright approach, using DDM as cross-check	Wright and multi-stage DDM approach
Reasoning for approach	No discussion	*Elec:* EI concludes that from a regulatory point of view, a reduction in the RFR necessitates an increase in the MRP. *Gas:* no discussion	No discussion	Decision to draw on the Wright approach based on Wright's recommendation for UK regulators	Ofwat does not consider the HER approach and doesn't explain why in current documentation. Rather, Ofwat focuses on the different approaches to calculating TMR, e.g. historical, DDM
View on DDM	Does not rely on DDM; sensitive to assumptions	*Elec:* does not consider that DDM is reliable *Gas:* no discussion	CAPM is preferred as it is simpler	Uses multi-stage DDM based on analysis by CEPA as a cross-check	Multi-stage DDM results from its consultants Europe Economics to inform its TMR range
MRP parameter methodology	Average of arithmetic and geometric mean of long-run historical returns in European countries	*Electricity*: based on survey evidence *Gas:* Based on historical risk premium and survey evidence	Long-run average of the arithmetic and geometric mean of the difference between the Swiss stock market returns and 10-year Swiss govt. bonds The applicable MRP is bounded by 4.5% as the lower bound and 5.5% as the upper bound.	TMR principally based on 2018 UKRN report recommendation (long-run historical TMR estimates), cross-checked using DDM and investment manager's forecasts	TMR based on long-run historical market returns, Fama and French underlying return approach as well as the DDM, placing equal weight on all approaches

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Case study appendix	**CNMC (Spain)** Appendix C.7	**EI (Sweden)** Appendix C.8	**SFOE (Switzerland)** Appendix C.9	**Ofgem (UK)** Appendix C.10	**Ofwat (UK)** Appendix C.11
RFR parameter methodology	6-year average of the 10-year Spanish sovereign bond yields, including an upward adjustment of 80 bps for the gas determination due to QE	*Electricity:* based on average of: i) 4-yr average of govt bonds, and ii) spot rates *Gas*: Nominal value based on assumed long-term inflation + GDP growth (= 4 per cent)	1-year average of yields on 10-year Swiss govt. bonds The applicable RFR is bounded by 2.5% as the lower bound and 6.5% as the upper bound	Spot yield on 20-year RPI-linked gilts, adjusted for the difference between RPI and CPI forecasts by the OBR	One-month average of RPI-linked gilt yields with 15 years maturity plus a forward uplift

Source: NERA analysis.

Appendix A. Australian Regulators

A.1. AER's approach to TMR/MRP estimation

This case study sets out the approach of the Australian Energy Regulator (AER) to estimating the MRP at its latest methodology decision for setting the rate of return for regulated energy companies Australia.

A.1.1. Background and Objectives of the Regime

The AER independently regulates electricity networks and covered gas pipelines in all Australian jurisdictions except Western Australia. It sets the amount of revenue that network businesses can recover from customers for using these networks.

For both electricity and gas regulation, the National Electricity Law and the National Gas Law establish the National Gas Objective (NGO) and National Electricity Objective (NEO), which state "the objective [of AER's decision-making] is to promote efficient investment in, and efficient operation and use of, the relevant electricity or gas services, for the long term interests of consumers with respect to the price, quality, safety, reliability and security of supply".[34] Furthermore, the "revenue and pricing principles" under the NGL and NEL establish that "a price or charge for the provision of a regulated service should allow for a return commensurate with the regulatory and commercial risks involved in providing the service."[35] The AER describes its regulatory task as being to "determine an overall rate of return (or WACC) for an efficient firm that is in the supply of regulated energy network services commensurate with its efficient financing costs".[36]

As we describe below, the AER determines its allowed cost of equity based on the CAPM, estimating RFR and MRP independently.

A.1.2. Estimation of MRP and RFR

A.1.2.1. AER draws on the HER approach and rejects the Wright approach

Prior to the 2018 Rate of Return Instrument process, the AER used the Wright approach to inform the overall return on equity.[37] The AER decided to reject the Wright approach for estimating the MRP when it determined the binding rate of return instrument in 2018. It notes that this approach is less likely to reflect market conditions over time than its current estimation method, as the Wright approach implies a largely stable return on equity. The AER concludes that, given its regulatory framework, it "*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*".[38]

When discussing the Wright method in the draft decision for AusNet's gas distribution network that released shortly before the Instrument was finalized, the AER summarized its objections to the Wright method as follows:[39]

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34 National Electricity Law Section 7; National Gas Law Section 23.

35 AER (Dec 2018), Rate of return instrument – Explanatory statement, p.30.

36 AER (Dec 2018), Rate of return instrument – Explanatory statement, p.220.

37 AER (Dec 2013), Rate of return guideline – Explanatory Statement, p.59.

38 AER (Dec 2018), Rate of return instrument – Explanatory statement, p.231.

39 AER (Oct 2018), Draft decision - AusNet Services gas access arrangement – Attachment 3 rate of return, pp.3-221 - 3-222.

- The Wright approach is not theoretically justified. It noted that the CAPM is a forward looking equilibrium asset pricing model and therefore requires forward looking input parameters.
- It considered that there is no compelling empirical evidence to support the use of the Wright specification.
- Market practitioners, academics or regulators do not generally accept the Wright approach.
- The model does not take into account changing market conditions and is unlikely to estimate an unbiased forward looking estimate of the required return on equity for the benchmark efficient entity.

Consequently, the AER places no weight on the Wright approach for the estimation of the MRP.

A.1.2.2. AER's approach to estimating the MRP

The AER essentially sets the MRP using the HER method, with its point estimate being equal to the arithmetic excess return between 1988 and 2017.

For estimating historical excess returns, the AER draws on the following:[40]

- Arithmetic and geometric averages
- The Brailsford, Handley and Maheswaran (BHM) returns data[41]
- Five separate periods
- Adjustment to include the effect of theta (dividend imputation)

Based on the above evidence, the AER then forms a range from the resulting estimates to inform its MRP determination. [42]

A.1.2.3. Views on Dividend Growth Model

The AER considers that there are material issues with the application of the DGM, as outlined below:[43]

- The assumption that market participants expect a stable return on equity, which the DGM then solves for the expected return on equity
- Reliance of the DGM on the RFR
- Subjectivity in selecting the growth rate, which significantly affect resulting MRP estimates
- Analyst forecasts, which form an essential component of the DGM, are upwardly biased
- Sticky dividends, which is the idea that firms will be slower to lower their dividends due to poor returns than they will be to raise them due to good returns, could upwardly bias the MRP estimate.

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40 AER (Dec 2018), Rate of return instrument – Explanatory statement, p.240.

41 Where BHM are three academics who have published academic articles examining the equity risk premium in Australia. See Brailsford, T., J. Handley and K. Maheswaran, Re-examination of the historical equity risk premium in Australia, Accounting and Finance 48, 2008, pages 73-97 and Brailsford, T., J. Handley and K. Maheswaran, The historical equity risk premium in Australia: Post-GFC and 128 years of data, Accounting and Finance, 2012, pages 237-247.

42 AER (Dec 2018), Rate of return instrument – Explanatory statement, p.240.

43 AER (Dec 2018), Rate of return instrument – Explanatory statement, pp.256-257 & 265.

Consequently, while the AER considers DGM models, its point estimate is essentially just the HER estimate. Therefore the DGM has no direct bearing on the AER's point estimate for the MRP.

A.1.2.4. Estimation of RFR

In its 2018 rate of return guidelines, the AER proposes to estimate the RFR drawing on the average yield on 10-year Commonwealth Government Securities.[44] This approach is consistent with its 2013 rate of return guidelines.[45]

For the averaging period, it decided to choose a period between 20 and 60 consecutive business days in its 2018 rate of return instrument, a change from the averaging period of 20 business days in its 2013 rate of return guidelines.[46]

For its most recent draft determination on the electricity DNSP SA Power Networks in 2019, the AER determined a nominal RFR of 2.14 per cent.[47]

A.1.3. Determined Values

Table A.1 below sets out AER's estimated values of the MRP of 6.1 per cent for SA Power Networks, and RFR based on short-run market data.

Table A.1: AER's estimated MRP for SA Power Networks (nominal)

Sector	Electricity
Regulatory period (latest)	2020-2025
TMR	7.42%
RFR	1.32%
MRP	6.10%

Source: AER (Oct 2019), Draft Decision – SA Power Networks Attachment 3 rate of return, table 3.1, p.3-6
Note: TMR calculated as MRP + RFR.

We convert AER's nominal TMR and RFR determinations into real CPI terms using its inflation forecast of 2.45 per cent, and the Fisher equation. Table A.2 sets out the MRP parameters in real CPI terms.

Table A.2: AER's estimated MRP for SA Power Networks (real CPI)

Sector	Electricity
Regulatory period	2020-2025
TMR	5.00%
RFR	-1.10%
MRP	6.10%

[44] AER (Dec 2018), Rate of return instrument – Explanatory statement, p.125.

[45] AER (Dec 2013), Rate of return instrument – Explanatory statement, p.73.

[46] AER (Dec 2018), Rate of return instrument – Explanatory statement, p.125; AER (Dec 2013), Rate of return instrument – Explanatory statement, p.76.

[47] AER (Oct 2019), Draft Decision – SA Power Networks Attachment 3 rate of return, table 3.1, p.3-6.

Note: TMR calculated as MRP+RFR. To convert nominal values into real CPI values, we use AER's inflation forecast of 2.45 per cent applied to SA Power Networks current rate of return. Sources: AER (Oct 2019), Draft Decision – SA Power Networks Attachment 3 rate of return, table 3.1, p.3-6.

A.2. ERA's approach to TMR/MRP estimation

This case study sets out the approach of the Economic Regulation Authority (ERA) to estimating the MRP at its latest regulatory decision for regulated energy and railway companies in Western Australia.

A.2.1. Background and Objectives of the Regime

The ERA is Western Australia's independent economic regulator. It is governed by certain regulations for electricity, gas as well as rail, as set out below.

Electricity

The Access Code sets out the legislative framework for electricity regulation in Western Australia.

Specifically, Section 6.4 of the Access Code requires that the price control in an access arrangement must (among other things) provide the service provider with an opportunity to earn revenue sufficient to cover its forward-looking and efficient costs of providing covered services, including a return on investment commensurate with the commercial risks involved.[48]

Section 6.66 of the Access Code requires that a WACC calculation:[49]

- Must represent an effective means of achieving the Access Code objective and the objectives in section 6.4;
- Must be based on an accepted financial model such as the Capital Asset Pricing Model (CAPM).

Gas

The National Gas Law as well as the National Gas Rules set out the legislative framework for gas regulation in Western Australia.

Specifically, the National Gas Objective sets out the aim of the National Gas Law:[50] "The objective of this Law is to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas."

Rail

The Railways Access Act 1998 and its subsidiary Railways Access Code 2000 set out the legislative framework for rail regulation in Western Australia.

Specifically, Section 2A of the Railways Access Act 1998 sets out the objective of the Act, which is to "establish a rail access regime that encourages the efficient use of, and investment in, railway facilities by facilitating a contestable market for rail operations".[51]

The Railways Access Code 2000 describes the capital costs calculation, but does not describe a method for determining the WACC:[52]

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48 Access Code Section 6.4.

49 Access Code Section 6.66.

50 National Gas Law Section 23.

51 Railways Access Act 1998 Section 2A.

52 Railways Access Code 2000 Schedule 4 Clause 2.

- (3) Capital costs (other than capital costs under subclause (5)) are to be determined as the equivalent annual cost or annuity for the provision of the railway infrastructure in accordance with subclause (4).
- (4) The calculation is to be made by applying
  - (a) the Gross Replacement Value (GRV) of the railway infrastructure as the principal;
  - (b) the Weighted Average Cost of Capital (WACC) as the interest rate; and
  - (c) the economic life which is consistent with the basis for the GRV of the railway infrastructure (expressed in years) as the number of periods.

A.2.2. Estimation of MRP and RFR

A.2.2.1. ERA draws on the HER and DGM approaches, but does not rely on the Wright approach

To confirm the appropriateness of the Wright approach, the ERA conducted statistical analysis of the long run average market return on equity, the yield on bonds and the market risk premium at its 2013 gas rate of return guidelines. Based on this analysis, the ERA considered that the MRP resulting from the Wright approach forms an upper bound of the range.[53] However, for the current decisions, the ERA has considered following consultancy advice and regulatory commentary on the Wright method:[54]

- Partington and Satchell, advisors to AER, note that the Wright CAPM has no "well accepted theoretical support", "does not seem to be much used, if at all, in practice", and "runs contrary to the well accepted view that asset prices are inversely related to interest rates".
- The AER stated that it does "not agree with the underlying premise of the Wright CAPM that there is a clear inverse relationship between movements in the risk free rate and market risk premium. Consequently, we place limited reliance on the Wright approach".

Based on above evidence, the ERA concludes *"that there are theoretical and empirical concerns with the Wright approach"*.[55] Hence, the ERA does not rely on the Wright approach and instead draws on the HER and DGM approaches for its regulatory decisions regarding electricity, gas as well as rail regulation.

A.2.2.2. ERA's approach to estimating the MRP

The ERA estimates the MRP directly for its regulatory decisions regarding electricity, gas as well as rail, drawing principally on evidence from historical estimates and forward-looking estimates, as set out below.[56] The ERA uses the HER approach to set the bottom of the range and the two-stage DGM to set the top of the range. It historically set the MRP at the midpoint of this range,[57] but as discussed

[53] ERA (Sep 2018), Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base, para.282, p.47.

[54] ERA (Sep 2018), Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base, para.285-287, p.48.

[55] ERA (Sep 2018), Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base, para.288, p.48.

[56] ERA (Sep 2018), Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base, para.307, p.50.

[57] ERA (Sep 2018), Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base, para.306, p.50.

below, in its most recent electricity decision it decided to place less weight on the DGM. It therefore used regulatory judgement to select a point estimate slightly below the mid-point.[58]

For its final decision on the Western Power Network Access Arrangement in 2018, the ERA determines a MRP of 6.2 per cent. [59] Regarding current gas regulation, the ERA determines a MRP of 7.4 per cent for the Dampier Bunbury Pipeline (DBP), and 6 per cent for both the Goldfields Gas Pipeline (GGP) as well as the Mid-West and South-West Gas Distribution System (Gas DSO). [60]

As set out in its latest final determination for rail networks and railways, the ERA has adopted an MRP estimate of 5.9 per cent, which will remain fixed until its next rail WACC method review.[61]

Historical approach

For estimating historical excess returns, the ERA draws on the following:[62]

- Arithmetic and geometric averages of historic market premium observations based on the BHM and NERA datasets
- Six overlapping time periods, to reflect different economic conditions

It then bases its historic MRP estimate on the average of the lowest arithmetic and highest geometric means of the resulting historic market premium matrix.

Forward-looking approach

Regarding the forward-looking estimate, the ERA draws principally on its two-stage dividend growth model (DGM).[63]

For its latest electricity final decision, the ERA considered a report by Partington and Satchell for the AER, which raised several concerns with the DGM, including:[64]

- The DGM is sensitive to its assumptions
- Forecasting dividends and earnings is fairly inaccurate over more than two years
- The smoothed or sticky nature of dividends upwardly biases the DGM estimate
- Analysist forecast biases can upwardly bias the DGM estimate

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58 ERA (Sep 2018), Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base, para.309 - 311, p.50.

59 ERA (Sep 2018), Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base, para.311, p.51.

60 ERA (Jun 2016), Final decision on proposed revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 - 2020, para.590 & para.595, p.126*;* ERA (Dec 2019), Final decision on proposed revisions to the Goldfields Gas Pipeline Access Arrangement for 2020 to 2024, table 68, p.154; ERA (Nov 2019), Final decision on proposed revisions to the Mid-West and South-West Gas Distribution Systems access arrangement for 2020 to 2024, table 127, p.295.

61 ERA (Aug 2019), 2018 and 2019 weighted average cost of capital for the Freight and Urban Networks, and the Pilbara Railways, para.257, p.53.

62 ERA (Dec 2018), Final rate of return guidelines, para.179, p.30, URL: https://www.erawa.com.au/cproot/19968/2/2018%20Final%20Gas%20Rate%20of%20Return%20Guidelines.PDF

63 ERA (Dec 2018), Final rate of return guidelines, para.182, p.30.

64 ERA (Sep 2018), Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base; para.205, p.37.

Additionally, the ERA provides four key concerns with the application of the DGM:[65]

- Experts do not clearly agree on the best DGM, or its assumptions
- Forecasting dividends and earnings are inaccurate and are likely upwardly bias
- Low interest rates likely upwardly bias the DGM estimate
- The resulting estimate of the DGM looks out beyond the five-year regulatory period, which upwardly biases an actual estimate over the five-year period

Consequently, the ERA places more weight on the historical approach relative to the forward-looking approach, as it considers that the forward-looking approach suffers from weaknesses including the form of its underlying model, its input assumptions, its sensitivity to assumptions and its upward bias.[66]

For its electricity final decision, the MRP estimate based on the DGM sets the upper bound of its MRP range.[67]

A.2.2.3. Estimation of RFR

The ERA draws on the same methodology for estimating the RFR for electricity as well as gas regulation but uses a different methodology for its rail regulation, as described below.

As set out in its 2018 gas rate of return guidelines, the ERA estimates the RFR based on the yield of five-year Commonwealth Government securities, averaged over a period of 20 consecutive trading days, which are as close as possible to the expected access arrangement final decision for regulatory period.[68]

For its final decision on the Western Power Network Access Arrangement in 2018, the ERA determines a nominal RFR of 2.37 per cent.[69] Regarding current gas regulation applying to DBP, GGP, as well as the Gas DSO, the ERA determines a nominal RFR of 1.8 per cent, 0.72 per cent and 0.82 per cent respectively.[70]

In its latest rail rate of return determination, the ERA draws on the yield of the 10-year Commonwealth Government bonds, averaged over a 40 day period. It determines a nominal RFR of 2.76 per cent as at 30 June 2018, and 1.53 per cent as at 30 June 2019.[71]

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65 ERA (Sep 2018), Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base; para.208, p.37.

66 ERA (Aug 2019), 2018 and 2019 weighted average cost of capital for the Freight and Urban Networks, and the Pilbara Railways, para.253, p.52.

67 ERA (Sep 2018), Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base; para.233, p.40.

68 ERA (Dec 2018), Final rate of return guidelines, para.112 & 118, pp.20-21.

69 ERA (Sep 2018), Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base; para.72, p.14.

70 ERA (Jun 2016), Final decision on proposed revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 - 2020, para.238, pp.49-50; ERA (Nov 2019), Final decision on proposed revisions to the Mid-West and South-West Gas Distribution Systems access arrangement for 2020 to 2024, table 127, p.295; ERA (Dec 2019), Final decision on proposed revisions to the Goldfields Gas Pipeline Access Arrangement for 2020 to 2024, table 68, p.154.

71 ERA (Aug 2019), 2018 and 2019 weighted average cost of capital for the Freight and Urban Networks, and the Pilbara Railways, para.87 & 97, pp.21-22.

A.2.2.4. Views on Dividend Growth Model

As set out above, 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.

A.2.3. Determined Values

Table A.3 below sets out ERA's estimated values for the MRP of between 5.9 per cent and 7.4 per cent and RFR based on short-run market data.

Table A.3: ERA's range for the MRP (nominal)

Sector	Electricity	Gas			Rail
		DBP	GGT	Gas DSO	
Regulatory period	2017/18-2021/2022	2016-2020	2020-2024	2020-2024	2018-2019
TMR	8.57%	9.2%	6.72%	6.82%	7.43%
RFR	2.37%	1.8%	0.72%	0.82%	1.53%
MRP	6.2%	7.4%	6%	6%	5.9%

Source: ERA (Sep 2018), Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base, para.311, p.51; ERA (Jun 2016), Final decision on proposed revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 - 2020, table 18, p.189; ERA (Dec 2019), Final decision on proposed revisions to the Goldfields Gas Pipeline Access Arrangement for 2020 to 2024, table 68, p.154; ERA (Nov 2019), Final decision on proposed revisions to the Mid-West and South-West Gas Distribution Systems access arrangement for 2020 to 2024, table 127, p.295. ERA (Aug 2019), 2018 and 2019 weighted average cost of capital for the Freight and Urban Networks, and the Pilbara Railways, table 18, p.83.
Note: TMR calculated as MRP + RFR. For rail regulation, we present the determined values for 2019.

We convert ERA's nominal TMR and RFR determinations into real CPI terms using its inflation forecasts for each decision, and the Fisher equation. Table A.4 sets out the MRP parameters in real CPI terms.

Table A.4: ERA's range for the MRP (real CPI)

Sector	Electricity	Gas			Rail
		DBP	GGT	Gas DSO	
Regulatory period	2017/18-2021/2022	2016-2020	2020-2024	2020-2024	2018-2019
TMR	6.6%	7.7%	5.4%	5%	5.9%
RFR	0.5%	0.4%	-0.6%	-0.9%	0.1%
MRP	6.1%	7.3%	5.9%	5.9%	5.8%

Note: TMR calculated as MRP+RFR. To convert nominal values into real CPI values, we use ERA's inflation assumptions for each decision. The ERA assumes the following inflation adjustments: 1.84 per cent for electricity regulation, 1.43 per cent for the DBP regulation, 1.28 per cent for the GGP regulation, 1.71 per cent for the Gas DSO regulation, and 1.46 per cent for rail regulation. Sources: ERA (Sep 2018), Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base, para.551, p.53; ERA (Jun 2016), Final decision on proposed revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 - 2020, para.171, p.35; ERA (Dec 2019), Final decision on proposed revisions to the Goldfields Gas Pipeline Access Arrangement for 2020 to 2024, para.633, p.150; ERA (Nov 2019), Final decision on proposed revisions to the Mid-West and South-West Gas

Distribution Systems access arrangement for 2020 to 2024, para.1438, p.289. ERA (Aug 2019), 2018 and 2019 weighted average cost of capital for the Freight and Urban Networks, and the Pilbara Railways, para.384, p.80.

A.3. IPART's approach to TMR/MRP estimation

This case study sets out the approach of the Independent Pricing and Regulatory Tribunal (IPART) to estimating the TMR/MRP at its latest regulatory draft decision for Sydney Water in New South Wales.

A.3.1. Background and Objectives of the Regime

IPART independently regulates prices for water, public transport, local government, and is also the licence administrator of water, electricity and gas in New South Wales. In this memo, we cover the regulatory draft decision for Sydney Water, as it is the latest published regulatory decision covering WACC. Sydney Water is Australia's largest water and wastewater service provider. It is a statutory State Owned Corporation that is wholly owned by the Government of New South Wales.

The Independent Pricing and Regulatory Tribunal Act 1992 sets out IPART's primary functions and governs how it carries out those functions. Specifically, section 15 determines that IPART must have regard to a range of factors, including:[72]

- The cost of providing the services concerned;
- The protection of consumers from abuses of monopoly power;
- The appropriate rate of return on public sector assets, including appropriate payment of dividends to the Government for the benefit of the people of New South Wales;
- The need for greater efficiency in the supply of services so as to reduce the costs for the benefit of consumers and taxpayers; and
- The impact on pricing policies of borrowing, capital and dividend requirements of the government agency concerned and, in particular, the impact of any need to renew or increase relevant assets.

IPART published its latest draft decisions on water regulation for Sydney Water and WaterNSW in March 2020. In this case study, we only cover Sydney Water's draft decision as the determined cost of capital parameters as well as its methodology is the same for WaterNSW's draft decision, drawing on its 2018 review of WACC methodology.[73]

A.3.2. Estimation of MRP and RFR

A.3.2.1. IPART draws on a mix of the HER approach and DGM

IPART draws on the HER approach in estimating its allowed cost of equity, as shown below. 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.[74] This is a central argument in favour of the Wright approach.

[72] Independent Pricing and Regulatory Tribunal Act 1992 Section 15.

[73] IPART (March 2020), Review of prices for Sydney Water - Appendices, p.11; IPART (March 2020), Review of prices for Water NSW Greater Sydney, p.94.

[74] IPART (Oct 2018), Review of our WACC method, p.51.

A.3.2.2. IPART's approach to estimating the MRP

When calculating the cost of capital, IPART calculates both a "historic" and a "current" cost of capital, and therefore estimates both a historic and a forward looking MRP, the methodologies for which are set out below.

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. In establishing whether the market is in a normal state, IPART relies on its uncertainty index, based on analyzing data of stock market volatility, dispersion of analyst forecasts, credit spreads and swap spreads. IPART then applies its decision rule, i.e. whether the current uncertainty index is above or below one standard deviation of its historical average, to decide whether markets are in a normal state or not.[75]

For its latest draft decision on Sydney Water, IPART determines a MRP of 6 per cent based on the historical approach and 8.8 per cent based on the forward-looking approach.[76]

Historical approach

For its historical approach, IPART draws on long run historical excess returns. It determines a historical MRP of 6 per cent.[77]

Forward-looking approach

For its forward-looking estimate of the MRP, which IPART labels as "current MRP", it relies on the following six methods:[78]

- Damodaran 2013 method
- Bank of England 2002 method
- Bank of England 2010 method
- Bloomberg method
- SFG (Frontier Economics) analysts forecast method
- SFG (Frontier Economics) market indicator method

The first four methods are all versions of the DDM, as they infer a forward-looking market average return on equity based on expected dividends. The analysts forecast method uses forecasts of stock market analysists for individual stocks and the DDM. The market indicator method measures an indirect estimate of the MRP drawing on economic indicators.

IPART notes that DDM models rely on assumptions about its inputs and growth rates but argues that factors that affect the MRP estimate tend to affect all of above estimation methods in a similar way.

[75] IPART (Oct 2018), Review of our WACC method, p.68.

[76] IPART (March 2020), Review of prices for Sydney Water - Appendices, table H.1, p.63.

[77] IPART (Oct 2018), Review of our WACC method, p.51.

[78] IPART (Oct 2018), Review of our WACC method, p.52 & p.55.

Hence, it considers that it can observe trends in changes to the forward-looking MRP estimate by taking the average or median of the resulting estimates.[79]

In its latest WACC review, IPART decided to draw on the median estimate of its six methods as outlined above, giving one-third weight to the market indicator MRP and two-thirds weight to the median DDM MRP, to establish its point estimate of the current MRP.[80]

A.3.2.3. Estimation of RFR

Consistent with its MRP approach, IPART estimates a historic as well as current RFR, drawing on Australian Government bond yields with a maturity of 10 years.[81]

In its latest draft decision for Sydney Water, it determines a nominal current RFR of 1.2 per cent and a nominal historic RFR of 3.1 per cent.[82]

For the historic RFR estimate, IPART averages over 10 annual observations. It estimates each annual observation as an average across a 40-day observation window, of which it will inform the regulated entity on a confidential basis in advance.[83]

For the current RFR estimate, IPART averages daily bond yields over a 40-day observation window. It informs the regulated entity about the exact timing of the observation window on a confidential basis.[84]

A.3.2.4. Views on Dividend Growth Model

As discussed previously, four of the 6 methods used to estimate the "current" MRP (which forms half the applied MRP during "normal" market conditions), are variants of the DDM/DGM.

A.3.3. Determined Values

Table A.5 below sets out IPART's estimated values of the MRP of between 6 and 8.8 per cent in its draft decision for Sydney Water, and RFR based on short-term average.

Table A.5: IPART's estimated MRP range for Sydney Water (nominal)

Sector	**Water & Wastewater**	
Regulatory period (latest)	2020-2024	
	Current market data	Long term averages
TMR	10%	9.1%
RFR	1.2%	3.1%
MRP	8.8%	6%

Source: IPART (March 2020), Review of prices for Sydney Water - Appendices, table H.1, p.63.
Note: TMR calculated as MRP + RFR.

79 IPART (Oct 2018), Review of our WACC method, p.52.

80 IPART (Oct 2018), Review of our WACC method, p.59.

81 IPART (Oct 2018), Review of our WACC method, p.25.

82 IPART (March 2020), Review of prices for Sydney Water - Appendices, table H.1, p.63.

83 IPART (Oct 2018), Review of our WACC method, p.36.

84 IPART (Oct 2018), Review of our WACC method, p.37.

We convert IPART's nominal TMR and RFR draft decisions into real CPI terms using the its inflation forecast of 2.3 per cent, and the Fisher equation. Table A.6 sets out the MRP parameters in real CPI terms.

Table A.6: IPART's estimated MRP range for Sydney Water (real CPI)

Sector	**Water & Wastewater**	
Regulatory period	2020-2024	
	Current market data	Long term averages
TMR	7.7%	6.8%
RFR	-1.1%	0.8%
MRP	8.8%	6%

Note: TMR calculated as MRP+RFR. To convert nominal values into real CPI values, we use IPART's inflation forecast of 2.3 per cent applied to Sydney Water's rate of return. Source: IPART (March 2020), Review of prices for Sydney Water - Appendices, table H.1, p.63.

A.4. QCA's approach to TMR/MRP estimation

This case study sets out the approach of the Queensland Competition Authority (QCA) to estimating the TMR/MRP at its latest regulatory decisions for Rail, DBCT as well as Water.

A.4.1. Background and Objectives of the Regime

The QCA is Queensland's independent economic regulator, established by the Queensland Competition Authority Act (1997).[85] The QCA either monitors or approves prices of firms in certain monopoly businesses including in the rail, port infrastructure, and water sectors under the QCA Act.

Rail and DBCT

The QCA regulates third-party access to essential rail and port infrastructure to support competition, including that operated by Aurizon Network, Queensland Rail and Dalrymple Bay Coal Terminal Management.[86] The QCA assesses and either approves or refuses to approve access undertakings submitted by service providers with regards to criteria set out in section 138(2) of the QCA Act.[87] In assessing an undertaking, the QCA must ensure that the undertaking takes into account:[88]

- the object of Part 5 of the Act:[89]

  to promote the economically efficient operation of, use of and investment in, significant infrastructure by which services are provided, with the effect of promoting effective competition in upstream and downstream markets

- the legitimate business interests of the owner or operator of the service;
- if the owner and operator of the service are different entities—the legitimate business interests of the operator of the service are protected;
- the public interest, including the public interest in having competition in markets (whether or not in Australia);
- the interests of persons who may seek access to the service, including whether adequate provision has been made for compensation if the rights of users of the service are adversely affected;
- the effect of excluding existing assets for pricing purposes;
- the pricing principles mentioned in section 168A of the Act;
- any other issues the authority considers relevant.

The most recent access undertaking the QCA has assessed is the *Queensland Rail 2020 draft access undertaking* and the QCA estimated MRP and RFR separately.[90] The same framework is also used to regulate Aurizon Networks and DBCT.

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85 https://www.qca.org.au/our-role/ accessed 06/04/20

86 https://www.qca.org.au/project/our-role-rail/ accessed 06/04/20

87 QCA (2020), *Queensland Rail 2020 Draft Access Undertaking – Decision*, February 2020, pg.1

88 Section 138(2) of the Queensland Competition Authority Act (1997)

89 Section 69E of the Queensland Competition Authority Act (1997)

90 QCA (2020), *Queensland Rail 2020 draft access undertaking*, February 2020

Water

The QCA is the economic regulator for water and sewerage services in Queensland.[91] Under Sections 23A and 24 of the QCA Act, the QCA monitors prices of a number of service providers, to constrain the exercising of market power.[92] In monitoring prices, the QCA must consider specific matters as set out in section 24 of the QCA Act:[93]

- prices that allow recovery of the prudent and efficient costs incurred in providing bulk water supply services
- an appropriate weighted average cost of capital (WACC)
- roll-forward of the regulated asset base (RAB), using the QCA's previously adopted methodology
- the revenue carryover calculation, using the QCA's previously adopted methodology prudency and efficiency of capital and operating costs, based on a sample of costs that are material to price changes.

Additionally, the QCA must take into account factors in section 26 of the QCA Act:[94]

- economic or efficiency factors, including the cost of providing the goods or services in an efficient way, the need for efficient resource allocation, and the protection of consumers from abuses of monopoly power
- non-economic factors, including social welfare and equity considerations, economic and regional development issues, demand management, the availability of goods and services to consumers and the social and environmental impacts of pricing practices

The most recent price monitoring report the QCA has published is the *Gladstone Area Water Board price monitoring 2020-2025* and the QCA estimated MRP and RFR separately.[95]

A.4.2. Estimation of MRP and RFR

A.4.2.1. QCA has used a mixture of HER, Wright and DGM Approaches

The Wright approach is based on the assumption that there is an inverse relationship between the market risk premium and the risk free rate. The QCA 2014 *Cost of Capital: Market Parameters* final decision outlines QCA's methodology on calculation of WACC.[96] On the relationship between the RFR and MRP, the QCA states that the "evidence supports more weight being attributed to the Ibbotson and Siegel estimates than to the Wright estimates", but also will still regard the Wright estimates in informing the view on MRP.[97] In addition, as outlined below, weight is placed on a

[91] https://www.qca.org.au/project/our-role-water/ accessed 06/04/20

[92] QCA (2020), *Gladstone Area Water Board price monitoring 2020-2025 Part A: Overview – Draft report,* February 2020, page 5

[93] QCA (2020), *Gladstone Area Water Board price monitoring 2020-2025 Part A: Overview – Draft report,* February 2020, page 5-6

[94] QCA (2020), *Gladstone Area Water Board price monitoring 2020-2025 Part A: Overview – Draft report,* February 2020, page 6

[95] QCA (2020), *Gladstone Area Water Board price monitoring 2020-2025 Part A: Overview – Draft report,* February 2020

[96] QCA (2014), *Cost of Capital: Market Parameters – Final Decision,* August 2014

[97] QCA (2014), *Cost of Capital: Market Parameters – Final Decision,* August 2014, pg.80

DGM model, which is methodologically similar to the Wright approach, but relies on forward-looking evidence.

Rail

The QCA uses both the Ibbotson and Wright approach in calculating MRP and does acknowledge that the Wright approach assumes a negative relationship between MRP and the RFR, while the Ibbotson approach assumes MRP is constant over time.[98] The QCA concludes that even with the conflicting assumptions, weight can be applied to both of these estimates because neither approach likely perfectly estimates MRP.[99]

In its 2020 decision on *Queensland Rail 2020 draft access undertaking* the QCA uses an MRP of 6.5 per cent, this is based on a weighted average of a number of estimates.[100]

Water

In the *Gladstone Area Water Board price monitoring 2020-2025* report, the QCA uses an MRP of 6.5 per cent.[101] QCA uses the same weights as for the QR decision and the 2017 Aurizon Network access undertaking. But relative to previous decisions (e.g. the 2015 DBCT draft access undertaking)[102,103] the QCA used an increased weight for the Wright approach. However, the QCA did not think there was enough evidence in the relationship between the RFR and MRP to increase the weight any further, proposed by GAWB.[104]

In the 2017 Aurizon Network access undertaking, Aurizon argued that the Wright and Ibbotson methods should be given equal weight as they sit at opposing ends of the theoretical spectrum.[105] The QCA stated that it had revised its opinion on the Wright method given more recent analysis that suggested evidence may not be decisive on the stability of MRP, and gave a higher weight to the Wright method than previously, but still not equal to the weight given to the Ibbotson method.[106]

A.4.2.2. QCA's approach to estimating the MRP

In the 2014 *Cost of Capital: Market Parameters* final decision, the QCA states in the calculation of MRP, the QCA will "will consider a range of evidence and will apply judgement in arriving at an estimate of the market risk premium" which results in an MRP of 6.5 per cent.[107] This differs to previously where: "QCA has tended to estimate the market risk premium based on taking an equally weighted average from a range of estimation techniques and rounded to the nearest whole number".[108]

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98 QCA (2020), *Queensland Rail 2020 draft access undertaking,* February 2020, pg.46

99 QCA (2020), *Queensland Rail 2020 draft access undertaking,* February 2020, pg.46

100 QCA (2020), *Queensland Rail 2020 draft access undertaking,* February 2020

101 QCA (2020), *Gladstone Area Water Board price monitoring 2020-2025 Part A: Overview – Draft report,* February 2020, page 77

102 QCA (2016), *DBCT Management's 2015 Draft Access Undertaking, final decision*, November 2016, pg.78

103 QCA (2016), *Aurizon Network's 2017 DAU, final decision, Appendix F*, December 2018, pg.69

104 QCA (2020), *Gladstone Area Water Board price monitoring 2020-2025 Part A: Overview – Draft report,* February 2020, page 75

105 QCA (2016), *Aurizon Network's 2017 DAU, final decision, Appendix F*, December 2018, pg.68

106 QCA (2016), *Aurizon Network's 2017 DAU, final decision, Appendix F*, December 2018, pg.69

107 QCA (2014), *Cost of Capital: Market Parameters – Final Decision,* August 2014, pg.23

108 QCA (2014), *Cost of Capital: Market Parameters – Final Decision,* August 2014, pg.iv

The range of evidence the QCA considers in *Cost of Capital: Market Parameters*, includes historic return estimates averaged using the Ibbotson historical averaging method and the Siegal historic averaging method, survey evidence, and a Cornell dividend growth model.[109] The 'mechanical' average giving each estimate equal weight gives an MRP of 6.3 per cent, but the QCA ultimately decided to use a 6.5 per cent MRP.[110]

Rail

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: [111]

> *A statistically defensible set of weights is: Ibbotson (25%); Cornell DGM (25%); Siegel (15%); Wright (15%); and surveys (20%). This set of weights places relatively more emphasis on the two methods that are entirely independent of each other (the Ibbotson and Cornell DGM methods). Doing so maximises the use of the information available (and reduces the mean square error of the estimate).*

The range of calculated MRPs using these methods was 4.7-10.3 per cent and the simple average is 6.8 per cent.[112]

Water

In *Gladstone Area Water Board price monitoring 2020-2025*, the QCA uses an MRP of 6.5 per cent, based on a weighted average of different estimates and rounding to the nearest 0.5 per cent.[113] The weightings used are the same as those used in the *Queensland Rail 2020 draft access undertaking* (see above).[114]

The QCA disagreed with the methodology used by GAWB which followed the methodology used in the *Queensland Rail 2020 draft access undertaking* but applied more weight to the Wright approach estimate and less to the dividend growth model estimate. The GAWB methodology resulted in an MRP of 7 per cent.[115] The QCA rather used weightings that it had in recent regulatory decisions, including the *Queensland Rail 2020 draft access undertaking* but stated that did not think there was enough evidence in the relationship between the RFR and MRP to increase the weight on the Wright approach any further.[116]

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109 QCA (2014), *Cost of Capital: Market Parameters – Final Decision,* August 2014, pg.21

110 QCA (2014), *Cost of Capital: Market Parameters – Final Decision,* August 2014 pg.23

111 QCA (2019), *Queensland Rail's 2020 draft access undertaking – draft decision,* April 2019, pg.39

112 QCA (2020), *Queensland Rail 2020 draft access undertaking,* February 2020, pg.48

113 QCA (2020), *Gladstone Area Water Board price monitoring 2020-2025 Part A: Overview – Draft report,* February 2020, page 77

114 QCA (2020), *Gladstone Area Water Board price monitoring 2020-2025 Part A: Overview – Draft report,* February 2020, page 76

115 QCA (2020), *Gladstone Area Water Board price monitoring 2020-2025 Part A: Overview – Draft report,* February 2020, page 73

116 QCA (2020), *Gladstone Area Water Board price monitoring 2020-2025 Part A: Overview – Draft report,* February 2020, page 75

A.4.2.3. Role of Dividend Growth Model (DGM)

In the 2014 *Cost of Capital: Market Parameters* final decision, the QCA uses a three-stage[117] Cornell dividend growth model as one of the estimates used to inform the final MRP decision but does note that DGMs should be used with caution due to sensitivities of the results to the assumptions and inputs.[118]

In its decision on Queensland Rail's draft access undertaking, the QCA uses a Cornell DGM as one piece of evidence to calculate the weighted average used for the final MRP.[119] The DGM is given a 25 per cent weighting.[120] The QCA also uses the same weighting in *Gladstone Area Water Board price monitoring 2020-2025.*[121]

A.4.2.4. Estimation of RFR

In the 2014 *Cost of Capital: Market Parameters* final decision, the QCA confirms its guidance of using an RFR calculated using 10-year Commonwealth Government Securities and a 20-day averaging period.[122] This approach has also been adopted in subsequent sections and is set out in Table B.2.

A.4.3. Determined Values

Table A.7 below sets out the QCA calculations for RFR and MRP for the rail and water sectors.

Table A.7: QCA calculations for the MRP

Sector	Cost of Capital: Market Parameters	Rail	Water
Regulatory period	-	2020-2025	2020-2025
Inflation		2.38%	2%
TMR	-	7.68%	7.44%
RFR	-	1.18%	0.94%
MRP	6.5%	6.5%	6.5%

Source: QCA (2014), Cost of Capital: Market Parameters – Final Decision, August 2014, pg.23
QCA (2020), Queensland Rail 2020 draft access undertaking, February 2020, pg.48
QCA (2020), Gladstone Area Water Board price monitoring 2020-2025 Part A: Overview – Draft report, February 2020, page 77
Note: TMR calculated as MRP + RFR.

[117] QCA (Dec 2018), Aurizon Network's 2017 draft access undertaking, p.65

[118] QCA (2014), *Cost of Capital: Market Parameters – Final Decision,* August 2014, pg.67&72

[119] QCA (2020), *Queensland Rail 2020 Draft Access Undertaking – Decision*, February 2020, pg.48

[120] QCA (2019), *Queensland Rail's 2020 draft access undertaking – draft decision,* April 2019, pg.39

[121] QCA (2020), *Gladstone Area Water Board price monitoring 2020-2025 Part A: Overview – Draft report,* February 2020, page 76

[122] QCA (2014), *Cost of Capital: Market Parameters – Final Decision,* August 2014, pg.12

A.5. ESCOSA's approach to TMR/MRP estimation

This case study sets out the approach of the Essential Services Commission of South Australia (ESCOSA) to estimating the TMR/MRP at its latest regulatory draft decision.

A.5.1. Background and Objectives of the Regime

The ESCOSA is South Australia's independent economic regulator, established by the Essential Services Commission Act (2002).[123] Under the Essential Services Commission Act (2002) the objective of the ESCOSA is the "protection of the long term interests of South Australian consumers with respect to the price, quality and reliability of essential services".[124]

Under the Water Industry Act (2012), ESCOSA is the economic regulator for water and sewerage services in South Australia, as part of this, ESCOSA sets maximum prices and minimum service standards for SA Water which is the monopoly provider of these services.[125] ESCOSA's overall objective in this regulation is to "encourage economically efficient behaviour that is in consumers' long-term interests."[126]

The ESCOSA released its draft determination on water in 2020 for the regulatory period 2020-2024 and calculated RFR and MRP separately.[127]

A.5.2. Estimation of MRP and RFR

A.5.2.1. ESCOSA has not used the Wright Approach

In the *SA Water Regularly Determination 2020*¸ ESCOSA used an MRP of 6 per cent, which is the same as what SA Water proposed, what ESCOSA used in the guidance papers to the determination, and the two previous regulatory determinations.[128]

There is debate around the relationship between MRP and RFR, ESCOSA states that while there is some evidence on an inverse relationship, the magnitude and timing is ambiguous.[129] ESCOSA also notes that the view among many Australian regulators is that it is hard to improve on using historic excess returns when estimating MRP.[130]

123 https://www.escosa.sa.gov.au/about-us/about-us accessed 06/04/20

124 https://www.escosa.sa.gov.au/about-us/about-us accessed 06/04/20

125 https://www.escosa.sa.gov.au/industry/water/overview accessed 06/04/20

126 ESCOSA (2020) *SA Water Regulatory Determination 2020: Draft Determination Statement of Reasons,* March 2020, pg.9

127 ESCOSA (2020) *SA Water Regulatory Determination 2020: Draft Determination Statement of Reasons,* March 2020.

128 ESCOSA (2020) *SA Water Regulatory Determination 2020: Draft Determination Statement of Reasons,* March 2020, pg.142

129 ESCOSA (2020) *SA Water Regulatory Determination 2020: Draft Determination Statement of Reasons,* March 2020, pg.156

130 ESCOSA (2020) *SA Water Regulatory Determination 2020: Draft Determination Statement of Reasons,* March 2020, pg.156

A.5.2.2. ESCOSA's approach to estimating the MRP

In deciding on a 6 per cent MRP, ESCOSA is in line with the SA water proposal and guidance papers and previous regulatory periods.[131] The 6 per cent figure is based on long-run historic estimates of excess returns and is within the range between the arithmetic and geometric averages of the longest time series considered (being 1833 – 2017).[132]

As a cross check for the value of MRP, ESCOSA also considers surveys of investor expectations and market-implied estimates and found that these estimates were generally in line with the 6 per cent MRP figure.[133]

A.5.2.3. Role of Dividend Growth Models (DGM)

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.[134] As a result, ESCOSA view long run historical excess returns as the best estimate of the MRP.

A.5.2.4. Estimation of RFR

In the *SA Water Regularly Determination 2020* the ESCOSA uses an annually updated RFR, based on 10-year Commonwealth Government Securities and using a 60-day averaging period.[135]

In relation to calculating the RFR, ESCOSA adopted the 60-day averaging proposed by SA water proposal, as compared to the 20-day averaging period that has been used in the last two regulatory periods.[136] Guidance Paper 7 to the 2020 Water Regulatory Determination, discusses the averaging period used for the calculation of the RFR and supports a 20-day averaging period, but also concludes that there is not likely to be a significant difference in forecast accuracy between a 20-day and 60-day averaging period.[137]

A.5.3. Determined Values

Table A.8 below sets out ESCOSA's calculation for MRP, including its nominal values for the RFR and TMR.

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131 ESCOSA (2020) *SA Water Regulatory Determination 2020: Draft Determination Statement of Reasons,* March 2020, pg.155-156

132 ESCOSA (2020) *SA Water Regulatory Determination 2020: Draft Determination Statement of Reasons,* March 2020, pg.324

133 ESCOSA (2020) *SA Water Regulatory Determination 2020: Draft Determination Statement of Reasons,* March 2020, pg.326

134 ESCOSA (2020) *SA Water Regulatory Determination 2020: Draft Determination Statement of Reasons,* March 2020, pg.326

135 ESCOSA (2020) *SA Water Regulatory Determination 202: Draft Determination Statement of Reasons,* March 2020, pg.142

136 ESCOSA (2020) *SA Water Regulatory Determination 202: Draft Determination Statement of Reasons,* March 2020, pg.142

137 ESCOSA (2019), *SA Water Regulatory Determination 2020: Draft Determination Statement of Reasons: Guidance paper 7 (technical paper) - The averaging period of the risk free rate*, June 2019.

Table A.8: ESCOSA calculations for the MRP (nominal)

Sector	Water
Regulatory period	2020-2024
TMR	7.16%
RFR	1.16%
MRP	6.00%

Source: ESCOSA (2020) SA Water Regulatory Determination 202: Draft Determination Statement of Reasons, March 2020, pg.142
Note: TMR calculated as MRP + RFR.

We convert ESCOSA's nominal TMR and RFR draft decisions into real CPI terms using the its inflation forecast of 2.33 per cent, and the Fisher equation. Table B.4 sets out the MRP parameters in real CPI terms.

Table A.9: ESCOSA calculations for the MRP (real)

Sector	Water
Regulatory period	2020-2024
TMR	4.86%
RFR	-1.14%
MRP	6.00%

Source: ESCOSA (2020) SA Water Regulatory Determination 202: Draft Determination Statement of Reasons, March 2020, pg.142

Note: TMR calculated as MRP + RFR.

A.6. ICRC's approach to TMR/MRP estimation

This case study sets out the approach of the Independent Competition and Regulatory Commission (ICRC) to estimating the TMR/MRP at its latest regulatory decision for water companies.

A.6.1. Background and Objectives of the Regime

The Independent Competition and Regulatory Commission (ICRC) is ACT's independent economic regulator. The ICRC's objectives to "regulate prices, access to infrastructure services and other matters in relation to regulated industries and to investigate competitive neutrality complaints and government-regulated activities"[138] are governed by the ICRC Act (1997) and the Utilities Act (2000).[139]

Under the ICRC Act the ICRC regulates what prices Icon Water can charge and what revenue they can earn for water and sewerage services. Section 19L of the ICRC Act sets out ICRC's objective in making a price direction: [140]

> *The objective of the commission, when making a price direction in a regulated industry, is to promote the efficient investment in, and efficient operation and use of regulated services for the long term interests of consumers in relation to the price, quality, safety, reliability and security of the service.*

Section 20(2) of the ICRC Act sets out a number of objectives the ICRC must take into account when making a price direction.[141] In making a pricing direction, the ICRC has set out pricing principles based on objectives in the ICRC Act, as well as general economic and regulatory principles.[142] These principles include the overarching objective from Section 19L of the ICRC Act, as well as more specific pricing principles:[143]

- Economic efficiency in use
- Economic efficiency for investment and operation
- Environmental considerations
- Community impact – gradual adjustment (i.e., any substantial pricing changes to be phased in over time)
- Community impact – fair outcomes for low-income households
- Regulatory governance – simplicity
- Regulatory governance – transparency

The ICRC released its final price direction on the 2018-2023 regulatory period in 2018 and estimated RFR and MRP separately.[144]

138 https://www.icrc.act.gov.au/about-us, accessed 02/04/20

139 ICRC (2019), *Statement of Intent 2019-2020*, 11 June 2019, pg.3

140 ICRC (2019), *Statement of Intent 2019-2020*, 11 June 2019, pg.2

141 ICRC (2019), *Statement of Intent 2019-2020*, 11 June 2019, pg.2

142 ICRC (2019), *Statement of Intent 2019-2020*, 11 June 2019, pg.2

143 ICRC (2019), *Statement of Intent 2019-2020*, 11 June 2019, pg.5

144 ICRC (2019), *Statement of Intent 2019-2020*, 11 June 2019, pg.4

A.6.2. Estimation of MRP and RFR

A.6.2.1. The ICRC does not use the Wright approach

The Wright approach is based on the assumption that there is an inverse relationship between the market risk premium and the risk free rate. 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.[145] 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.[146,147]

A.6.2.2. ICRC's approach to estimating the MRP

For the regulatory period of 2018-2022 the ICRC decided on an MRP of 6.5 per cent, adopting the MRP used in the AER's 2013 *Rate of Return Guidelines*,[148] and the most recent decision by the AER (at the time), being the draft decision for the Victorian gas transmission system (VTS).[149,150] In this decision, AER calculates MRP based on various sources including historical returns, dividend growth models, survey evidence, etc., placing the most weight on historical returns.[151] The ICRC noted 6.5 per cent was consistent with the QCA's most recent decision[152] and that it also placed weight on the QCA's approach. The AER constructs a range based on the different methodologies and then determined a point estimate by exercising its judgment and placing the most weight on historical estimates of excess returns. In other words, the AER did not perform mechanistic average of a number of estimates, rather it considered a range of evidence and then exercised judgment to determine the final point estimate.

A.6.2.3. Role of Dividend Growth Models (DGM)

In the 2017 AER decision that the ICRC is following, multi-stage dividend growth models are used as the piece of evidence "given second most reliance" after historical excess returns in informing the view on the MRP.[153] 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".

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145 ICRC (2018), *Final Report: Regulated Water and Sewerage Services Prices 2018-2023*, May 2018, pg.105

146 AER (2013), *Better Regulation Explanatory Statement - Rate of Return Guideline (Appendices)*, December 2013, pg. 26 & 107.

147 ICRC (2018), *Final Report: Regulated Water and Sewerage Services Prices 2018-2023*, May 2018, pg.106

148 AER (2013), *Better Regulation Explanatory Statement - Rate of Return Guideline*, December 2013, pg. 11

149 AER (2017), *Draft decision, APA VTS Australia Gas access arrangement 2018–2022, Attachment 3 – Rate of Return*. July 2017. Pg.3-13

150 ICRC (2018), *Final Report: Regulated Water and Sewerage Services Prices 2018-2023*, May 2018, pg.115

151 ICRC (2018), *Final Report: Regulated Water and Sewerage Services Prices 2018-2023*, May 2018, pg.109

152 ICRC (2018), *Final Report: Regulated Water and Sewerage Services Prices 2018-2023*, May 2018, pg.115.

153 AER (2017), *Draft decision, APA VTS Australia Gas access arrangement 2018–2022, Attachment 3 – Rate of Return*. July 2017. Pg.3-88

A.6.2.4. Estimation of RFR

For the nominal risk-free rate the ICRC adopted the Water and Sewerage Industry Panel's[154] risk free rate of 2.79 per cent.[155,156] The Industry Panel standard approach uses a 10-year Commonwealth Government Securities and a 40-day averaging period. The Commission also noted the intention to further examine averaging periods for the risk-free rate during the regulatory period in the general WACC review.[157] This review does not appear to have occurred yet.

The ICRC noted that using a 10-year term to maturity may be a potential issue for a 5-year regulatory period, but concluded it is considered appropriate when financing conditions are stable.[158]

A.6.3. Determined Values

Table A.10 below sets out ICRCs estimated value for the MRP of 6.5 per cent and nominal RFR of 2.79 per cent.

Table A.10: ICRC estimate of MRP (nominal)

Sector	Water & Sewerage
Regulatory period	2018-2023
TMR	9.29%
RFR	2.79%
MRP	6.5%

Source: ICRC (2018), *Final Report: Regulated Water and Sewerage Services Prices 2018-2023,* May 2018.
Note: TMR calculated as MRP + RFR.

We convert ICRC's nominal TMR and RFR determinations into real CPI terms using its inflation forecast of 2.5 per cent, and the Fisher equation. Table A.11 sets out the MRP parameters in real CPI terms.

Table A.11: ICRC estimate of MRP (real)

Sector	Water & Sewerage
Regulatory period	2018-2023
Inflation	2.5%
TMR	6.78%
RFR	0.28%
MRP	6.5%

Source: ICRC (2018), *Final Report: Regulated Water and Sewerage Services Prices 2018-2023,* May 2018.
Note: TMR calculated as MRP + RFR.

154 The ACT Water and Sewerage Industry Panel was established under the Independent Competition and Regulatory Commission Act 1997 to review the ICRCs price direction for regulated water and sewerage services. See https://apps.treasury.act.gov.au/industrypanel/industry-panel-review-background accessed 05/04/20

155 Industry Panel (2015), *Review of the Independent Competition and Regulatory Commission's 2013 Price Direction for Regulated Water Services in the ACT*, April 2015

156 ICRC (2018), *Final Report: Regulated Water and Sewerage Services Prices 2018-2023,* May 2018, pg.93

157 ICRC (2018), *Final Report: Regulated Water and Sewerage Services Prices 2018-2023,* May 2018, pg.94

158 ICRC (2018), *Final Report: Regulated Water and Sewerage Services Prices 2018-2023,* May 2018, pg.92

A.7. OTTER's approach to TMR/MRP estimation

This case study sets out the approach of The Office of the Tasmanian Economic Regulator (OTTER) to estimating the MRP at its latest regulatory decision.

A.7.1. Background and Objectives of the Regime

OTTER is Tasmania's independent economic regulator established under the Economic Regulator Act (2009). OTTER oversees regulated businesses in Tasmania in the electricity, gas, water and sewerage, taxi and compulsory third party insurance industries.[159]

OTTER has regulated prices and service standards in the water and sewerage industry since 2012 under the Water and Sewerage Industry Act (2008).[160] In regulating prices, OTTER must take into account:[161]

- Health, safety and environmental obligations
- The promotion of efficient ling term investment in infrastructure
- The promotion of efficient pricing for regulated services
- The impact of the rate of change of prices for customers
- Maintenance of appropriate service standards for regulated services
- Avoidance of regulatory duplication

Under Section 68(1A) of the Water and Sewerage Industry Act (2008), WACC is calculated differently for assets transferred to the entities before 1 July 2011 (existing assets) and new assets.[162] For existing assets, a pre-tax rate return on equity of 3 per cent is used, and for new assets the rate of return must "incorporate a commercial risk based rate of return on both debt and equity."[163]

OTTER released its final price determination for water and sewerage for the 2018-2021 regulatory period in 2018 and estimated RFR and MRP separately.[164]

A.7.2. Estimation of MRP and RFR

A.7.2.1. OTTER has not used the Wright Approach

In the most recent price determination for the 2018-2021 regulatory period,[165] OTTER applies the MRP of 6.5 per cent, adopting the MRP proposed by TasWater in the *Draft Price and Service Plan 3.*[166] This 6.5 per cent MRP is ultimately derived from the AER's view on MRP in its 2013 *Rate of Return Guideline.*[167]

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159 https://www.economicregulator.tas.gov.au/about-us/about-the-regulator accessed 03/04/20

160 OTTER (2018), *2018 Water and Sewerage Price Determination Investigation Final Report*, May 2018, pg.25

161 Section 15 of the Water and Sewerage Industry Act (2008).

162 OTTER (2018), *2018 Water and Sewerage Price Determination Investigation Final Report*, May 2018, pg.161

163 OTTER (2018), *2018 Water and Sewerage Price Determination Investigation Final Report*, May 2018, pg.161

164 OTTER (2018), *2018 Water and Sewerage Price Determination Investigation Final Report*, May 2018

165 OTTER (2018), *2018 Water and Sewerage Price Determination Investigation Final Report*, May 2018, pg. 10

166 TasWater (2017), *Draft Price and Service Plan 3 – 1 July 2018 to 30 June 2021*, 2017, pg. 114

167 AER (2013), *Better Regulation Explanatory Statement - Rate of Return Guideline,* December 2013, pg. 11

A.7.2.2. OTTER's approach to estimating the MRP

TasWater's estimate of MRP in the *Draft Price and Service Plan* is based on recent AER decisions for TasNetworks and regulatory decisions for other regulated water services. More specifically, it is based on the draft decision for TasNetworks electricity distribution over the 2017/18-2018/19 regulatory period, which uses a 6.5 per cent MRP.[168]

A.7.2.3. Estimation of RFR

OTTER calculates an RFR of 2.88 per cent using a novel approach that calculates the average of 10 year Commonwealth Government bonds using a 40 trading day average and the time weighted historical average of yields on the same bonds over the last 10 years. OTTER describes its approach as follows:[169]

1. calculate the 40-trading day average of 10-year Commonwealth Government Securities (CGS);
2. calculate the daily average of the last nine, eight, seven, six, five, four, three, two, one year of yields on the 10-year CGS used in step 1;
3. calculate the average of the value in step 1 and the values in step 2; and
4. calculate the midpoint of the values calculated in steps 1 and 3.

A report by Frontier for TasWater summarizes this approach as follows:[170]

> *We understand that the application of steps 1 and 2 produces 10 different values –an average of the 40-day yield, and an average of yields for the past 9 years, and the past 8 years, and the past 7 years, and so on until the past 1 year. An average of these 10 observations is taken in step 3, and then step 4 calculates the midpoint between this average, and the average of the 40-day yield. This approach results in a time-weighted average of bond yields that places greater weight on rates for more recent periods than older rates.*

A.7.3. Determined Values

Table A.12 below sets out OTTER's estimated value for the MRP of 6.5 per cent and RFR of 6.88 per cent.

Table A.12: OTTER's estimate of MRP (nominal)

Sector	Water and Sewerage
Regulatory period	2018-2021
TMR	9.38%
RFR	2.88%
MRP	6.5%

Source: OTTER (2018), 2018 Water and Sewerage Price Determination Investigation Final Report, May 2018, pg. 10

168 AER (2016), *Draft Decision: TasNetworks distribution determination 2017-18 to 2018-19 - Overview*, September 2016, pg.22
This decision does not calculate MRP, but follows the MRP used in previous determinations which in turn do not calculate MRP but reference the AER Rate of Return Guidelines use of a 6.5% MRP

169 OTTER (2018), *2018 Water and Sewerage Price Determination Investigation Final Report*, May 2018, pg. 116

170 Frontier (2018), *A review of the method for calculating depreciation and WACC for PSP3*, February 2018, pg.12

Note: TMR calculated as MRP + RFR.

We convert OTTER's nominal TMR and RFR determinations into real CPI terms using its inflation forecast of 2.25 per cent, and the Fisher equation. Table A.13 sets out the MRP parameters in real CPI terms.

Table A.13: OTTER's estimate of MRP (real)

Sector	Water and Sewerage
Regulatory period	2018-2021
TMR	7.12%
RFR	0.62%
MRP	6.5%

Source: OTTER (2018), *2018 Water and Sewerage Price Determination Investigation Final Report*, May 2018, pg. 10
Note: TMR calculated as MRP + RFR.

A.8. ACCC's approach to TMR/MRP estimation

This case study sets out the approach of the Australian Competition and Consumer Commission (ACCC) to estimating the MRP at its latest regulatory decision for regulated energy and railway companies in Western Australia.

A.8.1. Background and Objectives of the Regime

ACCC is the statutory authority which enforces the Competition and Consumer Act (2010) as well as other legislation, with the objectives of "promoting competition, fair trading and regulating national infrastructure for the benefit of all Australians".[171] The ACCC is the national economic regulator for Telecommunications and Post and is also the decision making body under the Part IIIA national access regime. The latter means it has certain responsibilities in relation to Ports and Rail where there is no a state based access regime.

Telecommunications

The Telecommunications sector is regulated under Part X1C of the Competition and Consumer Act (2010), under which the ACCC can make an access determination for any declared service that specifies terms and conditions of access and must include "terms and conditions relating to price or a method of ascertaining price".[172] When making an access determination, the ACCC must take into account:[173]

- If the determination will promote long-term interests of end-users
- Business interests of service providers
- The interests of users of the declared service
- The direct costs of providing access to the declared service
- The value of extensions or enhancement of service, where the cost is borne elsewhere
- Safety and reliability of operations
- Economic efficiency of operation of the service

The ACCC released its *Public inquiry into final access determinations for fixed line services* in 2015 for the 2015-2019 regulatory period and estimated RFR and MRP separately.[174]

Post

Under Part VIIA of the Competition and Consumer Act (2010), the ACCC assesses price notifications for a number of postal services for which "in the view of the minister, competitive pressures are not sufficient to achieve efficient prices and protect consumers".[175]

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171 https://www.accc.gov.au/about-us/australian-competition-consumer-commission accessed 05/04/20

172 Section 152BC of the Competition and Consumer Act (2010) and ACCC (2015), *Public inquiry into final access determinations for fixed line services – final decision*, October 2015, pg.1

173 Section 152BCA of the Competition and Consumer Act (2010)

174 ACCC (2015), *Public inquiry into final access determinations for fixed line services – final decision*, October 2015

175 https://www.accc.gov.au/regulated-infrastructure/postal-services/accc-role-in-postal-services accessed 05/04/20

In assessing price notifications, the ACCC must determine whether prices reflect a cost base that is efficient and provide incentives for efficient investment.[176] As part of this the ACCC calculates WACC to assesses whether the estimated revenue generated is required to cover efficient costs of providing the postal services.[177]

The ACCC released its *ACCC view on Australia Post's draft price notification* in 2019 and estimated RFR and MRP separately.[178]

Rail

Under Part IIIA of the Competition and Consumer Act (2010), the ACCC assesses access undertakings in relation to rail infrastructure.[179] A service provider may submit an undertaking to the ACCC which outlines terms and conditions for access to third parties. The ACCC will accept the undertaking if it takes into account:[180]

- The objectives Part IIIA in section 44AA of the Act
  - to promote economically efficient operation of and investment in the infrastructure
  - and provide a framework to encourage consistent access regulation across the industry
- The pricing principles in section 44ZZCA of the Act
  - Regulated prices should generate sufficient revenue to meet efficient costs and an appropriate return on investment
  - Access price structures should be efficient and not allow vertically integrated providers to discriminate in favour of its own operations
  - Access pricing regimes that incentivise productivity and reduced costs
- The legitimate business interests of the service provider
- Public interest and interests of potential users of the service

The ACCC released its draft decision on *Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking* in 2017 and estimated RFR and MRP separately.[181]

Ports

Under Part IIIA of the Competition and Consumer Act (2010), a third party seeking access to a declared service may request the ACCC to arbitrate if negotiations with the service provider are not successful.[182] The ACCC must make a determination on third party access, taking into account: [183]

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176 ACCC (2019), *ACCC view on Australia Post's draft price notification*, November 2019. Pg.9

177 ACCC (2019), *ACCC view on Australia Post's draft price notification*, November 2019. Pg.29

178 ACCC (2019), *ACCC view on Australia Post's draft price notification*, November 2019

179 https://www.accc.gov.au/regulated-infrastructure/rail/accc-role-in-rail#rail-access-undertakings accessed 05/04/20

180 ACCC (2017), *Draft Decision, Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking,* 20 April 2017, pg.13

181 ACCC (2017), *Draft Decision, Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking,* 20 April 2017

182 ACCC (2018), *Final Determination: Statement of Reasons – Access dispute between Glencore Coal Assets Australia Pty Ltd and Port of Newcastle Operations Pty Ltd,* 18 September 2018, pg.14

183 ACCC (2018), *Final Determination: Statement of Reasons – Access dispute between Glencore Coal Assets Australia Pty Ltd and Port of Newcastle Operations Pty Ltd,* 18 September 2018, pg. 14-15

- the objectives of Part IIIA as set out in section 44AA of the Act (as mentioned in previous section)
- the legitimate business interests of the service provider
- public interest (including the public interest of having competition)
- interests of users and potential users
- direct costs of providing the service
- other factors as set out in section 44X(1) of the Act.
- pricing principles set out in section 44ZZCA of the Act

The ACCC released its final determination statement of reasons on *Access dispute between Glencore Coal Assets Australia Pty Ltd and Port of Newcastle Operations Pty Ltd* in 2018 and estimated RFR and MRP separately.[184]

A.8.2. Estimation of MRP and RFR

A.8.2.1. ACCC has not used the Wright Approach

Telecommunications

The Wright approach is based on the assumption that there is an inverse relationship between the market risk premium and the risk free rate. The ACCC does not appear to accept the relationship between the RFR and MRP, stating that there is no clear consensus on the relationship and citing evidence suggesting there is no direct correlation between RFR and MRP.[185]

Post

The ACCC does not mention the Wright model in *ACCC view on Australia Post's draft price notification.*

Rail

In its 2017 draft decision on *Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking*, the ACCC does not consider the Wright model in its estimate of MRP.[186]

Ports

In its 2018 final determination statement of reasons on *Access dispute between Glencore Coal Assets Australia Pty Ltd and Port of Newcastle Operations Pty Ltd*, the ACCC does not mention the Wright model.

A.8.2.2. The ACCC's approach to estimating the MRP

Telecommunications

[184] ACCC (2018), *Final Determination: Statement of Reasons – Access dispute between Glencore Coal Assets Australia Pty Ltd and Port of Newcastle Operations Pty Ltd*, 18 September 2018

[185] ACCC (2015), *Public inquiry into final access determinations for fixed line services – final decision*, October 2015, pg.69

[186] ACCC (2017), *Draft Decision, Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking*, 20 April 2017, pg.147

In the 2015 *Public inquiry into final access determinations for fixed line services*, the ACCC takes into account a range of evidence and submissions and decides on an MRP of 6%.[187]

In deciding to use an MRP of 6 per cent, the ACCC used historical excess returns, survey evidence, conditioning variables, previous decisions made by the Australian Competition Tribunal, AER, and the ACCC, etc.[188] The ACCC noted that a 6 per cent MRP was in line with the majority of evidence, including the AERs study on historic excess returns, survey evidence, the AERs study of three types of conditioning variables, and other various regulatory decisions.[189]

Post

In its 2019 *ACCC view on Australia Post's draft price notification*, the ACCC uses an MRP of 6.1 per cent.[190] In the price notification, Australia Post proposed an MRP of 7 per cent based on advice from a consultant report. The ACCC disagrees and states that "the majority of evidence in Australia, including evidence other than historical returns, is consistent with an MRP of 6.1 per cent."[191] The ACCC also notes that this is consistent with recent ACCC and AER decisions based on historic returns, surveys and stakeholder submissions.[192]

Rail

In its 2017 draft decision on *Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking*, the ACCC uses an MRP of 6 per cent, which is the MRP proposed by the Hunter Valley Access Task Force (HRATF).[193]

The HRATF notes that the ACCC had used a 6 per cent MRP in recent decisions in the telecommunications, post and water sectors.[194] The ACCC considered historical estimates, market surveys and previous regulatory decisions when considering the appropriateness of a 6 per cent MRP, and states that the most reliance was placed on historical estimates.[195]

Ports

In its 2018 final determination statement of reasons on *Access dispute between Glencore Coal Assets Australia Pty Ltd and Port of Newcastle Operations Pty Ltd*, the ACCC used an MRP of 6 per cent, lower than the 6.5 per cent MRP that the Port of Newcastle proposed.[196] In deciding that an MRP of 6

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187 ACCC (2015), *Public inquiry into final access determinations for fixed line services – final decision,* October 2015, pg.75-77

188 ACCC (2015), *Public inquiry into final access determinations for fixed line services – final decision,* October 2015, pg.75-77

189 ACCC (2015), *Public inquiry into final access determinations for fixed line services – final decision,* October 2015, pg.74

190 ACCC (2019), *ACCC view on Australia Post's draft price notification*, November 2019, pg.29

191 ACCC (2019), *ACCC view on Australia Post's draft price notification*, November 2019, pg.37

192 ACCC (2019), *ACCC view on Australia Post's draft price notification*, November 2019, pg.37

193 ACCC (2017), *Draft Decision, Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking,* 20 April 2017, pg.147

194 ACCC (2017), *Draft Decision, Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking,* 20 April 2017, pg. 146

195 ACCC (2017), *Draft Decision, Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking,* 20 April 2017, pg. 147

196 ACCC (2018), *Final Determination: Statement of Reasons – Access dispute between Glencore Coal Assets Australia Pty Ltd and Port of Newcastle Operations Pty Ltd,* 18 September 2018, pg.149

per cent is appropriate, the ACCC considered previous ACCC regulatory decisions, (specifically, the 2017 draft decision on *Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking*) and AER decisions cited by the Port of Newcastle.[197]

A.8.2.3. Role of Dividend Growth Models (DGM)

Telecommunications

The ACCC does not give any weight to dividend growth models citing concerns stated by the AER that DGMs are highly sensitive to assumptions and results are sensitive to errors in forecasts.[198]

Rail

The ACCC does not consider dividend growth models in determining MRP, noting concerns raised by the AER 2013 *Rate of Return Guidelines* about dividend growth models:[199]

- they are highly sensitive to its assumptions on long-term dividend growth rate and the length of transition to long term growth
- they use assumptions about one unobservable variable (expected growth in future dividends) to derive values for another unobservable variable (expected return on equity), meaning results depend on the assumptions used
- they require strong assumptions (for example, the term-structure of the discount rate, the trajectory of expected future dividends, the assumption that at each point of time the price of equity equals its fair value) about unobservable input variables (for example, the expected long-term growth rate of future dividends) when estimating the MRP
- [they] generate a market cost of equity excessively 'sticky' because:
- dividends follow slowly with changes in profits, and are particularly 'sticky' downwards
- dividend growth models make strong assumptions about the term-structure of the cost of equity
- [they] tend to overestimate MRP in low interest rate environments and underestimate MRP in high interest rate environments

A.8.2.4. Estimation of RFR

Telecommunications

In the 2015 *Public inquiry into final access determinations for fixed line services*, the ACCC uses an RFR of 2.76 per cent, which is based on 10-year Commonwealth Government Securities and uses an averaging period of 20 business days.[200]

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197 ACCC (2018), *Final Determination: Statement of Reasons – Access dispute between Glencore Coal Assets Australia Pty Ltd and Port of Newcastle Operations Pty Ltd,* 18 September 2018, pg.151

198 ACCC (2015), *Public inquiry into final access determinations for fixed line services – final decision,* October 2015, pg.75-77

199 ACCC (2017), *Draft Decision, Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking,* 20 April 2017, pg. 148

200 ACCC (2015), *Public inquiry into final access determinations for fixed line services – final decision,* October 2015, pg.66

Post

In its 2019 *ACCC view on Australia Post's draft price notification* the ACCC adopts an RFR of 1.03 per cent but does not state what this is based on.[201]

Rail

In its 2017 draft decision on *Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking*, the ACCC uses an RFR of 2.12 per cent, based on 10-year Australian Commonwealth Securities and using a 20 day averaging period.[202]

Ports

In its 2018 final determination statement of reasons on *Access dispute between Glencore Coal Assets Australia Pty Ltd and Port of Newcastle Operations Pty Ltd*, the ACCC used an RFR of 2.6 per cent, following the RFR's used by the Port of Newcastle and Glencore in submissions.[203]

A.8.3. Determined Values

Table A.14 below sets out the ACCCs estimates values for MRP and RFR in the telecommunications, postal services, and rail sectors.

Table A.14: ACCC range for the MRP (nominal)

Sector	Telecommunications	Postal Services	Rail	Port of Newcastle
Regulatory period	2015-2019	2020-2021	2017-2026	2018-2031
TMR	8.76%	7.13%	8.12%	8.6%
RFR	2.76%	1.03%	2.12%	2.6%
MRP	6%	6.1%	6%	6%

Source: ACCC (2015), *Public inquiry into final access determinations for fixed line services – final decision*, October 2015, pg.67
ACCC (2019), *ACCC view on Australia Post's draft price notification*, November 2019, pg.29
ACCC (2017), *Draft Decision, Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking,* 20 April 2017, pg.19 & 134
ACCC (2018), *Final Determination: Statement of Reasons – Access dispute between Glencore Coal Assets Australia Pty Ltd and Port of Newcastle Operations Pty Ltd,* 18 September 2018, pg.30 & 148
Note: TMR calculated as MRP + RFR.

201 ACCC (2019), *ACCC view on Australia Post's draft price notification*, November 2019, pg.29

202 ACCC (2017), *Draft Decision, Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking,* 20 April 2017, pg. 135

203 ACCC (2018), *Final Determination: Statement of Reasons – Access dispute between Glencore Coal Assets Australia Pty Ltd and Port of Newcastle Operations Pty Ltd,* 18 September 2018, pg.134

We convert ACCC's nominal TMR and RFR determinations into real CPI terms using its inflation forecasts for each decision (2.5 per cent for telecommunications, 2.4 per cent for postal services, rail and port of Newcastle),[204] and the Fisher equation. Table A.15 sets out the MRP parameters in real CPI terms.

Table A.15: ACCC range for the MRP (real)

Sector	Telecommunications	Postal Services	Rail	Port of Newcastle
Regulatory period	2015-2019	2020-2021	2017-2026	2018-2031
TMR	6.25%	4.76%	5.73%	6.2%
RFR	0.25%	-1.34%	-0.27%	0.2%
MRP	6%	6.1%	6%	6%

Source: ACCC (2015), *Public inquiry into final access determinations for fixed line services – final decision,* October 2015, pg.67
ACCC (2019), *ACCC view on Australia Post's draft price notification*, November 2019, pg.29
ACCC (2017), *Draft Decision, Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking,* 20 April 2017, pg.19 & 134
ACCC (2018), *Final Determination: Statement of Reasons – Access dispute between Glencore Coal Assets Australia Pty Ltd and Port of Newcastle Operations Pty Ltd,* 18 September 2018, pg.30 & 148
Note: TMR calculated as MRP + RFR.

[204] There was no inflation assumption indicated for the post determination, hence we used the same as for rail and the port decisions.

Appendix B. Transport Regulators

B.1. CAA's approach to TMR/MRP estimation at H7 consultation

We set out the approach of the UK's Civil Aviation Authority (CAA) to estimating the TMR/MRP for Heathrow Airport Limited (HAL) for the next regulatory period which was expected to be implemented for the period 2020-25 and referred to as H7. The CAA's proposals are at a developed stage of consultation, but do not as yet constitute a decision or licence changes for HAL.

B.1.1. Background and Objectives of the Regime

The CAA has the power under the Civil Aviation Act 2012 (CAA12) for the economic regulation of Heathrow Airport Limited (HAL). The CAA granted HAL a licence to operate London Heathrow Airport in 2014. The licence includes a price control of airport charges for the period 2014 to 2018, called H6, which the CAA extended until 2020. It currently consults on the regulatory framework for the next regulatory period H7.

Specifically, the CAA12 gives the CAA a primary duty to carry out its functions under CAA12 in a manner which it considers will further the interests of users of air transport services regarding the range, availability, continuity, cost and quality of airport operation services (AOS).[205]

In discharging this primary duty, the CAA must also have regard to a range of other matters specified in the CAA12. These include:[206]

- The need to secure that each licensee is able to finance its licensed activities;
- The need to secure that all reasonable demands for AOS are met;
- The need to promote economy and efficiency on the part of licensees in the provision of AOS;
- The need to secure that the licensee is able to take reasonable measures to reduce, control and/or mitigate adverse environmental effects;
- Any guidance issued by the Secretary of State or international obligation on the UK notified by the Secretary of State; and
- The Better Regulation principles.

For H7, the CAA's assessment of market-wide parameters for HAL's cost of capital, i.e. the TMR and RFR, builds on the CAA's decision for UK's air traffic control service provider (NERL) at RP3.[207] We therefore cover the TMR and RFR decision for NERL at RP3, as these are relevant for HAL's costs of capital for H7.

[205] CAA (Jan 2020), Economic regulation of Heathrow Airport Limited: further consultation on regulatory framework and financial issues - Appendix A, para.2, p.66.

[206] CAA (Jan 2020), Economic regulation of Heathrow Airport Limited: further consultation on regulatory framework and financial issues - Appendix A, para.5, pp.66-67.

[207] CAA (Jan 2020), Economic regulation of Heathrow Airport Limited: further consultation on regulatory framework and financial issues, para.2.10, p.33.

B.1.2. Estimation of MRP and RFR

B.1.2.1. CAA draws on the Wright Approach

In its final proposal for RP3, the CAA proposes to use a "Wright approach" of directly estimating the TMR and RFR, with the MRP calculated as the residual. It notes that this approach is broadly consistent with the approaches adopted by NERL and other regulators, as the TMR is typically shown to be more stable than the MRP.[208]

B.1.2.2. CAA's approach to estimating the TMR

The CAA considers that the TMR for RP3 should be estimated drawing on a range of evidence, including evidence on: historical realised returns, forward looking estimates based on dividend growth models (DGM) as well as regulatory precedent. The CAA, for its final decision, does not update its TMR methodology as set out in its draft determination, noting that its TMR estimate appears to be consistent with its review of the available evidence at its final decision, as it is around the mid-point of the ranges from different sources and approaches.[209] We outline the CAA's TMR methodology at draft determination below.

The CAA concludes on a TMR range of 6 to 7.25 per cent real CPI-deflated,[210] based primarily on available evidence and TMR ranges from the UKRN cost of equity report, PwC's advice to the CAA for H7 and recent regulatory precedent.[211]

It selects a point estimate of 6.4 per cent real CPI-deflated,[212] toward the low end of its overall range, but near the mid-point of the historical evidence (UKRN report), other UK regulators' proposals (Ofgem for RIIO-2 and Ofwat for PR19) and PwC's TMR range for H7.[213]

Historical approach

At RP3 draft determination, the CAA presents historical TMR estimates from Wright et al. from their 2018 report for the UK regulators' network ("UKRN report") of 6-7 per cent real CPI-deflated.[214]

The CAA concludes the UKRN historical returns estimate of 6-7 per cent real CPI-deflated[215] is consistent with other evidence, including recent consultations by UK regulators (Ofgem and Ofcom) and their advisors (Europe Economics, PwC and CEPA).[216]

Forward-looking approach

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208 CAA (Aug 2019), UK RP3 CAA decision document: Appendices, para.E21, p.30.

209 CAA (Aug 2019), UK RP3 CAA decision document: Appendices, para.E85, p.45.

210 The CAA estimates a real TMR range of 5 to 6.25 per cent (real, RPI), which implies a TMR range of 6 to 7.25 per cent (real, CPI), assuming 100 bps RPI-CPI wedge.

211 CAA (Aug 2019), UK RP3 CAA decision document: Appendices, para.E80, p.44.

212 The CAA estimates a real TMR midpoint of 5.4 per cent (real, RPI), which implies a TMR midpoint estimate of 6.4 per cent (real, CPI), assuming 100 bps RPI-CPI wedge.

213 CAA (Aug 2019), UK RP3 CAA decision document: Appendices, para.E87, p.45.

214 CAA (Feb 2019), Appendices to Draft UK Reference Period 3 Performance Plan proposals, para.D18, p.29.

215 The CAA reports TMR range of 5 to 6 per cent (real, RPI), which implies a TMR range of 6 to 7 per cent (real, CPI), assuming 100 bps RPI-CPI wedge.

216 CAA (Feb 2019), Appendices to Draft UK Reference Period 3 Performance Plan proposals, D33, p.34.

In relation to forward-looking evidence, the CAA presents a range of TMR estimates derived using multi-stage DGMs.[217] These include estimates from Ofwat, Ofcom and Ofgem prepared by their advisors Europe Economics, CEPA and PwC, which according to the CAA show a DGM-based TMR of 5.0 to 7.3 per cent real CPI-deflated.[218] The CAA also presents updated estimates from PwC of 6.3 to 7.2 per cent real CPI-deflated.[219]

The CAA also comments on the alternative DGM-based TMR from the Bank of England (BoE), stating that PwC concludes that the BoE estimates are focussed on movements of analyst equity return expectations rather than levels and are therefore unsuitable for informing the view of a forward-looking TMR.[220]

The CAA concludes that forward-looking evidence presents a relevant piece of evidence on the TMR and that the evidence presents some overlap with the historical returns evidence, supporting a range of 6-7 per cent CPI-deflated.[221]

Regulatory precedent

Finally, the CAA presents evidence from recent consultations by UK regulators including Ofwat, Ofcom and Ofgem, which all support an CPI-deflated return below 7 per cent.[222] The CAA also comments on international precedent, including: international TMR estimates collected by Europe Economics for Ofwat in the range of 6.3 to 7.8 per cent in CPI-deflated terms and PwC's estimate of the TMR for Charles de Gaulle airport of 7.3 per cent real CPI-deflated.[223]

B.1.2.3. Estimation of RFR

Similar to its TMR approach, the CAA, for its final determination, has not changed its approach to estimating RFR from its draft determination.

For estimating the RFR, the CAA primarily draws on the methodology adopted in the UKRN report, which states that regulators should use the yield on inflation-indexed gilts (ILG) to derive the RFR.

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217 CAA (2019), UK RP3 CAA Decision Document: Appendices, p.38, 40 URL: http://publicapps.caa.co.uk/docs/33/CAP%201830a%20appendices.pdf, Europe Economics (October 2018), Cost of Capital: Total Market Return, p.8-9, URL: https://www.ofcom.org.uk/__data/assets/pdf_file/0026/124739/europe-economics-wacc-report.pdf, PwC (February 2019), Estimating the cost of capital for H7 - Response to stakeholder views, p.54, URL: https://www.caa.co.uk/uploadedFiles/CAA/Content/Accordion/Standard_Content/Commercial/Airports/Files/PwC%20-%20H7%20Initial%20WACC%20response%20document.pdf

218 CAA (Feb 2019), Appendices to Draft UK Reference Period 3 Performance Plan proposals, para.D34 & D35, p.35. The CAA reports TMR range of 4 to 6.3 per cent (real, RPI), which implies a TMR range of 5 to 7.25 per cent (real, CPI), assuming 100 bps RPI-CPI wedge.

219 CAA (Feb 2019), Appendices to Draft UK Reference Period 3 Performance Plan proposals, para.D36, p.35. The CAA reports TMR range of 5.3 to 6.2 per cent (real, RPI), which implies a TMR range of 5.3 to 6.2 per cent (real, CPI), assuming 100 bps RPI-CPI wedge.

220 CAA (Feb 2019), Appendices to Draft UK Reference Period 3 Performance Plan proposals, para.D37, p.35.

221 CAA (Feb 2019), Appendices to Draft UK Reference Period 3 Performance Plan proposals, para.D38, p.36. The CAA reports TMR range of 5 to 6 per cent (real, RPI), which implies a TMR range of 6 to 7 per cent (real, CPI), assuming 100 bps RPI-CPI wedge.

222 CAA (Feb 2019), Appendices to Draft UK Reference Period 3 Performance Plan proposals, para.D39, p.36. The CAA reports TMR estimate of 6 per cent (real, RPI), which implies a TMR estimate of 7 per cent (real, CPI), assuming 100 bps RPI-CPI wedge.

223 CAA (Feb 2019), Appendices to Draft UK Reference Period 3 Performance Plan proposals, para.D42, p.37. The CAA reports TMR estimate of 6.3 per cent (real, RPI), which implies a TMR estimate of 7.3 per cent (real, CPI), assuming 100 bps RPI-CPI wedge.

Specifically, the CAA produced implied forward-gilt yields at different maturities 5, 10, 15 and 20 years for the period covering RP3, 2020 to 2024.

Based on above approach, the CAA estimates a RFR of -0.7 per cent in CPI-deflated terms.[224] It also cross-checks its real RFR estimate with regulatory precedent, namely Ofgem SSMD, Ofwat PR19 and Ofcom, noting that its estimated RFR appears broadly reasonable when compared to these other recent estimates.[225]

B.1.3. Determined Values

Table B.1 below sets out CAA's estimated values for the TMR of 6 to 7.25 per cent real and RFR, with the MRP as the residual.

Table B.1: CAA's range for the MRP (real CPI)

Sector	**Aviation**		
Regulatory period	2020-2024		
	Low	Mid	High
TMR	6%	6.4%	7.25%
RFR	-0.7%	-0.7%	-0.7%
MRP	6.7%	7.1%	7.95%

Source: CAA (Aug 2019), UK RP3 CAA decision document: Appendices, Table E.7, p.69.
Note: MRP calculated as TMR-RFR. CAA reported real values in RPI terms. We apply the RPI-CPI wedge of 100 bps to arrive at the corresponding real values in CPI terms.

[224] CAA (Aug 2019), UK RP3 CAA decision document: Appendices, para.E102, p.48. The CAA estimates a real RFR estimate of -1.7 per cent (real, RPI), which implies a RFR estimate of -0.7 per cent (real, CPI), assuming 100 bps RPI-CPI wedge.

[225] CAA (Aug 2019), UK RP3 CAA decision document: Appendices, para.E101, p.48.

B.2. CMA's approach to TMR/MRP estimation at NERL provisional findings

This case study reviews the UK's Competition and Markets Authority approach to the determination of the UK's air traffic service provider in the UK (NERL plc) for MRP, in regard of NERL's 2020 price control appeal.

B.2.1. Background and Objectives of the Regime

Under the Transport Act (TA) 2000 the UK Government issued a licence to NATS (En Route) plc (NERL) to provide en route air traffic services in the UK. NATS is the main air navigation service provider in the United Kingdom. The TA gives the Civil Aviation Authority (CAA) the role of economic regulator of NERL. The CAA exercises this role mainly through monitoring and enforcing the conditions in the Licence and through modifications to the Licence.

Specifically, NERL is currently regulated under the European Union Single European Sky performance scheme and the UK TA 2000 and economic licence.

The performance scheme provides for the setting of targets and incentives in four key performance areas – safety, capacity, environment and cost efficiency.[226]

Section 2 of the TA 2000 sets out the duties of the CAA. In particular, the CAA must exercise its functions under this Chapter in the manner it thinks best calculated:[227]

- To further the interests of operators and owners of aircraft, owners and managers of aerodromes, persons travelling in aircraft and persons with rights in property carried in them;
- To promote efficiency and economy on the part of licence holders;
- To secure that licence holders will not find it unduly difficult to finance activities authorized by their licences;
- To take account of any international obligations of the United Kingdom notified to the CAA by the Secretary of State;
- To take account of any guidance on environmental objectives given to the CAA by the Secretary of State after the coming into force of this section.

For the latest regulatory review, RP3, NATS did not consider that the proposed modifications to the NERL licence were in the public interest and, given the difference between the CAA proposals and the NERL business plan, NERL rejected the CAA's proposed licence modifications and made a reference to the Competition and Markets Authority (CMA) to report on the matters specified in the reference.

B.2.2. Estimation of MRP and RFR

B.2.2.1. CMA has confirmed its use of Wright Approach

For the current appeal, the CMA has adopted the same framework that it adopted at its previous appeal for the determination of the TMR/MRP.[228] The CMA conducted its last fundamental review of TMR as part of the Northern Ireland Electricity (NIE) price determination in 2014. At NIE, the CMA

[226] CAA (Aug 2019), RP3 decision document, para.2, p.7.

[227] TA (2000), Section 2.

[228] CMA (Mar 2020), Nats provisional findings, para.12.167, p.174.

explains that its preferred approach to estimating the MRP is to subtract its estimate of the RFR from its estimate of the TMR, i.e. to adopt a "Wright approach". The CMA provides three reasons for this decision:[229]

- MRP estimates can vary depending on the class of risk-free instrument used in the calculation. Additionally, the CMA notes that it is not valid to add MRPs based on Treasury Bills to its RFR based on underlying index-linked gilt (ILG) yields.[230]
- The market return has tended to be less volatile than the MRP.
- There is evidence suggesting that the MRP is negatively correlated with Treasury bill rates over the short term.

Based on above evidence, the CMA prefers to estimate the TMR and RFR separately. However, it uses estimates for the MRP as a cross-check for its implied MRP (TMR-RFR), drawing on forward looking MRP estimates, noting that these estimates broadly support its implied estimated MRP.[231]

B.2.2.2. CMA's approach to estimating the TMR

At NERL provisional findings, the CMA uses historical approaches (both ex-ante and ex-post) for estimating the equity market return, as it considers it to be the most reliable evidence on TMR. It does not place weight on forward-looking estimation methods, noting that the forward-looking approaches are largely assumption-driven, with little evidence to support the use of one set of assumptions over others, and they produce a wide range of estimates.[232]

Based on both historical approaches as set out below, the CMA concludes on a TMR range of 6 to 7 per cent (real, CPI).[233]

Historical ex-post approach

For the historical ex-post approach, the CMA estimated the TMR drawing on the Dimson, Marsh and Staunton (DMS) 2020 dataset, which spans 1900 to 2018.[234] The CMA estimates a real CED/CPI deflated TMR range between 6.1 and 6.9 per cent. [235,236]

The CMA notes that the historical ex post method has drawn significant criticism in finance literature and many studies have concluded that it does not provide a reliable indication of the MRP.[237]

Historical ex-ante approach

229 CMA (Mar 2014), NIE final determination, para.13.82, p.13-16.

230 CMA (Mar 2014), NIE final determination, para.13.148, p.13-30.

231 CMA (Mar 2014), NIE final determination, para.13.157, p.13-32.

232 CMA (Mar 2020), Nats provisional findings, para.12.166, p.173.

233 The CMA concludes on a TMR range of 5 to 6 per cent (real, RPI) which implies a TMR range of 6 to 7 per cent (real CPI), assuming 100 bps CPI-RPI wedge. CMA (Mar 2020), Nats provisional findings, para.12.234, p.190.

234 CMA (Mar 2020), Nats provisional findings, para.12.185, p.179.

235 In order to convert nominal equity returns to real returns, the CMA uses the consumption expenditure deflator (CED) for the period 1900 to 1947/9 and the CPI inflation series for the period from 1947/9 onwards, with RPI as a cross-check. CMA (Mar 2020), Nats provisional findings, para.12.189-12.191, pp.181-182.

236 CMA (Mar 2020), Nats provisional findings, para.12.201, p.184.

237 CMA (Mar 2020), Nats provisional findings, para.12.209, p.185.

For the historical ex-ante approach, the CMA decomposes the returns into average dividend yields and the average rate of dividend growth, based on a study by Fama and French (2002).[238] Based on this approach, the CMA estimates a forward looking real-CPI TMR[239] of between 6 per cent and 7.2 per cent, drawing on data from the 2018 Barclays Equity Gilt Study.[240] Similarly, the CMA also estimates a real-CPI TMR[241] drawing on the DMS dataset, resulting in a range of 6 per cent to 7.5 per cent.[242]

Forward looking approaches

The CMA notes that there are mainly two sources for forward-looking estimate, namely estimates based on the DDM and surveys of investors, market participants and academics. It uses the resulting estimates of the MRP as a cross-check.

The CMA considers the estimates of various parties for the DDM, which include the multi-stage DDM analysis by Ofwat, Ofcom, Europe Economics, CEPA and PwC as well as BoE analysis cited by NERA.[243]

Regarding evidence from the DDM, the CMA notes that a limitation of this approach is that it is wholly dependent on assumptions and produces a broad range of TMR estimates depending on the assumption used.[244]

Regarding evidence from surveys, the CMA considers that results of such surveys tend to depend on the identity and outlook of the respondents and how they interpret the questions being asked. Additionally, some surveys do not clarify the time frame over which the parameters are to be estimated; whether an arithmetic or geometric averaging approach should be used; or whether the MRP is over bonds or bills or some other instrument.[245]

Based on above assessment, the CMA concludes that it prefers to focus on the historical data, which it considers to be more robust.[246]

B.2.2.3. Estimation of RFR

For estimating the RFR, the CMA considers that current ILG rates continue to provide the most appropriate basis for the measurement of a notional investors' achievable risk-free returns, noting that negative yields are not irrational per se.[247] This is also the approach adopted by the CAA.[248]

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238 CMA (Mar 2020), Nats provisional findings, para.12.210, p.186.

239 The CMA estimates a real TMR range of 5 to 6.2 per cent (real, RPI), which implies a TMR of 6 to 7.2 per cent (real, CPI), assuming 100 bps RPI-CPI wedge.

240 CMA (Mar 2020), Nats provisional findings, para.12.219, p.187.

241 The CMA estimates a real TMR range of 5 to 6.5 per cent (real, RPI), which implies a TMR of 6 to 7.5 per cent (real, CPI), assuming 100 bps RPI-CPI wedge.

242 CMA (Mar 2020), Nats provisional findings, para.12.220, p.187.

243 CMA (Mar 2020), Nats provisional findings, p.188-189

244 CMA (Mar 2020), Nats provisional findings, para.12.227, p.189.

245 CMA (Mar 2020), Nats provisional findings, para.12.230, p.189.

246 CMA (Mar 2020), Nats provisional findings, para.12.231, p.189.

247 CMA (Mar 2020), Nats provisional findings, para.12.251, p.194.

248 CMA (Mar 2020), Nats provisional findings, para.12.238, p.191.

Based on above assessment, the CMA estimates a range for the real-CPI RFR[249] of -1.6 to -1.2 per cent, using the mid-point -1.4 per cent as a basis for its RFR assumption, drawing on the 10-year ILG data provided by the Bank of England, cross checked against yields on 10-20 year maturity ILGs and against 3 and 6 month historic averages.[250] To arrive at its final RFR estimate, it also makes an upward adjustment of 15 bps to above mid-point estimate for anticipated increases in yields between now and the middle of RP3, resulting in an estimated RFR of -1.25 per cent (real CPI).[251]

B.2.3. Determined Values

Table B.2 below sets out CMA's estimated values for the TMR of 6 to 7 per cent real and RFR based on short-run market data, with the MRP as the residual.

Table B.2: CMA's range for the MRP (real CPI)

Sector	**Aviation**	
Regulatory period	2020-2024	
	Low	High
TMR	6%	7%
RFR	-1.25%	-1.25%
MRP	7.25%	8.25%

Source: CMA (Mar 2020), Nats provisional findings, table 12-17, p.202.
Note: MRP calculated as TMR-RFR. CMA reported real values in RPI terms. We apply the RPI-CPI wedge of 100 bps to arrive at the corresponding real values in CPI terms.

[249] The CMA estimates a real RFR range of -2.6 to -2.2 per cent (real, RPI), which implies a RFR range of -1.6 to -1.2 per cent (real, CPI), assuming 100 bps RPI-CPI wedge.

[250] CMA (Mar 2020), Nats provisional findings, para.12.259, p.196.

[251] CMA (Mar 2020), Nats provisional findings, para.12.260 & para.12.261, pp.196-197.

B.3. CAR's approach to TMR/MRP estimation at daa final determination

In this Appendix, we set out the approach of the Commission for Aviation Regulation (CAR) to estimating the TMR/MRP at its latest decision for Dublin Airport, published in 2020. The CAR's decision is the subject of an appeal by Dublin Airport.

B.3.1. Background and Objectives of the Regime

The CAR is responsible for the regulation of airport charges at the Dublin Airport (daa). Dublin Airport is the main airport in Ireland and operated by the daa. The daa is regulated under the 2001 Aviation Regulation Act, and the 2004 State Airports Act. This legislation sets out the statutory objectives as well as factors that the CAR has to comply with.

Specifically, Section 33 of the 2001 Aviation Regulation Act, as substituted by Section 22 (4) of the 2004 State Airport Act in 2005, set out the statutory objectives and factors in setting the maximum level of airport charges.[252] In particular, Section 22 (4) of the 2004 State Airport Act determines that the CAR, in making a determination, has the following three objectives:[253]

- To facilitate the efficient and economic development and operation of Dublin Airport which meet the requirements of current and prospective users of Dublin Airport.
- To protect the reasonable interest of current and prospective users of Dublin Airport in relation to Dublin Airport.
- To enable daa to operate and develop Dublin Airport in a sustainable and financially manner.

Above statutory objectives permit the CAR to regulate airport charges at Dublin Airport with reference to economic efficiency.

For the current regulatory period, 2020 to 2024, the CAR published its final determination on daa's maximum charges in October 2019, including its assessment of the efficient rate of return.

B.3.2. Estimation of MRP and RFR

B.3.2.1. CAR draws on the Wright and DDM Approaches

For the current regulatory period, the CAR estimates the TMR and RFR directly and estimates the MRP as the residual (i.e. TMR less RFR), i.e. it adopts the Wright and DDM approach. This approach is different to its previous determination in 2014, where it estimated the MRP directly (using HER approach). The CAR provides two reasons for its methodological change:[254]

- The TMR and RFR are more readily observable than the MRP.
- The TMR is a more stable parameter than the RFR.

Specifically, Swiss Economics (SE), CAR's consultant, analyse the relationship between the RFR and the MRP. SE finds a relatively broad consensus that the MRP and the RFR systematically move in opposite directions, implying that TMRs are more stable over time than either of the individual components.[255] Indeed, SE notes that various empirical studies confirm the existence of a negative

[252] CAR (May 2019), Maximum level of airport charges at Dublin Airport 2020-2024 final determination, para.13.2, p.147.

[253] State Airports Act 2004, Section 22 (4).

[254] CAR (May 2019), Maximum level of airport charges at Dublin Airport 2020-2024 draft determination, para.8.5, p.37.

[255] Swiss Economics (Sep 2019), Dublin Airport cost of capital for 2019 determination, para.80, p.30.

correlation between the RFR and the MRP, citing evidence based on studies from Mason, Miles and Wright (2003) and Wright and Smithers (2014).[256]

B.3.2.2. CAR's approach to estimating the TMR

For the TMR, SE relies on two types of evidence: "backward-looking", i.e. long-term historical averages, and "forward-looking estimates", i.e. estimates from a dividend discount model (DDM).[257]

For its backward-looking estimates, SE uses a Blume averaging method for the Irish and European equity returns reported by Dimson, Marsh and Staunton (DMS) for the period 1900-2017 and a holding period assumption of 10 years. SE estimates an historical TMR range of 6.05 to 6.8 per cent based on the European and Irish equity returns, respectively.[258]

For the forward-looking estimates, SE relies on its own DDM model, which follows the classic model of Gordon (1962). The SE model is a one-stage DGM which assumes a constant dividend growth rate and relies on data from Stoxx Europe 50 price index for the period 2001 to 2018 for price and dividend data. For the dividend growth rate, SE relies on the average of OECD's one year-ahead real GDP forecasts.[259] SE concludes on a forward-looking TMR range of 5.96 to 6.19 per cent.[260]

SE also presents Irish regulatory precedent on TMR (point estimates ranging from 6.3 to 7.3 per cent), concluding that it is consistent with the empirical estimates obtained.[261]

SE concludes on a TMR range of 5.96 to 6.80 per cent, based on the minimum and maximum estimates from the forward-looking and historical evidence, respectively.[262] CAR relies on SE's estimate and argues that it is consistent with Irish regulatory precedent and the recommendations of the Thessaloniki Forum.[263]

B.3.2.3. Estimation of RFR

For estimating the RFR, the CAR draws primarily on yields from the 10-year Irish and German government bond yields and forward looking evidence, cross-checked against regulatory precedent. It also uses German bonds because they are perceived to be lower risk and daa is not limited to raising funds in Ireland.[264]

Specifically, Swiss Economics (SE), CAR's consultant, estimates a range for the real RFR of -1.1 per cent to -0.1 per cent, with a point estimate of -0.6 per cent.[265] It deflates nominal yields using inflation expectations derived from the ECB survey on expected inflation and the spread between nominal and inflation-linked German government bonds.[266] The lower bound is based on the 1-year average yield of the 10-year German government bond, and the upper bound is based on the 5-year

256 Swiss Economics (Sep 2019), Dublin Airport cost of capital for 2019 determination, pp.31-33.

257 Swiss Economics (Sep 2019), Dublin Airport cost of capital for 2019 determination, para.75, p.30.

258 Swiss Economics (Sep 2019), Dublin Airport cost of capital for 2019 determination, para.100, p.34.

259 Swiss Economics (Sep 2019), Dublin Airport cost of capital for 2019 determination, para. 108-111, p.35.

260 Swiss Economics (Sep 2019), Dublin Airport cost of capital for 2019 determination, table 11, p.36.

261 Swiss Economics (Sep 2019), Dublin Airport cost of capital for 2019 determination, table 12, para.116, p.37.

262 Swiss Economics (Sep 2019), Dublin Airport cost of capital for 2019 determination, table 13, p.38.

263 CAR (Oct 2019), Determination on the maximum level of airport charges at Dublin airport 2020-2024, para.8.24, p.93.

264 CAR (May 2019), Maximum level of airport charges at Dublin Airport 2020-2024 draft determination, para.8.14, p.39.

265 CAR (Oct 2019), Determination on the maximum level of airport charges at Dublin airport 2020-2024, table 8.2, p.94.

266 Swiss Economics (Sep 2019), Dublin Airport cost of capital for 2019 determination, para.39, pp.21-22.

average yield of the 10-year Irish Government bond.[267] Both values include an adjustment for an expected upward trend in government yields, as implied by ECB forward estimates of both AAA-rated and all Euro area bonds.[268]

CAR relies on SE's approach to estimating the RFR and argues that it is aligned with UK regulatory precedent, as well as consistent with Irish regulatory precedent

B.3.3. Determined Values

Table B.3 below sets out CAR's estimated values for the TMR of 6.6 to 7.4 per cent real and RFR, with the MRP as the residual.

Table B.3: CAR's range for the MRP (real CPI)

Sector	**Aviation**		
Regulatory period	2020-2024		
	Low	Mid	High
TMR	6.0%	6.4%	6.8%
RFR	-1.1%	-0.6%	-0.1%
MRP	6.6%	7%	7.4%

Source: CAR (Oct 2019), Determination on the maximum level of airport charges at Dublin airport 2020-2024, table 8.2, p.94.
Note: Range for MRP is derived by subtracting the mid point estimate of the RFR

[267] Swiss Economics (Sep 2019), Dublin Airport cost of capital for 2019 determination, table 5, p.23.

[268] Swiss Economics (Sep 2019), Dublin Airport cost of capital for 2019 determination, table 8, p.28.

B.4. ART's approach to TMR/MRP estimation

This case study sets out the approach of the Autorità di Regolazione dei Trasporti (ART) to estimating the TMR/MRP for Italian airports.

B.4.1. Background and Objectives of the Regime

B.4.1.1. The Italian concession regime

Italian airports are operated and managed according to a concession model whereby the Italian Ministry of Infrastructure and Transport (MIT), upon proposal by the Italian Civil Aviation Authority (Ente Nazionale per l'Aviazione Civile, ENAC), grants the right to develop, operate and manage airport activities and use lands, properties, and facilities located in the airport area for a long-term period.

There are currently three main types of concession regimes in force in Italy:[269]

- *Total concession*: all airport-related activities and infrastructure are operated by an airport company. The company retains all revenues stemming from the management and operation of the airport, including the provision of airport-related activities (e.g., take-off and landing service, passenger boarding, etc.).
- *Partial concession*: airport services are operated by an airport company, whereas flight related infrastructure is operated by the State. The company retains all revenues stemming from the provision of airport related services. Small and minor airports are operated under a partial concession (e.g., Bolzano airport).
- *No concession*: all airport related activities and infrastructure are operated by the State (e.g., Lampedusa airport).[270]

Except for a few minor airports, all airports in Italy operate under a total concession regime.[271]

B.4.1.2. Airport Charges Regulation in Italy

Following the implementation of the European Commission's Airport Charges Directive (ACD)[272] into Italian law and the creation of an independent economic regulator, the Transport Regulation Authority (Autorità di Regolazione dei Trasporti, ART) in 2011,[273] tariff regulation in Italy follows a dual regime regardless of the type of concession under which each airport operates.

The three largest airport systems in Italy (Milan, Rome and Venice) are regulated through bilateral contracts (so called "Contratti di Programma in deroga"*)* between ENAC and the airport operator.[274]

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269 ENAC website, Tipologia di gestioni aeroportuali, URL: https://www.enac.gov.it/aeroporti/gestioni-aeroportuali-regolazione-tariffaria/tipologia-canoni-delle-gestioni-aeroportuali/tipologia-di-gestioni. Visited on 20 March 2019.

270 There are two additional concession models that apply to very small airports. Source: ENAC website (4 March 2015), Tipologia di Gestioni Aeroportuali, URL: https://www.enac.gov.it/aeroporti/gestioni-aeroportuali-regolazione-tariffaria/tipologia-canoni-delle-gestioni-aeroportuali/tipologia-di-gestioni. Visited on 30 March 2019.

271 NERA review of ENAC's website.

272 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32009L0012

273 Decreto-Legge 6 dicembre 2011, n. 201, convertito con modificazioni dalla L. 22 dicembre 2011, n. 214. Disposizioni urgenti per la crescita, l'equità e il consolidamento dei conti pubblici, art. 37.

274 ENAC website, Contratti di Programma, URL: https://www.enac.gov.it/aeroporti/gestioni-aeroportuali-regolazione-tariffaria/contratti-di-programma. Visited on 22 March 2019.

For these airports, ENAC is responsible for airports' tariff regulation as well as approving the investment plan, quality and environmental plans.[275]

All other airports are regulated by ART under one of the three tariff models approved by ART in 2014 and later revised in 2017 with Delibera n. 92/2017.[276] These models vary based on the airports' traffic volumes, but the many regulatory rules are common across models including the methodology for setting risk-free rate and market risk premium (see below). [277]

In line with the ACD, ART is responsible for defining the regulatory framework and approving airport charges as well as defining the access regime and rules to airport infrastructure and services. Pursuant to Article 37 of Decree Law 201/2011 implementing the ACD into Italian law, in performing these activities ART's objective is to promote competition, productive efficiency and cost containment for airport users, businesses and consumers and guarantee fair and non-discriminatory access to airport infrastructure and services.[278]

Pursuant to the same article, when defining the airport tariff methodology, ART must ensure the economic equilibrium of the airport operator as well as promote productive efficiency and cost containment for airport users, businesses and consumers. Guaranteeing the economic equilibrium of airport operators equates to ensuring that the company can finance, through airport tariffs, its costs as well as the remuneration required by equity and debt investors.[279]

B.4.2. Estimation of MRP and RFR

B.4.2.1. ART draws on the HER approach

ART draws on an HER approach, where the MRP is based on historical data and the RFR based on relatively recent RFR. The ART does not provide a justification for its HER approach.

B.4.2.2. ART's approach to estimating the MRP

The MRP is the Market Risk Premium, equal to 5.5 per cent under all tariff models. This value has been set by ART considering the arithmetic and geometric mean estimates published by Dimson, Marsh, Staunton (DMS) based on historical data for Italy between 1900 and 2016, and the MRP values used by other Italian regulators (AGCOM, ARERA).[280]

It does not discuss the DDM model in setting the MRP.

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275 ENAC website, Contratti di Programma, URL: https://www.enac.gov.it/aeroporti/gestioni-aeroportuali-regolazione-tariffaria/contratti-di-programma. Visited on 22 March 2019.) , ma e' un po "legale" .

276 ART (22 September 2014), Delibera n.64/2014, Approvazione dei modelli di regolazione dei diritti aeroportuali.

277 Volumes are measured by average yearly number of passengers handled in the last two years for which actual data is available. Model 1 applies to airports with more than 5 million passengers per year; Model 2 applies to airports which have between 3 and 5 million passengers per year; and Model 3 applies to airports with less than 3 million passengers per year. Source: ART (2017), Delibera 92/2017, Conclusione del procedimento avviato con delibera n. 106/2016 – Approvazione dei modelli di regolazione dei diritti aeroportuali.

278 ART website: https://www.autorita-trasporti.it/cosa-fa/?lang=en.

279 ART, Delibera n.118/2019 del 1 agosto 2019, Relazione Illustrativa degli Uffici, p.15. Link: https://www.autorita-trasporti.it/wp-content/uploads/2019/08/RI-delibera-n.-118_2019-1.pdf

280 ART (2017), Analisi di Impatto della regolazione correlata alla delibera n.92/2017, p.15.

B.4.2.3. Estimation of RFR

RFR is the (nominal) Risk-Free Rate calculated using the arithmetic mean of the 10-year Italian government bond yields (BTP), as published by the Bank of Italy for the 12-month period before the start of airport operator's consultation with users.[281]

B.4.3. Determined Values

The ART decided on a MRP of 5 per cent, but does not publish a value for the RFR or therefore the TMR.

Table B.4: ART's estimated MRP

Sector	Aviation
TMR	n/a
RFR	n/a
MRP	5.5%

Note: TMR calculated as MRP+RFR. Source: *http://www.rgs.mef.gov.it/_Documenti/VERSIONE-I/Attivit--i/Contabilit_e_finanza_pubblica/DPB/2019/IT-DPB-2020-15-10-2019-W-cop.pdf, p.14.*

[281] ART (2017), Delibera 92/2017, Allegato 1, modello di regolazione dei diritti aeroportuali per aeroporti con traffico superiore a 5 milioni di passeggeri, para. 8.8.2.

B.5. Commerce Commission's approach to TMR/MRP estimation

This case study sets out the approach of the New Zealand Commerce Commission to estimating the TMR/RFR at its latest regulatory decisions.

B.5.1. Background and Objectives of the Regime

The Commerce Act of 1986 sets out the overarching objectives of the regulatory framework in New Zealand. The main purpose of the regime, as set out under Clause 1A and 52A of the Commerce Act, is to promote the long-term benefit of consumers within the country. The long-term benefit is to be pursued by promoting outcomes that are consistent with those produced in workably competitive markets, such that suppliers of regulated goods or services:

- have incentives to innovate and invest, including in replacement, upgraded, and new assets;
- have incentives to improve efficiency and provide services at a quality that reflects consumer demands;
- share with consumers the benefits of efficiency gains in the supply of the regulated goods or services, including through lower prices;
- are limited in their ability to gain excessive profits.

The legislative objectives and their pursuit through regulations of the prices and quality of goods and services apply to markets where there is little or no competition and little or no likelihood of a substantial increase in competition.[282] Therefore, the Commerce Act is also the governing legislation for the regulation of airports, electricity and gas networks in New Zealand.

The airport services are regulated under Part 4 of the Commerce Act and are supplied by Auckland International Airport Limited (AIAL), Wellington International Airport Limited (WIAL), and Christchurch International Airport Limited (CIAL).[283]

The NZCC is also the regulator for telecommunications, which is governed by a different act (the Telecommunications Act 2001) that shares largely similar objectives. The purpose statement for Part 6 of this Act, which governs the building blocks regime for fibre broadband, effectively mirrors the purpose statement of Part 4 of the Commerce Act.[284]

B.5.2. Estimation of MRP and RFR

The NZCC's approach to WACC is common for airports, electricity and gas networks, as described under part 4 of the Commerce Act 1986. A similar form of regulation is to be applied to Telecommunications.[285]

The NZCC determines a WACC estimate annually for the sectors of airports, electricity and gas distribution and transmission for the purpose of information disclosure (ID) regulation.[286] Among the ID regulated sectors, only airports are not also under a price-quality path regulation by the NZCC.[287]

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282 Ministry of Business, Innovation, and Employment (1986), Commerce Act, Clause 1A, 52, 52A.

283 NZCC (2010), Airports – Input Methodologies – Reasons, para 1.1.1, p.1

284 See clause 162 of the Telecommunications Act 2001

285 NZCC (19 November 2019), Fibre Input Methodologies: Draft decision – reasons paper, para X.5, p.6

286 NZCC (2010), Airports – Input Methodologies – Reasons, para E2.1, p.186

287 NZCC (2018), Guidelines for WACC determinations under the cost of capital input methodologies, Regulation under Part 4 of the Commerce Act 1986, Table 1, p.7

The differentiation, if any, in terms of the parameter estimation methodology will be discussed in the subsequent sections.

With regards to the cost of equity component of the WACC, the CC consider that the classical CAPM is not appropriate as it does not properly account for the characteristics of NZ's tax regime. Therefore, the regulator employs the simplified 'Brennan-Lally CAPM' model since it explicitly accounts for differing tax rates on differing forms of income. The model further considers the effects of dividend imputation and assumes capital gains are tax-free. The cost of equity under this model is estimated based on the following formula:

$$re = rf(1-ti) + \beta e TAMRP$$

where r*f* is the risk-free rate, t*i* is the investor tax rate on interest, B*e* is the equity beta and TAMRP is the tax adjusted MRP. [288] More specifically, the MRP is adjusted for the taxes faced by investors on equity returns.[289]

B.5.2.1. The CC's approach to estimating the TAMRP relies on a broad range of evidence, including HER, TMR and DGM

Under the NZCC's "Input Methodologies" (which have a similar status/purpose to the AER's binding rate of return instrument), many WACC parameters values, including the TAMRP value, are fixed. The TAMRP is specified and assumed to remain fixed for a five-year period commencing the first day of the regulatory period.[290]

The input methodologies (IMs) represent key upfront regulatory rules, requirements and processes.[291] Based on the NZCC's use of the simplified Brennan-Lally CAPM, the TAMRP is calculated as follows:

$$\mathrm{TAMRP} = \mathrm{E(Rm)} - \mathrm{Rf}(1 - \mathrm{Tc})$$

where E(Rm) is the expected return on the market exclusive of imputation credits, Rf is the RFR, and Tc is the corporate tax rate.[292]

In order to estimate the TAMRP when determining the initial Input Methodologies, the NZCC relied on ex post Ibbotson-type estimates undertaken by Dimson, Staunton and Marsh, the Siegel approach, as well as ex ante estimates (Cornell approach and survey evidence).[293] The NZCC obtains a TAMRP estimate of 7.0% based on an arithmetic average of these estimates and taking into account consultation feedback[294]. The NZCC also uses term to maturity of 5-years, equal to the length of the regulatory period, for the RFR used in estimating the TAMRP, as this ensures consistency.[295]

More recently, in 2015, the NZCC considered the TAMRP as part of their pricing determination for two regulated telecommunications services (Chorus' UCLL and UBA services). The NZCC also used

[288] NZCC (2010), Airports – Input Methodologies – Reasons, para. E2.44 – E2.46, 195-196

[289] NZCC (2015), Cost of capital for the UCLL and UBA pricing reviews, Final decision, para 174, p.41

[290] NZCC (2018), Guidelines for WACC determinations under the cost of capital input methodologies, Regulation under Part 4 of the Commerce Act 1986, para.26-27, p.13

[291] NZCC (19 November 2019), Fibre Input Methodologies: Draft decision – reasons paper, para X.2, p.6

[292] Dr Lally (2019), Estimation of the TAMRP , Chapter 2, p.4.

[293] NZCC (2010), Airports – Input Methodologies – Reasons, para E7.28, E7.125 p.270, 294

[294] NZCC (2010), Airports – Input Methodologies – Reasons, p.273-276

[295] NZCC (2010), Airports – Input Methodologies – Reasons, para E7.40, p.272

a TAMRP estimate of 7.0% for these determinations, after considering updated analysis from Dr Lally, who recommended the estimate based on the median of five different methods, rounded to the nearest 0.5% (Ibbotson, Siegel estimate version one and two, DGM estimate, Surveys). [296]

The Ibbotson approach is a simple historical averaging of excess returns using data from 1931 to 2018 (1931-2002, 2003-2018). The NZCC applies adjustments to account for the taxation changes and different taxation regimes and to account for the different RFR terms to maturity.[297] The Ibbotson approach is consistent with the HER approach, as both approaches draw on historical excess returns to estimate the MRP.

Dr Lally, the NZCC's consultant, suggests that the Ibbotson MRP estimate is biased as it fails to correct for the pronounced unanticipated inflation between 1926-1990. The Siegel version one approach attempts to correct this issue to estimating the standard MRP. The Siegel model adjusts the Ibbotson approach on the underlying assumption that TAMRP is stable over time by adding back into the estimation the average long-term real RFR and then deducting an improved estimate of the expected long-term real RFR.[298]

The Siegel 2 methodology is based on Siegel's observation that the average real TMR was similar across the three subperiods examined by him[299], leading him to conclude that the expected real TMR was stable over time. The methodology is broadly similar to the Wright approach. Therefore, Siegel 2 adjusts the Ibbotson approach on the underlying assumption that real total market returns are constant. The model estimates the expected real TMR from the historical average, proceeds to convert it to its current nominal counterpart using a current inflation forecast, and then deducts the current three-year RFR (net of tax) in accordance with the TAMRP equation above.[300] This is effectively the Wright approach.

The DGM approach is a three-stage model that "involves estimates of expected dividends for the first three years, followed by linear convergence over eight years from the expected growth rate in the third year to the long-run expected growth rate (applicable from year 11)".[301]

The survey methodology relies on surveys of investors' views on the TAMRP, which are based on the Fernandez annual survey. The NZCC also consider available estimates from practitioners in New Zealand as a cross-check.[302]

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296 See :NZCC (2016), Input methodologies review decisions, Topic paper: cost of capital issues, para.495, p.127-128 and Lally (2015), REVIEW OF SUBMISSIONS ON THE RISK-FREE RATE AND THE TAMRP FOR UCLL AND UBA SERVICES, Chapter 7, appendix, URL: https://comcom.govt.nz/__data/assets/pdf_file/0026/60677/Martin-Lally-Review-of-submissions-on-the-risk-ree-rate-and-the-TAMRP-for-UCLL-and-UCLL-services-13-Oct-2015.PDF

297 Dr Lally (2019), Estimation of the TAMRP, p.4-10

298 Dr Lally (2019), Estimation of the TAMRP, p.10-13

299 Siegel analyses real bond and equity returns in the US over the sub-periods 1802-1870, 1871-1925 and 1926-1990

300 Dr Lally (2019), Estimation of the TAMRP, p.13-15

301 See Dr Lally (2019), Estimation of the TAMRP, Chapter 5, p.15-19. Dr Lally applies the same DGM methodology in previous NZCC determinations, such as in Lally (2015), REVIEW OF SUBMISSIONS ON THE RISK-FREE RATE AND THE TAMRP FOR UCLL AND UBA SERVICES, Chapter 7.4, p.30-33

302 NZCC (19 November 2019), Fibre Input Methodologies: Draft decision – reasons paper, para. 3.963p.290

Given that the TAMRP is a market-wide parameter, the NZCC applies the estimated TAMRP of 7% to all sectors[303] and companies regulated under Part 4 of the Commerce Act of 1986.[304] In its recent decisions on fibre broadband, the NZCC affirmed the same methodology for MRP as it applies under Part 4.[305]

B.5.2.2. Estimation of RFR

The NZCC estimates the RFR using the term of the regulatory price setting period (typically 5 years) and a 3-month averaging window. The RFRs for the cost of equity and debt are estimated using the same methodology.[306] The RFR methodology is also consistent across the sectors regulated by the NZCC.[307] The RFR along with the debt premium are the only WACC parameters that need to be updated over time under the IMs.[308]

B.5.2.3. Views on Dividend Growth Model

The NZCC does not rely on any particular approach to estimating the TAMRP but considers a range of information sources and methodologies.[309] The regulator recognises that all estimation methods have disadvantages and no one method is optimal. Therefore, the NZCC place an equal weight across the different methodologies that they employ for the TAMRP estimation.[310]

The NZCC considered the Ibbotson, the Siegel version one, the Cornell, which represents a variant of the DGM,[311] and a survey method to estimate the TAMRP in 2010. The Cornell approach was replaced with the DGM in 2015 and has been applied ever since. Therefore, DGM is one of the methodologies used by the NZCC.

B.5.3. Determined Values

Table B.5 below sets out NZCC's estimated values of the MRP for its regulated entities, and RFR based on short-run market data.

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303 These include electricity distribution businesses (EDBs), Transpower, gas distribution businesses (GDBs), gas transmission businesses (GTBs) and airports according to NZCC (2018), Guidelines for WACC determinations under the cost of capital input methodologies, Regulation under Part 4 of the Commerce Act 1986, para.6, p.6

304 NZCC (2018), Review of Auckland International Airport's pricing decisions and expected performance (July 2017 – June 2022), Final report – Summary and analysis under section 53B(2) of the Commerce Act 1986, para. A206, p.144

305 NZCC (2020), Fibre input methodologies: Draft decision – reasons paper,1 9 November 2019, p.286-296.

306 NZCC (2015), Cost of capital for the UCLL and UBA pricing reviews, Final decision, para.10, p.7

307 See the relevant IM determination studies for airports, electricity and gas distribution and transmission referred to in: NZCC (2018), Guidelines for WACC determinations under the cost of capital input methodologies, Regulation under Part 4 of the Commerce Act 1986, Table 1, p.7

308 NZCC (2018), Guidelines for WACC determinations under the cost of capital input methodologies, Regulation under Part 4 of the Commerce Act 1986, para.2, p.5

309 See: NZCC (19 November 2019), Fibre Input Methodologies: Draft decision – reasons paper, para 3.963, p.290, NZCC (2015), Cost of capital for the UCLL and UBA pricing reviews, Final decision, para 191-192, p.45-46

310 See: Lally, Franks and Myers (2008),Recommendations to the New Zealand Commerce Commission on an Appropriate Cost of Capital Methodology, para.85, p.22, URL: https://comcom.govt.nz/__data/assets/pdf_file/0033/95577/Franks-Lally-and-Myers-Report-Recommendations-on-Appropriate-Cost-of-Capital-Methodology.pdf, NZCC (19 November 2019), Fibre Input Methodologies: Draft decision – reasons paper, para 3.962-3.971 p.289-292

311 ARERA (2015), DOCUMENTO PER LA CONSULTAZIONE 275/2015/R/COM CRITERI PER LA DETERMINAZIONE E L'AGGIORNAMENTO DEL TASSO DI REMUNERAZIONE DEL CAPITALE INVESTITO PER LE REGOLAZIONI INFRASTRUTTURALI DEI SETTORI ELETTRICO E GAS. ORIENTAMENTI INIZIALI, para.13.15, p.24

Table B.5: NZCC's determined MRP parameters (nominal)

Sector	EDBs & Wellington Airport	Transpower, GPBs (GasNet & Vector) and Airports (AIAL & CIAL)	Gas DSOs & TSOs	EDB DPP and Transpower IPP	(DPP) for Gas DSOs & for Gas TSOs (GPBs)
Regulatory period	2019-2020	2019-2020	2019-2020	2020-2025	2017-2022
TMR	8.27%	8.05%	7.72%	7.81%	8.99%
RFR	1.77%	1.46%	1.00%	1.12%	2.77%
MRP	6.50%	6.59%	6.72%	6.69%	6.22%

Source: NZCC (Mar 2017), Cost of capital determination GPBs DPP; NZCC (April 2019), Cost of capital determination EDBs and Wellington Airports ID; NZCC (July 2019), Cost of capital determination Transpower, GPBs and Airports ID; NZCC (Sept 2019), Cost of capital determination EDBs and Transpower; NZCC (Oct 2019), Cost of capital determination First Gas and Powerco GPBs.
Note: TMR calculated as TAMRP +Rf(1-Tc).

We convert NZCC's nominal TMR and RFR determinations into real CPI terms using the OECD's inflation forecast of 1.9 per cent, and the Fisher equation. Table B.6 sets out the MRP parameters in real CPI terms.

Table B.6: CC's determined MRP parameters (real)

Sector	EDBs & Wellington Airport	Transpower, GPBs (GasNet & Vector) and Airports (AIAL & CIAL)	Gas DSOs & TSOs	EDB DPP and Transpower IPP	(DPP) for Gas DSOs & for Gas TSOs (GPBs)
Regulatory period	2019-2020	2019-2020	2019-2020	2020-2025	2017-2022
TMR	6.38%	6.16%	5.84%	5.92%	7.08%
RFR	-0.13%	-0.43%	-0.88%	-0.77%	0.85%
MRP	6.50%	6.59%	6.72%	6.69%	6.22%

Source: NZCC (Mar 2017), Cost of capital determination GPBs DPP; NZCC (April 2019), Cost of capital determination EDBs and Wellington Airports ID; NZCC (July 2019), Cost of capital determination Transpower, GPBs and Airports ID; NZCC (Sept 2019), Cost of capital determination EDBs and Transpower; NZCC (Oct 2019), Cost of capital determination First Gas and Powerco GPBs. OECD inflation forecasts, https://data.oecd.org/price/inflation-forecast.htm
Note: TMR calculated as TAMRP +Rf(1-Tc).

Appendix C. Energy and Water Regulators

C.1. Economic regulation in the US

This case study sets out the approach by Public Utility Commissions in California, New York State and Pennsylvania for setting the rate of return. The case study is structured as follows:

- Background and objectives of US economic regulation
- State-level regulators approach to cost of equity estimation

C.1.1. Background and Objectives of economic regulation in the US

State-level regulators set allowed rate of returns through cost of capital proceedings

Economic regulators in the US typically set overall revenues, including an allowed rate of return on capital, through rate case applications, in which utilities file tariff applications and the regulator decides on the overall revenue requirement including the reasonable rate of return on a case-by-case basis.[312]

The FERC, which regulates the interstate transmission of electricity, natural gas and oil, generally prefers the discounted cash flow (DCF) model (the US term for the dividend growth model, DDM) but has not established a generic framework for estimating the allowed rate of return due to an overly complex system of special cases and legal concerns.[313]

US regulators typically rely on the DCF

In determining the allowed rate of return, US regulators typically consider evidence from the DCF (or DDM) model as well as the CAPM, giving more weight to the DCF, as set out below. The DCF model estimates the cost of equity by forecasting the latest dividend paid for one period divided by the stock price plus an expected dividend growth rate. This model has dominated US rate proceedings since its introduction in the late 1960s and early 1970s.[314]

An alternative approach to estimate the return on equity that has appeared in US rate cases is the CAPM, which defines the cost of equity as the sum of the risk free rate and the market return, adjusted by the equity beta.[315]

Legal principals applied to the regulators' decision on the appropriate rate of return

The so-called Hope decision in 1944 set the standard for determining just and reasonable returns for investor-owned utilities: "The return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and attract capital."[316]

The Supreme Court previously defined the proper rate of return in the so-called Bluefield decision in 1923: "A public utility is entitled to such rates as will permit it to earn a return on the value of the

312 J. Makholm (Nov 2015), A half-century of computing the cost of capital for utilities at NERA, p.17.

313 J. Makholm (Nov 2015), A half-century of computing the cost of capital for utilities at NERA, pp.14-15.

314 J. Makholm (Nov 2015), A half-century of computing the cost of capital for utilities at NERA, p.13.

315 J. Makholm (Nov 2015), A half-century of computing the cost of capital for utilities at NERA, pp.13-14.

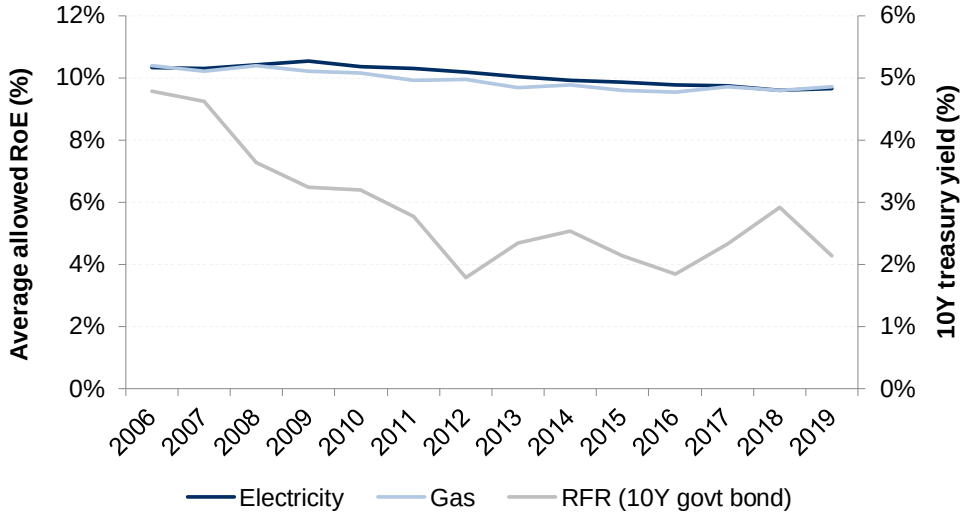
316 Federal Power Commission et al v. Hope Natural Gas Co, 320 U.S. 591 (1944), p. 603.

property which it employs for the convenience of the public equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties, but it has no constitutional right to profits such as are realized or anticipated in highly profitable enterprises or speculative ventures."[317]

Allowed return on equity has not fallen despite decreasing interest rates

S&P conducted a survey of all major rate case decisions in the US until 2019. Figure C.1 below shows that the allowed return on equity has remained relatively stable between 2006 and 2019, despite declining US government yields.

Figure C.1: US regulators kept stable cost of equity allowances despite falling treasury yields



Source: S&P Global Market Intelligence (2020), RRA Regulatory Focus – Major Rate Case Decisions 2019
Note: We show overall return on equity as information on individual parameters is not available, given the US regulators' reliance on the DCF as a primary model, which produces a return on equity directly.

Over the period 2006-2019, yields on US government bonds (proxied by the 10-year treasury yield) have fallen dramatically, but the allowed returns on equity for regulated energy utilities have not followed. The median return on equity was remarkably stable at around 10 per cent (nominal, pre-tax) over the whole period 2006-2019.[318]

C.1.2. Individual rate case decisions

As set out below, we cover the regulatory approach to setting the allowed rate of return in California, New York State and Pennsylvania.

C.1.2.1. Energy regulation in California

The California Public Utilities Commission (CPUC) regulates privately owned electric, natural gas, telecommunications, water, railroad, rail transit, and passenger transportation companies, in addition

[317] Bluefield Waterworks & Improvement Co. v. Public Service Commission of the State of West Virginia et al., 262 U.S. 679, 693 (1923).

[318] We observe a slight decline in allowed returns on equity of around 50bps over the period since 2006, compared to a 250-300 bps reduction in US treasury yields over this period. However, this marginal decline in allowed return on equity is likely explained by the decline in inflation expectations rather than a decline in the real cost of equity.

to authorizing video franchises in California. At its latest decision on the allowed cost of capital in 2019, the CPUC decided on the allowed return on equity for Californian energy utilities PG&E, SCE, SDG&E and SoCalGas.

Hope and Bluefield decisions set legal standard for the CPUC

In its latest cost of capital decision in 2019, the CPUC sets out that the Bluefield and Hope decisions as outlined above establish the legal standard for setting the fair rate of return.[319]

The CPUC emphasises that it attempts "to set the ROE at a level of return commensurate with market returns on investments having corresponding risks, and adequate to enable a utility to attract investors to finance the replacement and expansion of a utility's facilities to fulfill its public utility service obligation". And to accomplish this objective, it has consistently evaluated analytical financial models as a starting point to arrive at a fair return on equity.[320]

CPUC considers evidence from DCF, CAPM and risk premium model

The CPUC outlines that the CAPM, the risk premium model[321] as well as the DCF model are the most commonly used financial models in its return on equity proceedings.[322] With regards to the DCF approach, the CPUC allows for different methods to be used by the parties, which include constant growth and multi-stage growth assumptions.[323] The CPUC also notes that in arriving at its final decision on the allowed return on equity, it applies informed judgement, instead of relying on the precision of financial models, noting that all models have flaws and it does not adopt any particular financial model.[324] In making its determination, the court draws on evidence from all three approaches.

The rate case published proceedings do not provide any details on the estimation of the CAPM parameters, i.e. there is no further published details on the estimation of the MRP and ERP.

Determined values

Table C.1 below sets out the allowed return on equity for PG&E, SCE, SDG&E and SoCalGas.

Table C.1: CPUC allowed return on equity (nominal)

Sector	**California**			
Regulatory period	2020			
Regulated utility	PG&E	SCE	SDG&E	SoCalGas
Cost of equity	10.25%	10.30%	10.20%	10.05%

Source: Application 19-04-014 Decision, pp.41-43.

319 Application 19-04-014 Decision, p.16.

320 Application 19-04-014 Decision, p.16.

321 The risk premium model analyses the historical relationship between allowed returns in US rate case decisions and a US Treasury bond rate. The resulting estimate, a "risk premium", can then be added on top of the current RFR to estimate the ROE.

322 Application 19-04-014 Decision, p.20.

323 Application 19-04-014 Decision, p.24

324 Application 19-04-014 Decision, p.25.

C.1.2.2. Energy regulation in New York State

The New York Public Service Commission (Commission) is the public utilities commission of the New York state government that regulates and oversees the electric, gas, water, and telecommunication industries in New York as part of the Department of Public Service.

The Commission places more weight on the DCF than on the CAPM

In its latest rate decision for Orange & Rockland in 2018, the Commission allows for a nominal return on equity of 9 per cent, based on evidence presented in the Joint Proposal.[325] It notes that the allowed return on equity should preserve the company's credit ratings while imposing a reasonable cost on ratepayers.

The Joint Proposal's estimated ROE of 9 per cent is based on the DCF model as well as the CAPM, with the DCF given a weight of two-thirds and CAPM given a weight of one-third. The Commission notes that this methodology, often referred to as the Generic Finance Case methodology, has been in use consistently by the Commission since the mid-1990s.[326]

Regarding the DCF analysis, the Joint Proposal used a two-stage model with inputs derived from Value Line applied to a proxy group of similar utility companies.

Regarding the CAPM analysis, the Joint Proposal draws on the average of 10-year and 30-year US Treasury Bond yields for the RFR and the MRP derived using Merrill Lynch's Quantitative Profiles.[327]

C.1.3. Water regulation in Pennsylvania

The Pennsylvania Public Utility Commission (PUC) is the public utility commission in Pennsylvania. It oversees public utility and services operations in Pennsylvania, in sectors including water, energy, telecommunications, and transportation.

Hope and Bluefield decisions set legal standard for the Pennsylvania PUC

The Hope and Bluefield decisions, as well as Pennsylvania statutory law, set the legal framework for setting fair and reasonable returns in Pennsylvania.[328]

Specifically, in its latest rate case in March 2020, the Pennsylvania PUC emphasis the Bluefield decision, as set out in section C.1.1.[329]

According to Pennsylvania statutory law, any determined rate by the Pennsylvania PUC has to be just and reasonable.[330]

Pennsylvania PUC mainly draws on the DCF, cross-checked against CAPM

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325 Case 18-E-0067, Order adopting terms of joint proposal and establishing electric and gas rate plans, p.

326 See: Case 91-M-0509, Proceeding to Consider Financial Regulatory Policies for Utilities, Recommended Decision (issued July 19, 1993).

327 Case 18-E-0067, Order adopting terms of joint proposal and establishing electric and gas rate plans, p.24.

328 Opinion and Order - 3010958-OSA - 03-26-20 PM - Exceptions to Recommended Decision - Pa PUC et al v Twin Lakes Utilities Inc - Rate Case Water, p.8; Cawley and Kennard (2018), A guide to utility ratemaking, p.81.

329 Bluefield, 262 U.S. at 692-693.

330 Code § 1308(c).

The Pennsylvania PUC, in its latest rate case decision in March 2020 for the water company Twin Lakes, decided on an ROE of 9.23 per cent.[331] This decision was based on the judges determination, as it considers that this rate strikes *"the correct balance between the consumers' interests in safe, adequate and affordable water service, and the Company's right to a reasonable return to cover its cost of operation, to achieve a fair Rate of Return calculation."*[332]

The determined ROE of 9.24 per cent is based on the DCF method, cross-checked against the CAPM estimate.[333] The Pennsylvania PUC has also historically mainly relied on the DCF model to inform its ROE determination.[334]

Regarding the DCF method, the expert report draws on the standard 2-stage DCF, using an average growth rate based on various sources, including Value Line and Yahoo! Finance. Its DCF estimate results in an ROE of 9.23 per cent.[335]

Regarding the CAPM estimate, the expert report draws on projected yields on the 10-year Treasury notes and returns from Value Line's 1700 Stocks and the S&P 500 Index. Its CAPM estimate results in an ROE of 8.68 per cent, which only serves as a cross-check of the DCF result.[336]

331 Opinion and Order - 3010958-OSA - 03-26-20 PM - Exceptions to Recommended Decision - Pa PUC et al v Twin Lakes Utilities Inc - Rate Case Water, p.48.

332 Opinion and Order - 3010958-OSA - 03-26-20 PM - Exceptions to Recommended Decision - Pa PUC et al v Twin Lakes Utilities Inc - Rate Case Water, p.48.

333 Opinion and Order - 3010958-OSA - 03-26-20 PM - Exceptions to Recommended Decision - Pa PUC et al v Twin Lakes Utilities Inc - Rate Case Water, p.47.

334 See, for example: Pa. P.U.C v. PECO Energy Co., 87 Pa. P.U.C. 184, 212 (1997); Pa. P.U.C. v. City of Betlehem, 84 Pa. P.U.C. 275, 304-05 (1995); Pa. P.U.C. v. Media Borough, 77 Pa. P.U.C. 446, 481 (1992); Pa. P.U.C. v. Philadelphia Suburban Water Co., 71 Pa. P.U.C. 593, 623-32 (1989); Pa. P.U.C. v. Western Pennsylvania Water Co., 67 Pa. P.U.C. 529, 559-70 (1988); Pa. P.U.C. v. Consumers Pennsylvania Water Company – Roaring Creek Division, 87 Pa. P.U.C. 826 (1997).

335 Main brief of the Bureau of Investigation and Enforcement, p.61.

336 Main brief of the Bureau of Investigation and Enforcement, p.62.

C.2. Economic Regulation in Canada

We provide a general overview to setting the allowed return on equity in Canada. We then review the approach of the Ontario energy regulator, the Ontario Energy Board (OEB), to setting the allowed return.

C.2.1. General Overview

Canada uses a "Formula" for cost of capital determinations [337]

Beginning in 1994, Canadian regulators began to adopt automatic adjustment mechanisms for setting the cost of capital in utility rates based on a fixed spread with observed movements in yields on Canadian long-term bonds:

$$\text{Cost of Equity}^{t} = \text{Cost of Equity}^{t-1} + .75(\text{Yield}^{t} - \text{Yield}^{t-1})$$

The formula (and then variants of this formula) was first introduced in British Columbia in 1994 before being adopted by Manitoba, National Energy Board (NEB), Ontario (which we described below), Quebec, and finally Alberta in 2004. Not all major Canadian jurisdictions implemented formula-based cost of equity computations. However, the jurisdictions retaining case-by-case analyses seemed to set the cost of equity in a manner that was highly sensitive to changes in the bond markets. The use of the bond-yield-based formula resulted in driving the allowed cost of capital in Canada well below that observed in the United States, resulting in widespread objection by the subject Canadian utilities, although Canadian regulators have also started to abandon the formula.[338]

Legal principals applied to the regulators' decision on the appropriate rate of return

The overall legal framework for setting charges in Canada is very similar to the US. From the Constitutional foundation to administrative practices, accounting practices, and judicial review, Canada and the US have very similar regulatory environments.

US Hope and Bluefield decisions, as discussed in Appendix C.1 are cited in Canadian rate cases. Judicial decisions in Canada include the right to earn a "fair return" on investment, as determined by the opportunity cost of capital.[339] Canada has its own version of the Hope decision (which rests not on constitutional principles, as such, but on legal precedent): Northwest Utilities v. City of Edmonton, S.C.R. 186 (NUL 1929). [340]

C.2.2. Background and Objectives of the Regime

The OEB is the independent regulator of natural gas distribution utilities and electric transmission and distribution companies in Ontario.[341]

The OEB's regulatory objectives and authority with respect to electricity and natural gas regulation are mainly set out in the Ontario Energy Board Act of 1998 and the Electricity Act of 1998.[342] The regulator pursues the following objectives in relation to its responsibilities in the electricity sector:

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337 Makholm, J. (15 November 2015) A Half Century of Computing the Cost of Capital for Utilities at NERA, p. 15

338 Makholm, J. (15 November 2015) A Half Century of Computing the Cost of Capital for Utilities at NERA, p. 16

339 Makholm, J. (15 November 2015) A Half Century of Computing the Cost of Capital for Utilities at NERA, p. 8-9

340 Makholm, J. (15 November 2015) A Half Century of Computing the Cost of Capital for Utilities at NERA, p. 8-9

341 OEB (11 December 2009), EB-2009-0084 Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, p.15, URL: https://www.oeb.ca/oeb/_Documents/EB-2009-0084/CostofCapital_Report_20091211.pdf

342 See: https://www.oeb.ca/about-us/mission-and-mandate and https://www.ontario.ca/laws/statute/98o15#BK32

- To inform consumers and protect their interests with respect to prices and the adequacy, reliability and quality of electricity service
- To promote economic efficiency and cost effectiveness in the generation, transmission, distribution, sale and demand management of electricity and to facilitate the maintenance of a financially viable electricity industry.
- To promote electricity conservation and demand management in a manner consistent with the policies of the Government of Ontario, including having regard to the consumer's economic circumstances.
- To facilitate the implementation of a smart grid in Ontario.
- To promote the use and generation of electricity from renewable energy sources in a manner consistent with the policies of the Government of Ontario, including the timely expansion or reinforcement of transmission systems and distribution systems to accommodate the connection of renewable energy generation facilities

The OEB pursues the following objectives in its regulation of the gas sector:

- To facilitate competition in the sale of gas to users.
- To inform consumers and protect their interests with respect to prices and the reliability and quality of gas service
- To facilitate rational expansion of transmission and distribution systems.
- To facilitate rational development and safe operation of gas storage.
- To promote energy conservation and energy efficiency in accordance with the policies of the Government of Ontario, including having regard to the consumer's economic circumstances.
- To facilitate the maintenance of a financially viable gas industry for the transmission, distribution and storage of gas.
- To promote communication within the gas industry

C.2.3. Estimation Methodology

The OEB uses a formulaic approach to determine and update the cost of equity. The approach is a modified CAPM methodology and "Equity Risk Premium" (ERP) approach.[343]

[343] OEB (11 December 2009), EB-2009-0084 Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, p.26

First, the OEB estimates the base period cost of equity for all regulated utilities using an ERP approach.[344] The cost of equity under the ERP approach is determined as the Long Canada Bond Forecast (LCBF) rate plus an equity risk premium (ERP).[345] The LCBF is defined for the year as:[346]

- the average of the 3-month and 12-month forecasts of the 10-year sovereign bond yields; plus
- the average of the observed spreads between 10- and 30-year sovereign bond yields, for each business day in the month.

The LCBF components are based on data from the most recent Consensus Forecast issue.

The ERP component is a "utility-specific risk premium the analyst has estimated based on historical ERP evidence and forward-looking considerations".[347] The OEB calculates the ERP in the base period as an average of the direct and indirect ERP recommendations derived using multiple methods and submitted by the participants during the consultation process. The methodology includes a premium of 50 bps for flotation and transaction costs in the ERP.[348] The regulator initially set a base period ROE at 9.75 percent comprising a 4.25 percent base LCBF and 5.50 percent ERP estimate.[349]

Second, the OEB annually adjusts the cost of equity estimate through the following formula:

$$ROE_t = 9.75\% + 0.5 \times (LCBF_t - 4.25\%) + 0.5 \times (UtilBondSpread_t - 1.415\%)$$

Where ROE_t is the return on equity in year t, the $LCBF_t$ is the the Long Canada Bond Forecast estimate for year t and the $UtilBondSpread_t$ term is defined as the "the average spread of 30-year A-rated Canadian Utility bond yields over 30-year Government of Canada bond yields over all business days in the month three (3) months in advance of the implementation date for rates". The 9.75 percent, 4.25 percent and 1.415 percent figures represent the base ROE, LCBF and UtilBondSpread respectively. The 0.5 coefficient represents the adjustment factor for the LCBF and the UtilBondSpread term.[350]

[344] OEB (11 December 2009), EB-2009-0084 Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, p.5

[345] OEB(20 December 2006), Report of the Board on Cost of Capital and 2nd Generation Incentive Regulation for Ontario's Electricity Distributors, p.17, URL: https://www.oeb.ca/documents/cases/EB-2006-0088/report_of_the_board_201206.pdf

[346] OEB (11 December 2009), EB-2009-0084 Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, Chapter Appendix A

[347] OEB (11 December 2009), EB-2009-0084 Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, Chapter. Appendix A, p.I-II

[348] OEB (20 December 2006), Report of the Board on Cost of Capital and 2nd Generation Incentive Regulation for Ontario's Electricity Distributors, p.17

[349] OEB (11 December 2009), EB-2009-0084 Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, Chapter. Appendix B, p.V

[350] OEB (11 December 2009), EB-2009-0084 Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, Chapter. Appendix B, p.V-VII

The OEB, based on the adjustment formula, determined a return on equity of 8.52 percent for the period between 1 January 2020 and 31 December 2020.[351] The regulator applies the same rate-setting methodology across all rate-regulated entities irrespective of ownership.[352]

C.2.4. Regulatory approach to estimating the MRP

The OEB determines the ERP in the initial stage as an average of the direct and indirect ERP recommendations submitted by the participants in the consultation process; however, the regulatory proceedings provide no further detail. The OEB estimated an initial ERP of 5.50 percent that includes a premium of 50 bps for flotation and transaction costs.[353] The ERP is also described as "utility specific" parameter, and therefore not directly comparable to the generic market ERP (or MRP) of the CAPM.

C.2.5. Estimation of RFR

Based on the regulator's methodology, the LCBF is the closest to a RFR estimate calculated as a 30-year sovereign bond yield forecast for year t.354 However, this is not specifically designated as the RFR.

[351] See all cost of capital updates: https://www.oeb.ca/industry/rules-codes-and-requirements/cost-capital-parameter-updates

[352] OEB (11 December 2009), EB-2009-0084 Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, p.25

[353] OEB (11 December 2009), EB-2009-0084 Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, p.37 and OEB(20 December 2006), Report of the Board on Cost of Capital and 2nd Generation Incentive Regulation for Ontario's Electricity Distributors, p.17

[354] OEB (11 December 2009), EB-2009-0084 Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, Chapter. Appendix A, p.II

C.3. CRE's approach to TMR/MRP estimation at its latest regulatory decisions

This case study sets out the approach of the Commission de Regulation de l'Energie (CRE) to estimating the TMR/MRP at its latest regulatory decision for electricity as well as gas companies.

C.3.1. Background and Objectives of the Regime

In France, the CRE regulates gas and electricity network operators.

The French Energy Code sets out the duties and powers of the CRE, in particular the following sections:

- Article L. 134-2, 4: Empowers CRE to specify the conditions for the use of natural gas transmission and distribution networks, including the methodology for establishing the tariffs for the use of these networks and tariff evolutions.
- Article L. 452-1: States that these tariffs are established in a transparent and non-discriminatory manner to cover all costs borne by the transmission network operators and the storage infrastructure operators, insofar as these costs correspond to those of efficient operators. These costs take into account the characteristics of the service rendered and the costs related to this service, and include the obligations established by law and regulations as well as those costs resulting from the execution of public service missions and contracts mentioned in I of Article L. 121-46.
- Article L. 452-3: Provides that CRE shall determine on changes to the tariff with, where applicable, the modifications to the level and structure of the tariff that it deems justified in view, in particular, of the analysis of the operators' accounts and any forecast changes in operating and investment expenses. CRE's determination may provide for a multi-annual framework for the changes in tariffs as well as appropriate short- or long-term incentive measures to encourage operators to improve their performance related in particular, to the quality of service provided, integration of the internal gas market, the security of supply and productivity efforts.

The CRE publishes its regulatory decisions for a regulatory period of four years after an extensive consultation process. The consultation process involves the commissioning of an expert report on the WACC by an external consultancy, usually recommending a range of values for all relevant WACC parameters. However, the CRE does not need to follow the recommendations of its consultant and it also does not explain in detail the reasons for its choice of a specific value in the actual decision document.

Regarding gas regulation, the CRE has published regulatory decisions for gas TSOs and DSOs in January 2020, valid for a four-year period starting in mid-2020.[355] As part of the preceding public

[355] For gas TSOs: CRE (Jan 2020), Délibération de la Commission de régulation de l'énergie du 23 janvier 2020 portant décision sur le tarif d'utilisation des réseaux de transport de gaz naturel de GRTgaz et Teréga, Déliberation No. 2020-012;

For gas DSOs: CRE (2020a), Délibération de la Commission de régulation de l'énergie du 23 janvier 2020 portant décision sur le tarif péréqué d'utilisation des réseaux publics de distribution de gaz naturel de GRDF Déliberation No. 2020-010.

consultation, CRE has commissioned two expert reports, one for transmission[356] and one for distribution[357] arriving at identical WACC ranges. [358]

Regarding electricity regulation, the CRE has published the regulatory decision for electricity transmission in November 2016, valid for a four-year period starting in August 2016.[359] The CRE does not determine a cost of capital for electricity DSOs.[360]

C.3.2. Estimation of MRP and RFR

C.3.2.1. CRE draws on the HER Approach

The CRE draws on the HER approach for both its 2020 decision for gas TSOs and DSOs and its 2016 decision for electricity TSOs, as set out below. It does not discuss the Wright approach explicitly.

C.3.2.2. CRE's approach to estimating the MRP

Gas

Regarding gas regulation, the CRE has determined a market risk premium of 5.2 per cent over the regulatory period.[361] The CRE draws on the estimated MRP range from its consultant, Compass Lexecon (CL).

CL has recommended a MRP range between 4.15 per cent, based on the mid-point of the arithmetic and geometric mean of historical average returns in France between 1900 and 2018, and 6.0 per cent based on Fernandez's survey of MRP estimates in 2019.[362]

CL criticises the forward-looking approach to estimating the MRP using a DGM, noting that this approach requires many assumptions, resulting in sensitive estimation results as minor changes in the assumptions can lead to a significant change in the resulting estimate of the MRP. [363] Hence, CL does not place any weight on the forward-looking approach in estimating the MRP. The CRE does not comment on the use of the DGM.

Electricity

356 Compass Lexecon (July 2019), Estimation du CMPC des activités régulées de transport de gaz pour la période 2020-2023.

357 Compass Lexecon (July 2019), Estimation du CMPC des activités régulées de distribution de gaz pour la période 2020-2023.

358 The decisions for gas companies are broadly consistent with respect to the determination of the WACC. In the following, we reference to the gas TSO decision.

359 CRE (2016), Délibération de la Commission de régulation de l'énergie du 17 novembre 2016 portant décision sur les tarifs d'utilisation des réseaux publics d'électricité dans le domaine de tension HTB.

360 There is no WACC determination for electricity DSOs due to the specificities of electricity distribution in France. Source: CEER (Jan 2020), Report on regulatory frameworks for European energy networks 2019, p.37.

361 CRE (Jan 2020), Délibération de la Commission de régulation de l'énergie du 23 janvier 2020 portant décision sur le tarif d'utilisation des réseaux de transport de gaz naturel de GRTgaz et Teréga, Déliberation No. 2020-012, p.41.

362 Compass Lexecon (July 2019), Estimation du CMPC des activités régulées de transport de gaz pour la période 2020-2023, para.5.33, p.20.

363 Compass Lexecon (July 2019), Estimation du CMPC des activités régulées de transport de gaz pour la période 2020-2023, para.5.27, pp.19-20.

Regarding electricity networks, the CRE has determined a MRP of 5 per cent at its 2016 decision.[364]

Its consultant, Frontier, suggested a MRP range of 4.5 to 5.4 per cent, drawing on the arithmetic average of MRP estimates for Europe and France, based on the estimates of Dimson, Marsh and Staunton (DMS).[365] Frontier also notes that its MRP range is consistent with regulatory precedent in Europe as well as benchmark studies.[366] The CRE does not comment on the use of the DGM.

C.3.2.3. Estimation of RFR

Gas

Regarding gas networks, the CRE has determined a nominal RFR of 1.7 per cent, drawing on the 10-year average yield of French government bonds with a maturity of ten years. The CRE notes that using 10-year government bonds is in line with other regulators approaches. Additionally, it notes that the long-term averaging period makes it possible to take into account changes in the financial markets, while maintaining stable and foreseeable conditions for remunerating energy infrastructure in France.[367]

CL also considers that the ten-year averaging period and a ten-year maturity is consistent with the approach of other regulators and the academic literature.[368]

Electricity

Regarding electricity networks, the CRE has determined a nominal RFR of 2.7 per cent in its 2016 decision.[369] Frontier, its consultant, suggested a RFR range of 2.6 to 3.4 per cent based on the long-term average yield of French government bonds with a maturity of 10 and 30 years, averaged over a period starting from the financial crisis in 2008.[370]

C.3.3. Determined Values

Table C.2 below sets out CRE's estimated values for the MRP of 5 per cent for Electricity TSOs and 5.2 per cent for Gas DSOs and Gas TSOs and RFR based on long-run market data.

Table C.2: CRE's range for the MRP (nominal)

Sector	Electricity TSO	Gas DSO/TSO
Regulatory period	2017-2021	2020-2023
TMR	7.7%	6.9%
RFR	2.7%	1.7%
MRP	5%	5.2%

364 CRE (2016), Délibération de la Commission de régulation de l'énergie du 17 novembre 2016 portant décision sur les tarifs d'utilisation des réseaux publics d'électricité dans le domaine de tension HTB, p.56.

365 Frontier (July 2016), Audit du taux de remuneration d'Enedis, p.13.

366 Frontier (July 2016), Audit du taux de remuneration d'Enedis, p.13.

367 CRE (Jan 2020), Délibération de la Commission de régulation de l'énergie du 23 janvier 2020 portant décision sur le tarif d'utilisation des réseaux de transport de gaz naturel de GRTgaz et Teréga, Déliberation No. 2020-012, p.41.

368 Compass Lexecon (July 2019), Estimation du CMPC des activités régulées de transport de gaz pour la période 2020-2023, para.3.23, p.9.

369 CRE (2016), Délibération de la Commission de régulation de l'énergie du 17 novembre 2016 portant décision sur les tarifs d'utilisation des réseaux publics d'électricité dans le domaine de tension HTB, p.56.

370 Frontier (July 2016), Audit du taux de remuneration d'Enedis, p.7.

Source: CRE (Nov 2016), Délibération de la Commission de régulation de l'énergie du 17 novembre 2016 portant décision sur les tarifs d'utilisation des réseaux publics d'électricité dans le domaine de tension HTB, p. 56; CRE (Jan 2020), Délibération de la Commission de régulation de l'énergie du 23 janvier 2020 portant décision sur le tarif d'utilisation des réseaux de transport de gaz naturel de GRTgaz et Teréga, Déliberation No. 2020-012, p.41.
Note: TMR calculated as MRP+RFR.

We convert CRE's nominal TMR and RFR determinations into real CPI terms using the ECB's inflation forecasts and the Fisher equation. Table C.3 sets out the MRP parameters in real CPI terms.

Table C.3: CRE's range for the MRP (real CPI)

Sector	Electricity TSO	Gas DSO/TSO
Regulatory period	2017-2021	2020-2023
TMR	5.9%	5.2%
RFR	0.9%	0%
MRP	5%	5.2%

Note: TMR calculated as MRP+RFR. To convert nominal values into real CPI values, we assume a CPI inflation of 1.8 per cent over the regulatory period 2017-2021 for electricity TSOs and a CPI inflation of 1.7 per cent over the regulatory period 2020-2023 for gas DSOs/TSOs. These inflation assumptions are long-term (5 year) CPI inflation forecasts published by the ECB to cover the regulatory period. Source: ECB inflation forecasts. Link:
https://www.ecb.europa.eu/stats/ecb_surveys/survey_of_professional_forecasters/html/table_hist_hicp.en.html

C.4. BNetzA's approach to TMR/MRP estimation at its latest regulatory decisions

This case study reviews the approach of the Bundesnetzagentur (BNetzA) to estimating the TMR/MRP at its latest regulatory decision for electricity as well as gas companies.

C.4.1. Background and Objectives of the Regime

In Germany, the BNetzA and the regulatory authorities of the federal states are responsible for regulation of the gas and electricity networks. The regulation of network operators is governed by the Energy Sector Law (EnWG), the incentive regulation (ARegV) as well as network charges ordinances (StromNEV[371] and GasNEV[372] respectively).

The cost of capital is regulated by the network tariff ordinances (NEV) for both electricity and gas. Specifically, the NEV includes instructions for determining the appropriate regulatory cost of equity in section 7. The regulatory cost of equity is calculated as a base rate plus a risk premium to cover business risks of network operators. The NEV specifies the series and averaging period to be used for estimating the RFR and includes three criteria to be taken into account when calculating the risk premium: 1) market conditions on national and international capital markets and valuations of network operators on these markets, 2) the average return of equity by foreign network operators, and 3) the observed, quantifiable business risks of network operators.[373]

The analysis presented below is based on its most recent cost of capital decision in 2016, which is applicable for the current the regulatory period from 2018-2022 (gas) and 2019-2023 (electricity).[374]

C.4.2. Estimation of MRP and RFR

C.4.2.1. BNetzA draws on the HER Approach

The BNetzA rejects the Wright approach, drawing on the view of the Federal Supreme Court that the Wright approach is not suitable to determine the MRP as well as its consultant, Frontier. In particular, the BNetzA notes the lack of a clear positive or negative relationship between the MRP and the RFR.[375] Furthermore, the BNetzA provides evidence based on studies from Hoffjan and Posch (2015) and Stehle (2016), showing that there is no inverse relationship between the MRP and RFR.

Based on above assessment, the BNetzA concludes that there is no compelling reason to deviate from its HER approach as outlined below.[376]

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371 Stromnetzentgeltverordung. Link: https://www.gesetze-im-internet.de/stromnev/

372 Gasnetzentgeltverordnung. Link: https://www.gesetze-im-internet.de/gasnev/

373 StromNEV section 7(5).

374 For electricity: BNetzA (Oct 2016), BK4-16-160;

For gas: BNetzA (2016), BK4-16-161. In the following, we make references to the electricity decision only, given that the two decisions are identical in content and structure.

375 BNetzA (Oct 2016), BK4-16-160, p.13.

376 BNetzA (Oct 2016), BK4-16-160, p.14.

C.4.2.2. BNetzA's approach to estimating the MRP

The BNetzA estimates the MRP based on long-run historical return data, drawing on the Dimson, Marsh and Staunton (DMS) database, covering the period 1900-2015 for 23 countries. The BNetzA criticises MRP estimation methodologies based on model-based forecasts and surveys among market participants, noting that results based on these approaches are broadly driven by subjective assumptions. Hence, it prefers analysing historical returns due to their objectivity and transparency.[377] It does not discuss the DGM explicitly. Additionally, the BNetzA argues that MRP estimation based on historical data is widely used among regulators and that capital markets are sufficiently integrated to justify the use of a global reference portfolio. [378]

The BNetzA determines a real MRP of 3.8 per cent, based on the average of the arithmetic mean of the MRP of 4.4 per cent and the geometric mean of 3.2 per cent, drawing on long-term global equity returns relative to medium-term government bonds based on the DMS database.[379] It notes that its approach is consistent with previous decisions.[380]

Network operators appealed against the approach chosen by BNetzA and the court of first instance, the OLG Dusseldorf agreed with the network operators. The OLG argued that current market conditions are not adequately reflected in a purely backward-looking estimation of the MRP and that BNetzA must not simply update its previous formula when market conditions signal increased risk. [381]

However, following an appeal by BNetzA, the Federal Supreme Court reinstated the BNetzA determination. In overturning the OLG decision, the Supreme Court ruled that BNetzA's low equity risk premium is likely compensated by a higher than usual risk-free rate and that the overall level of the cost of equity appears sufficient; thereby implicitly endorsing a HER approach.[382]

C.4.2.3. Estimation of RFR

Regarding the estimation of the RFR, the NEV instructs the BNetzA to calculate the mean of the current yield of all bonds submitted by domestic companies and various state entities over the past ten calendar years, based on monthly yield data published by the Bundesbank. [383] The published interest rate (referred to as "Umlaufrendite") is an average of bonds with an average maturity of more than three years. The BNetzA determines a nominal RFR of 2.4 per cent, drawing on the average yield of the bonds as outlined above over the years 2006 to 2015.[384]

While BNetzA is required by ordinance to use a 10-year average of the Umlaufrendite, there has been some debate about whether BNetzA should use long-term bonds only. BNetzA argues that alternative approaches, e.g. with different maturities or the term-structure curve, have been rejected by courts in the previous determination, and the regulator therefore sees no reason to change its approach in the current decision.[385]

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377 BNetzA (Oct 2016), BK4-16-160, p.9.

378 BNetzA (Oct 2016), BK4-16-160, p.10.

379 BNetzA (Oct 2016), BK4-16-160, pp.11-12.

380 BNetzA (Oct 2016), BK4-16-160, p.12.

381 OLG Düsseldorf (2018), Decision VI-3 Kart 319/16 [V], 22 March 2018.

382 Bundesgerichtshof (2019): Beschlüsse EnVR 41/18 und EnVR 52/18.

383 StromNEV, section 7(4).

384 BNetzA (Oct 2016), BK4-16-160, p.4.

385 BNetzA (Oct 2016), BK4-16-160, p.6.

C.4.3. Determined Values

Table C.4 below sets out BNetzA's estimated values for the MRP of 5 per cent for Electricity TSOs/DSOs and 5.2 per cent for Gas TSOs/DSOs and RFR based on long-run market data.

Table C.4: BNetzA's range for the MRP (nominal)

Sector	Electricity TSO / DSO	Gas TSO / DSO
Regulatory period	2019-2023	2018-2022
TMR	6.29%	6.29%
RFR	2.49%	2.49%
MRP	3.80%	3.80%

Source: BNetzA (Oct 2016), BK4-16-160, pp.11-12; BNetzA (Oct 2016), BK4-16-160, p.4.
Note: TMR calculated as MRP+RFR.

We convert BNetzA's nominal RFR determination into real CPI terms using the ECB's inflation forecasts and the Fisher equation. Table C.5 sets out the MRP parameters in real CPI terms.

Table C.5: BNetzA's range for the MRP (real CPI)

Sector	Electricity TSO / DSO	Gas TSO / DSO
Regulatory period	2019-2023	2018-2022
TMR	4.48%	4.38%
RFR	0.68%	0.58%
MRP	3.8%	3.8%

Note: TMR calculated as MRP+RFR. To convert nominal values into real CPI values, we assume a CPI inflation of 1.8 per cent over the regulatory period 2019-2023 for electricity TSOs/DSOs and a CPI inflation of 1.9 per cent over the regulatory period 2018-2022 for gas DSOs/TSOs. These inflation assumptions are long-term (5 year) CPI inflation forecasts published by the ECB to cover the regulatory period. Source: ECB inflation forecasts. Link:
https://www.ecb.europa.eu/stats/ecb_surveys/survey_of_professional_forecasters/html/table_hist_hicp.en.html

C.5. ARERA's approach to TMR/MRP estimation

This case study sets out the approach of the Italian regulator of the electricity and gas sector Autorita di Regolazione per Energia Reti e Ambiente (ARERA) to estimating the TMR/MRP for energy companies for the current regulatory period 2016-2021.

C.5.1. Background and Objectives of the Regime

ARERA is the regulator of the electricity and gas sector (as well as the water services, waste cycle and district heating sectors) in Italy. Law No.481 of 14 November 1995, under which ARERA was established, establishes the objectives to be pursued through regulatory and control activities. The tariff regulations must:

- Be "certain, transparent, and based on predefined criteria";
- Protect the interests of users and consumers
- Ensure the promotion of competition and efficiency in public utility services, as well as adequate levels of quality in the services themselves in terms of economy and profitability, ensuring their usability and diffusion in a homogeneous way nationally.
- Balance operators' economic and financial objectives with general social objectives of environmental protection and the efficient use of resources.[386]

C.5.2. Estimation of MRP and RFR

In December 2015, the Italian energy regulator approved Resolution 583/2015/R/com introducing a new methodology and criteria for determining the parameters of the allowed cost of capital for gas and electricity transmission and distribution operators in Italy.[387]

Annex A to the Resolution ("TIWACC" hereafter) sets out the detailed criteria to determine and update each parameter for a six-year period between 1 January 2016 and 31 December 2021 (2016-21).[388] The regulatory period has been divided into two sub-periods of three years each (2016-18 and 2019-21).

C.5.2.1. ARERA has confirmed its use of the Wright Approach

Contrary to its previous approach, since 2015 ARERA decided to adopt a Wright approach to estimating the allowed cost of equity for electricity and gas transmission and distribution companies,

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386 ARERA (2015), CRITERI PER LA DETERMINAZIONE E L'AGGIORNAMENTO DEL TASSO DI REMUNERAZIONE DEL CAPITALE INVESTITO PER LE REGOLAZIONI INFRASTRUTTURALI DEI SETTORI ELETTRICO E GAS. ORIENTAMENTI INIZIALI, para 3.1-3.5, URL: https://www.autorita.energia.it/allegati/docs/15/275-15.pdf, See also: https://www.autorita.energia.it/it/inglese/#, https://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:legge:1995-11-14;481%21vig=%20

387 ARERA, Delibera 2 dicembre 2015, 583/2015/R/com, Tasso di remunerazione del capitale investito per i servizi infrastrutturali dei settori elettrico e gas: criteri per la determinazione e l'aggiornamento. "Delibera 583/15" hereafter.

Note: the Resolution applies also to other regulated infrastructure sectors in Italy, including gas storage, regasification and gas and electricity metering services.

388 ARERA, Criteri per la determinazione e l'aggiornamento del tasso di remunerazione del capitale investito per i servizi infrastrutturali dei settori elettrico e gas per il periodo 2016-2021 (TIWACC 2016-2021), Versione approvata con deliberazione 02 dicembre 2015, 583/2015/R/com e modificata con deliberazioni 654/2015/R/eel, 575/2017/R/gas e 653/2017/R/gas, 639/2018/R/com,114/2019/R/gas, 419/2019/R/gas,474/2019/R/gas e 570/2019/R/gas. "TIWACC" heareafter.

as opposed to estimating the RfR and MRP separately.[389] As a result, the value of the MRP is derived as the difference between the real TMR and real risk-free rate.

ARERA does not provide an explicit justification for its switch to the Wright approach in its final decision. However, the regulator's preference for Wright over the HER approach emerged as a result of the consultation process.[390]

In 2014, ARERA, with resolution 597/2014/R/COM, initiated the process for the review of the methodology used for determining and updating the cost of capital (WACC) for regulated services in the electricity and gas sectors.[391]

ARERA noted that for all previous reviews its cost of capital methodology was established in a context whereby government bond yields represented a good approximation of a RfR and represented a stable reference for the financial markets. However, post-crisis government bond yields in many countries declined which challenged its assumption that government bond yields constituted a good approximation of rates of return on risk-free assets. The decline in the 10-year BTP rates no longer appeared sufficient to guarantee tariff stability in the new period post-2008 crisis and the launch of the QE programs. The trends observed post-crisis have also called into question the validity of the assumption that the MRP and the RFR were uncorrelated. According to ARERA (2015), this assumption, which was also reflected in the practices of regulators internationally, did not appear valid in the new economic and financial environment.[392]

Following the financial crisis and the unprecedented monetary policy response by central banks, ARERA, in setting the rate of the return on capital invested, identified the following objectives for the deliberation process:

- Stability and certainty of the regulatory framework
- Adequacy of the level of return on capital, commensurate with industry risk
- Protection of the users of the services

ARERA considered that the continued use of a methodology, which relied on short run government yields and a long run MRP[393], in an unstable macroeconomic and financial context, was incompatible with the first objective.[394] Oxera (2015) similarly highlighted the complications in estimating the real RFR post-crisis. Consequently, Oxera suggested that ARERA consider evidence on the TMR given

389 ARERA (2015), Relazione Tecnica, Delibera 583/15, Chapter 9.

390 ARERA (2015), DOCUMENTO PER LA CONSULTAZIONE 509/2015/R/COM, para 6.19-6.21, p.12, URL: https://www.autorita.energia.it/allegati/docs/15/509-15.pdf

391 ARERA (2015), CRITERI PER LA DETERMINAZIONE E L'AGGIORNAMENTO DEL TASSO DI REMUNERAZIONE DEL CAPITALE INVESTITO PER LE REGOLAZIONI INFRASTRUTTURALI DEI SETTORI ELETTRICO E GAS Orientamenti finali para 1.1, URL: https://www.autorita.energia.it/allegati/docs/15/509-15.pdf

392 ARERA (2015), Relazione Tecnica, Delibera 583/15, Chapter 2, para 2.5-2.10, p.5

393 ARERA (2011), RELAZIONE A. I. R. DISPOSIZIONI DELL'AUTORITÁ PER L'ENERGIA ELETTRICA E IL GAS PER L'EROGAZIONE DEI SERVIZI DI TRASMISSIONE, DISTRIBUZIONE E MISURA DELL'ENERGIA ELETTRICA PER IL PERIODO DI REGOLAZIONE 2012-2015 E DISPOSIZIONI IN MATERIA DI CONDIZIONI ECONOMICHE PER L'EROGAZIONE DEL SERVIZIO DI CONNESSIONE (deliberazione 29 dicembre 2011, ARG/elt 199/11 e deliberazione 26 aprile 2012, 157/2012/R/EEL), para.21.7, 21.17, p.51-53

394 ARERA (2015), CRITERI PER LA DETERMINAZIONE E L'AGGIORNAMENTO DEL TASSO DI REMUNERAZIONE DEL CAPITALE INVESTITO PER LE REGOLAZIONI INFRASTRUTTURALI DEI SETTORI ELETTRICO E GAS. ORIENTAMENTI INIZIALI., para 2.4-2.6, URL: https://www.autorita.energia.it/allegati/docs/15/275-15.pdf

its reasonable degree of consistency over time. This approach would, overall, enhance the stability of the cost of equity component of the WACC over time.[395] In its final decision, ARERA chose to discontinue its existing methodology and implement a Wright approach.[396]

C.5.2.2. ARERA's approach to estimating the TMR

To estimate the TMR, ARERA has relied on long-run historical evidence of total market returns for Germany, France, Belgium, and the Netherlands using the Dimson, Marsh and Staunton (DMS) publication. The DMS publication provide arithmetic and geometric averages of annual total market returns from 1900 to 2014. In its final decision, ARERA (2015) decided to place 20 per cent weight on the geometric mean (3.5 per cent), and 80 per cent on arithmetic mean (6.6 per cent) based on a review of economic literature.[397]

As a result, ARERA has set the TMR value equal to 6 per cent for the six-year TIWACC period with effect from 1 January 2016.[398]

C.5.2.3. Use of DDM

The ARERA considers that the DDM, given that the regulator needs to adopt transparent, well-founded methodologies based, where possible, on public and identifiable datasets, is not easy to implement. Moreover, it does not appear to currently be adopted in international regulation, except as a comparison measurement for estimates based on historical data.[399]

C.5.2.4. Estimation of RFR

The real risk-free rate (RfR_{real}) is common across all regulated sectors and its value is determined as the highest value between:[400]

- 0.5 per cent; and
- The average real risk-free rate of AA-rated European countries according to the S&P rating (i.e., France, Belgium, Netherlands and Germany) over the 12-month period of October-September of the year preceding the reset. The real risk-free rate is calculated as difference between:
  - The average nominal risk-free rage calculated using the 10-year bond yields of the above-mentioned countries over the 12-month period ($RF_p^{nominsl}$); and
  - The average 10-year swap rates linked to inflation in the Euro area over the same 12-month period (isr_p).

395 Oxera (June 2015), Estimating the cost of capital for Italian electricity and gas networks, p.12, URL: https://www.oxera.com/wp-content/uploads/2018/07/Estimating-the-cost-of-capital-for-Italian-electricity-and-gas-networks_Oxera.pdf.pdf

396 ARERA (2015), Relazione Tecnica , Chapter 9, para. 9.4, p.14,

397 ARERA (2015), Relazione Tecnica, Delibera 583/15, Chapter 10.

398 TIWACC, Article 3.2.

399 ARERA (2015), CRITERI PER LA DETERMINAZIONE E L'AGGIORNAMENTO DEL TASSO DI REMUNERAZIONE DEL CAPITALE INVESTITO PER LE REGOLAZIONI INFRASTRUTTURALI DEI SETTORI ELETTRICO E GAS. ORIENTAMENTI INIZIALI, para 13.15-13.16, p.24, URL: https://www.autorita.energia.it/allegati/docs/15/275-15.pdf

400 TIWACC, Articles 3.2, 5.1 and 5.2.

It follows that the Italian energy regulator has set a minimum floor to the value of the real-risk free rate (equal to 0.5 per cent). Due to the low interest environment, the real RfR has been set equal to 0.5% for both sub-periods (2016-18, and 2019-21).[401]

C.5.3. Determined Values

Table C.6 below sets out ARERA's estimated values for the TMR and the RFR, with the MRP as the residual.

Table C.6: ARERA's MRP range (real)

Sector	**Gas & Electricity Sectors**	
Regulatory period	2016-2018	2018-2021
TMR	6.00%	6.00%
RFR	0.50%	0.50%
MRP	5.50%	5.50%

[401] Implied by the values of the nominal risk-free rate ($RF_p^{nominsl}$) and implied inflation rate (isr_p) set out in the TIWACC, Article 8, Table 1.

C.6. ACM's approach to TMR/MRP estimation Methodology

We describe ACM's, the Dutch energy regulator, approach to the determination of the MRP and RFR for energy network companies in the Netherlands, as published in 2019.

C.6.1. Background and Objectives of the Regime

The ACM was established on April 1st of 2013, through the consolidation of the Netherlands Consumer Authority (CA), the Netherlands Independent Post and Telecommunications Authority (OPTA), and the Netherlands Competition Authority (NMa).[402] In the Netherlands, the Authority for Consumers and Markets (ACM) performs the regulatory tasks in regulating the Transmission and Distribution System Operators (TSOs and DSOs) in electricity and gas markets, which are tasked with the transport and distribution of electricity and natural gas.[403]

The objectives of the ACM, as per the establishment act of the ACM in 2013, are the following:

- Ensure that consumers are protected and treated with due care
- Ensure that markets function well and that market processes are orderly and transparent

To the pursuit of this mandate, the ACM will guard, promote and protect effective competition and a balanced playing field as well as remove any obstacles to its objectives.[404] Therefore, the overall objective of the ACM is to create a level playing field, where businesses follow the rules, and where consumers are well-informed and exercise their rights.[405]

As a EU regulator, the ACM implements the EU directives on energy. Pursuant with the EU directives on energy market liberalization, the operation of electricity and gas transmission and distribution networks is strictly regulated.[406]

C.6.2. Estimation of MRP and RFR

The ACM determines the cost of equity using the CAPM.[407] In doing so, the ACM estimates the RFR and MRP separately, rather than estimating the TMR and RFR directly and calculating the MRP as a residual. In estimating the MRP, it employs both the HER approach and cross checks this with the DDM approach.

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402 ACM (2012), Authority for Consumers and Markets national report on energy regulation 2012, para. 1, URL: https://www.ceer.eu/documents/104400/3738419/C13_NR_Netherlands-EN.pdf/e79f5d39-5c54-1b9d-cd89-d156e44d045c?version=1.0

403 CEER (2019), Report on Regulatory Frameworks for European Energy Networks 2019, Chapter 2.19, p.82, URL: https://euneighbours.eu/sites/default/files/publications/2020-01/20200131%20C19-IRB-48-03_Regulatory%20Frameworks%20Report%202019_0.pdf

404 ACM (2013), Establishment Act of the Authority for Consumers and Markets, Chapter 2, URL: https://www.acm.nl/sites/default/files/documents/2018-10/establishment-act-acm.pdf

405 See link: https://www.acm.nl/en/about-acm/our-organization/the-netherlands-authority-for-consumers-and-markets

406 Simonetti et al., (2019), The energy regulation and markets review – Edition 8, Netherlands, para II, URL: https://thelawreviews.co.uk/edition/the-energy-regulation-and-markets-review-edition-8/1194565/netherlands

407 ACM (2019) Uitwerking van de methode voor de WACC, ACM/UIT/505475, p.12.

C.6.2.1. The ACM's approach to estimating the MRP

The ACM estimates the MRP based on long-run historical ex-post equity risk premium published in Credit Suisse Global Investment Returns Yearbook by Dimson, Marsh and Staunton (DMS).[408] Specifically, the ACM adopts the mean of arithmetic and geometric average of long-run historical average equity risk premium for Eurozone economies, weighted by their stock markets' market capitalisations. Therefore, the ACM sets the MRP at 5.05 per cent based on the weighted average of the historical MRP in Eurozone countries and an average of the arithmetic and geometric mean.

There is no clear justification for the ACM's use of the HER approach over the Wright approach in the available documentation.

C.6.2.2. Views on DDM

The ACM's regulatory approach also requires that evidence on the MRP from the DGM is used as a cross-check on the MRP estimate based on historical data.[409] The ACM concludes that forward-looking evidence from DGM could be subjective and volatile from year to year, even though it reflects more recent market expectations. The ACM draws on recommendation from its consultant Brattle, which concludes that long-term historical averages are stable and more appropriate for estimating the expected return. The ACM acknowledge that the DMS report discusses that the HER approach may lead to the possible overestimation of future expected return and considers whether the historically derived MRP should be adjusted downward, but concludes that no downward adjusted is needed based on its consultant Rebel's recommendation. [410]

C.6.2.3. Estimation of RFR

The ACM determines the RFR based on the average (50/50) of ten-year Dutch and German nominal government bond yields over the last three years[411]. In terms of the maturity, the ACM considers that the 10-year bond is appropriate as it has high liquidity and is widely used by financial markets as the RFR reference. The ACM further considers that the 10-year maturity permits network operators to finance both short-term and long-term.[412] The ACM also uses nominal yields as the basis for RFR, rather than the real yield implied from index-linked government bonds, since Dutch and German nominal government bonds are liquid, whereas the market for index bonds is considerably less liquid than nominal bonds[413]. There are also no Dutch index-linked government bonds and only a limited number of German index-linked government bonds in issue.[414]

Overall, the ACM estimates a nominal RFR of 1.28 per cent based on a 3-year reference period because of the apparent stability and consistency of this methodology. The ACM concludes that a 3-year average provides a more robust estimate and is less sensitive to outliers in the data than if a shorter reference period is used.[415]

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408 ACM (2019) Uitwerking van de methode voor de WACC, ACM/UIT/505475, p.15.

409 Brattle (2020), The WACC for the Gas TSO, Chapter. III, p.8

410 ACM (2019) Uitwerking van de methode voor de WACC, ACM/UIT/505475, p.15.

411 Brattle (2020), The WACC for the Gas TSO, chapter II, p.5

412 ACM (2019) Uitwerking van de methode voor de WACC, ACM/UIT/505475, p.4-6

413 Liquidity is important for accurate pricing. Therefore, it is also important for an accurate and clear determination of the RFR.

414 ACM (2019) Uitwerking van de methode voor de WACC, ACM/UIT/505475, p.6.

415 ACM (2019) Uitwerking van de methode voor de WACC, ACM/UIT/505475, p.7.

C.6.3. Determined Values

Table C.7 below sets out ACM's estimated values for the TMR and the RFR, with the MRP as the residual.

Table C.7: ACM's MRP (nominal)

Sector	Gas & Electricity
Regulatory period	2017-2021
TMR	6.33%
RFR	1.28%
MRP	5.05%

Note: TMR calculated as MRP+RFR.
Source: ACM (2019) Uitwerking van de methode voor de WACC, ACM/UIT/505475, p.7.

We convert ACM's nominal TMR and RFR determinations into real CPI terms using its inflation assumption and the Fisher equation. Table C.8 sets out the MRP parameters in real CPI terms.

Table C.8: ACM's MRP (real)

	Gas & Electricity				
Year	2017	2018	2019	2020	2021
TMR	5.43%	5.30%	5.17%	5.04%	4.91%
RFR	0.38%	0.25%	0.12%	-0.01%	-0.14%
MRP	5.05%	5.05%	5.05%	5.05%	5.05%

Note: TMR calculated as MRP+RFR. The ACM determines an inflation assumption for 2016 of 0.77 per cent and 1.42 per cent for 2021. We linearly interpolate the inflation rates between 2016 and 2021, to derive an inflation assumption for each year of the regulatory period 2017-2021.
Source: ACM (2019) Uitwerking van de methode voor de WACC, ACM/UIT/505475, p.7.

C.7. CNMC's approach to TMR/MRP estimation Methodology

We review the approach of the Spanish energy regulator (CNMC) to setting the MRP and RFR for energy networks, as published in 2019.

C.7.1. Background and Objectives of the Regime

The CNMC was established in 2013 under Law 3/2013 of June 4 with integration of the National Competition Commission, the National Energy Commission, the Telecommunications Market Commission, the National Commission for the Postal Sector, the State Council for Audiovisual Media and the Railway Regulation Committee. and Airport.[416] The CNMC is the independent regulatory body responsible for the regulation of the energy sector in Spain and is subject to parliamentary control and oversight.[417]

The CNMC's principal regulatory objective, as set out under the provisions of Law 3/2013, is to conserve, safeguard and promote the correct operation, transparency and the existence of effective competition in all markets and productive sectors in the interests of consumers and users.[418] A key duty of the regulator is the application of both Spanish and EU competition regulations.[419] The CNMC has also adopted the EU directives 2009/72 / EC and 2009/73 / EC of the European Parliament and of the Council, of July 13, 2009, regarding the common standards for the electricity and natural gas markets.[420]

In addition to pursuing its objectives, the CNMC, through its actions, also seeks to achieve the vision of creating a model for effective economic regulation and competition, whereby more efficient markets lead to improvements in consumer welfare.[421]

C.7.2. Estimation of MRP and RFR

The CNMC chooses to estimate the cost of equity using the CAPM model and estimating the RFR and MRP separately for the gas and electricity sectors.[422] The CNMC employs the historic excess returns (HER) approach to estimating the MRP as opposed to the Wright approach.

The applicable regulatory period for which the financial remuneration rate and its parameters are determined for electricity transmission and distribution activities is between January 1, 2020 and

416 Chapter 2.2, p.5 and https://www.cnmc.es/sobre-la-cnmc/que-es-la-cnmc#objetivo

417 See https://www.cnmc.es/en/sobre-la-cnmc/que-es-la-cnmc

418 Official state gazette (2013), GENERAL PROVISIONS MINISTRY OF FINANCE AND PUBLIC AUTHORITIES, Royal Decree 657/2013 of 30 August 2013 approving the Organisational Charter of the National Markets and Competition Commission. Article 3, p.10, URL: https://www.cnmc.es/sites/default/files/editor_contenidos/CNMC/RD%20657-2013%20de%2030%20de%20agosto%20Estatuto%20Organico%20CNMC%20eng_rev.pdf

419 See https://www.cnmc.es/sobre-la-cnmc/que-es-la-cnmc#objetivo

420 CNMC (12 November 2019), MEMORIA EXPLICATIVA DE LA CIRCULAR DE LA COMISIÓN NACIONAL DE LOS MERCADOS Y LA COMPETENCIA, POR LA QUE SE ESTABLECE LA METODOLOGÍA DE CÁLCULO DE LA TASA DE RETRIBUCIÓN FINANCIERA DE LAS ACTIVIDADES DE TRANSPORTE Y DISTRIBUCIÓN DE ENERGÍA ELÉCTRICA, Y REGASIFICACIÓN, TRANSPORTE Y DISTRIBUCIÓN DE GAS NATURAL, Chapter 2.2, p.5, URL: URL: https://www.cnmc.es/sites/default/files/2749939_29.pdf hereafter referred to as CNMC (2019), Methodology

421 See strategic plan available at: https://www.cnmc.es/en/sobre-la-cnmc/plan-estrategico

422 CNMC (2019), Methodology, Chapter 9.6.4, p.43

December 31, 2025. For transportation, regasification and distribution of natural gas, the regulatory period is between January 1, 2021 and December 31, 2026.[423]

C.7.2.1. Regulatory approach to estimating the MRP

The CNMC estimates the MRP using historical data and does not rely on survey data or the DGM approach. The Brattle Group, CNMC's consultants, reports that the estimation of the MRP using historical data offers stable, predictable and less volatile estimates. Conversely, Brattle argue that survey data tends to be unreliable and DGM forecasts tend to be sensitive to input assumptions which include analysts' forecasts of future dividends.[424]

The CNMC estimates the MRP as the average of the geometric and arithmetic means[425] published in the DMS database, as a weighted average for all European countries.[426] The weights assigned to the different countries are based on their market capitalisation as of December 31, 2017, using data obtained from Bloomberg.[427] As a result, the estimated MRP for the Electricity sector is 4.75%.

The same methodology is applied to the gas distribution, transportation and regasification sectors. However, given the different regulatory period start dates, 2020 for electricity and 2021 for gas, the gas sector estimation includes 2018 in the calculations. Therefore, the CNMC considers data from the CNMC for the period 1900-2018 and applies a weight to each country in the sample based on their stock market's market capitalisation as of December 31st, 2018. Given the differences, the CNMC obtains an estimate of 4.64% for the MRP for the gas sector.[428]

The CNMC does not discuss its preference of the HER approach relative to theWright approach.

C.7.2.2. Views on DDM

The CNMC does not use a DDM approach. The regulator cites a report prepared for the European Commission by the Brattle Group to further highlight that the historical analysis method is more appropriate over other approaches. The Brattle group reports the following on the DGM and the advantage of the historical analysis method over the DGM[429]:

"*MRP forecasts from DGMs tend to be sensitive to input assumptions which include analysts' forecasts of future dividends. In contrast, the historical data is stable, because it is hard for one additional year to change the average of over 100 years' worth of data. Stability, predictability and a lack of volatility are desirable in a regulatory context. The historical MRP provides a good 'anchor' for estimates and prevents large changes in the ERP from one regulatory period to the next*".

423 CNMC (2019), Methodology Chapter 3.1, p.9

424 CNMC (2019), Methodology, Chapter.9.6.4.4, p.52-58

425 The CNMC chooses to give equal weight to arithmetic and geometric mean values based on a review of the associated literature.

426 in a manner consistent with the criteria followed for the choice of comparators.

427 CNMC (2019), Methodology, Para. 9.7.4.3

428 CNMC (2019), Methodology, Para 9.8.4.4

429 CNMC (2019), Methodology, Para 9.6.4.4, p.53

C.7.2.3. Estimation of RFR

The CNMC considers an averaging period for the RFR of 6 years, equal to the length of the regulatory period, between years n-8 and n-3 and where n represents the start of the regulatory period[430]. The CNMC applies the same averaging period for both the electricity and gas sectors based on the applicable regulatory period. No particular rationale is provided for the choice of this particular averaging period.

The applicable regulatory period for the electricity sector is between 2020-2025. Therefore, the RFR for electricity distribution and transmission is calculated as the average of the daily 10-year Spanish sovereign bond yields, obtained from Bloomberg, over the period from January 1st 2012 to December 31st 2017. The CNMC estimates a nominal RFR value of 2.97%.[431]

Conversely, the applicable regulatory period for the gas sector is between 2021-2026. Therefore, the RFR for gas distribution, transportation and regasification is calculated as the average of the daily 10-year Spanish sovereign bond yields, obtained from Bloomberg, over the period from January 1st 2013 to December 31st 2018. The CNMC estimates a nominal RFR value of 2.23%.[432] The CNMC introduced an upward adjustment of 80bps to the RFR estimate for natural gas transportation and regasification activity to account for effects of quantitative easing (QE) policies. Therefore, the final estimate for the nominal RFR is 3.03 per cent.[433]

The reason for the QE adjustment stems from its prevalence during the calculation period for gas networks. QE began in March 2015, and therefore CNMC considers that the RFR is particularly affected by QE. Conversely, a contrary effect due to the sovereign debt crisis is omitted (2012 not included in calculation period). For electricity, both the debt crisis and the QE period are included. The CNMC report suggests that their effects offset each other, thus requiring no further adjustment.[434]

The decision for an upward adjustment of 80bps due to the QE is based on a review of studies estimating the impact of the ECB's QE on 10-year government bonds.[435,436]

C.7.3. Determined Values

Table C.9 below sets out the CNMC's estimated values for the MRP, RFR and for the overall TMR.

Table C.9: CNMC's determined MRP parameters (nominal)

Sector	Electricity TSO/DSO	Gas TSO/DSO/Regas
Regulatory period	**2020-2025**	**2021-2026**
TMR	7.72%	6.67%
RFR	2.97%	3.03%
MRP	4.75%	4.64%

Source: NERA analysis

430 CNMC (2019), Methodology, Para. 9.6.4.1, 9.7.4.1

431 CNMC (2019), Methodology, Para 9.7.4.2, p.77

432 CNMC (2019), Methodology, Para 9.7.4.2, 9.9, p.77, 114

433 CNMC (2019), Methodology, Para 9.8.4.2

434 CNMC (2019), Methodology p.16, 20, URL: https://www.cnmc.es/sites/default/files/2749939_29.pdf

435 CNMC (2019), Methodology, p.47-48, URL: https://www.cnmc.es/sites/default/files/2749939_29.pdf

436 CNMC (2019), Methodology, p.21, URL: https://www.cnmc.es/sites/default/files/2749939_29.pdf

We convert the CNMC's nominal values into real CPI terms using Eurostat's Harmonised Index of Consumer Prices (HICP) mean point estimates of inflation forecasts in 2020 Q1 for five years ahead, and the Fisher equation. Table C.10 sets out the parameters in real CPI terms.

Table C.10: CNMC's determined MRP parameters (real)

Sector	Electricity TSO/DSO	Gas TSO/DSO/Regas
Regulatory period	**2020-2025**	**2021-2026**
TMR	6.00%	5.95%
RFR	1.25%	1.31%
MRP	4.75%	4.64%

Source: NERA analysis

C.8. EI's approach to TMR/MRP estimation Methodology

We review the approach of the Swedish Energy Markets Inspectorate (EI) to setting the MRP and RFR for energy networks at its latest decisions.

C.8.1. Background and Objectives of the Regime

The Swedish Energy Markets Inspectorate ("EI") is the national regulatory authority for the natural gas and electricity networks in Sweden. EI sets the allowed revenues for:

- gas networks applicable for the regulatory period 2019-2022; and
- electricity networks applicable for the regulatory period 2020-2023.

The EI's principal objective, pursued through its regulatory activity, is to ensure that network operators do not make monopoly profits while retaining efficient operations of the grid with a good quality of supply, thus ensuring high quality and fair prices for the consumers.[437] Therefore, the EI's actions aim to promote a reliable network of supply, well-functioning energy markets and consumer awareness.

The EI is also responsible for the implementation of tasks pursuant to Directive 2009/72/EC and 2009/73/EC of the European Parliament and of the Council in relation to common rules for the internal market in electricity and natural gas respectively.[438] As a regulator operating within the EU, the EI has several policy measures regulated by EU directives and there are EU regulations applicable in Sweden.[439]

C.8.2. EI's Regulatory Approach

The EI determines the regulatory cost of capital using the WACC method for both electricity and gas networks.

For electricity networks, the WACC methodology is fixed and specified in a government ordinance. The government issued Ordinance 2018:1520[440] ("the ordinance") entailing provisions for determining the revenue cap for electricity network operators in accordance with the Electricity Law of 1997.[441] These provisions contain detailed instructions regarding the regulatory cost of capital, with the aim of reducing uncertainty and promoting regulatory stability.[442] The ordinance was prepared in response to successful appeals of the WACC decisions in the two previous regulatory periods (RP1: 2012-2015, RP2: 2016-2019). To assist its 2019 decision, EI commissioned a report by

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437 See: CEER (2019), Incentive Regulation and Benchmarking Work Stream Report on Regulatory Frameworks for European Energy Network, Chapter 2.26, p.108, URL: https://www.ceer.eu/documents/104400/-/-/9665e39a-3d8b-25dd-7545-09a247f9c2ff and https://ei.se/en/About-Ei/About-us/mandate-and-vision1/

438 EI (2018), The Swedish Electricity and Natural Gas market 2018, Chapter. Preface, 1.1.1, 1.1.5,2.1.1, 2.1.5, URL: https://www.ceer.eu/documents/104400/6693346/C19_NR_Sweden_EN.pdf/a95a427b-3b40-27fd-6e90-57ea6f28d16d

439 See http://www.energimyndigheten.se/en/about-us/policy-and-legislation/

440 Förordning (2018:1520) om intäktsram för elnätsverksamhet; accessible at: https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/forordning-20181520-om-intaktsram-for_sfs-2018-1520

441 Ellag (1997:857); accessible at: https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/ellag-1997857_sfs-1997-857

442 Paragraphs 17-25 specify rules for to calculate the regulatory cost of capital using a Weighted Average Cost of Capital ("WACC"). T

the consulting company Montell & Partners to propose parameter values for the appropriate level of gearing (net debt ratio), the credit risk premium and the beta-coefficient.[443]

For gas networks, EI does not rely on a WACC methodology fixed by government ordinance. Instead, EI commissioned Montell & Partners to estimate the WACC parameters, based on the WACC methodology used in previous regulatory periods including decisions by appellant courts.

C.8.2.1. Electricity Networks – MRP and RFR

Electricity MRP

The ordinance does not prescribe a methodology for estimating the MRP for electricity networks. Therefore, the EI relies on PwC's studies on the Swedish MRP.[444] PwC's study applies an "ex-ante" approach to estimating the MRP, which measures market participants' expectations and requirements for the rate of return on equity investment in addition to the RFR.[445] The respondents to PwC's study base their expectations of the MRP on RFRs with a range of maturities. In 2019, 69 per cent of respondents based their expectations on the return on 10-year Swedish government bonds, 11 per cent on the return on 5-year Swedish government bonds, and 20 per cent on other RFRs unspecified in PwC's paper.[446]

In its decision, EI reviews the evolution of the TMR in Sweden between 2005 and 2018 (see Figure C.2) and concludes that it has remained relatively stable from around 7 per cent to 9 per cent over the period. However, underlying the relative stability of the TMR, the MRP and the RFR have fluctuated significantly. The MRP has steadily increased between 2005 and 2018, while the RFR has decreased to historically low levels. EI concludes that from a regulatory point of view, a reduction in the RFR necessitates an increase in the MRP.[447]

443 Montell & Partners (2019) Parametrar till bedömning av kalkylränta för elnät 2020-2023.

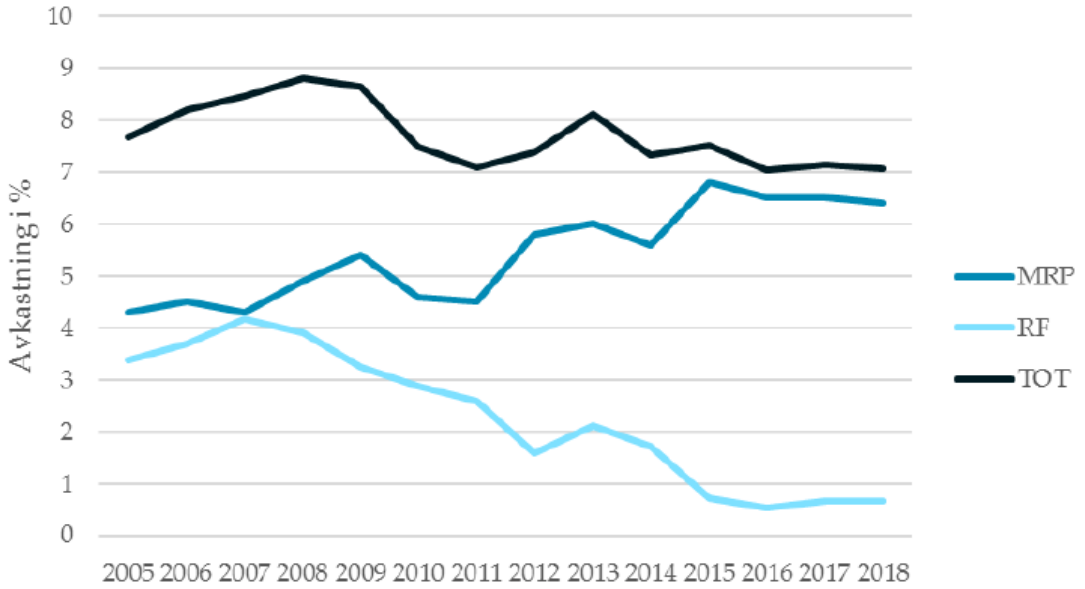
444 Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.12.

445 PwC (March 2019), Riskpremien på den svenska aktiemarknaden, p.6,8.

446 PwC (March 2019), Riskpremien på den svenska aktiemarknaden, p.11.

447 Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.13.

Figure C.2: The Evolution of the TMR, MRP and the RFR in Sweden



Notes: MRP= Market risk premium, RF – Risk free rate, TOT – TMR,
Source: Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.14.

EI notes that it is important to use the same time period for the estimation of the RFR and the MRP.[448] For the RFR the time period considered is 8 years (4 year of historical data, and 4 years of forecast data). EI argues that for the MRP it is not possible to observe the actual historical level, as opposed to the RFR. EI was also not able to find a source that produces a continuous forecast of the MRP.[449]

EI argues that its approach to setting the RFR and the MRP is still consistent, as it proxies well for considering both historical, and forward-looking estimates.[450] EI considers the PwC studies on the Swedish MRP for 2015-2018 as historical values for the MRP, but considers the 2019 PwC Swedish MRP study as forward looking.

EI considered consultation responses arguing for the use of the forward looking MRP, but concluded that the approach relying on PwC's 2019 survey is the most appropriate approach.[451] EI argues that PwC's studies are the most common and widely accepted studies for market participants to form a view of the MRP on the Swedish stock market.[452] Furthermore, EI argues that the method is appropriate because it is replicable, understandable and consistent.[453]

EI sets the MRP as the average of:[454]

448 EI's view is partly informed by the WACC appeal decision at RP2 (2016-2019). Source: Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.15.

449 Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.16.

450 Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.16.

451 Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.16.

452 Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.16.

453 Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.16.

454 Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.15.

- The average of PwC's estimates of the Swedish MRP for the years 2015 to 2018, 6.55%; and
- PwC's estimate of the Swedish MRP for 2019, 6.80%.

The resulting MRP for the regulatory period 2020-2023 is 6.68% (see Table C.11).[455]

Table C.11: EI's Estimation of the MRP for Electricity Networks

	Year	MRP
Historical MRP	2015	6.80%
	2016	6.50%
	2017	6.50%
	2018	6.40%
	Average	6.55%
Latest MRP	2019	6.80%
MRP for RP3	**Average**	**6.68%**

Note: NERA analysis using EI's prescribed method and PwC data.
Source: PwC (March 2019), Riskpremien på den svenska aktiemarknaden, p.8.

Views on DDM

EI considered consultation responses arguing for the estimation of the forward looking MRP component but concluded that the approach relying on PwC's 2019 survey is the most appropriate approach.[456] EI argues that PwC's studies are the most common and widely accepted studies for market participants to form a view of the MRP on the Swedish stock market. Furthermore, EI argues that the method is appropriate because it is replicable, understandable and consistent.[457] Conversely, the EI notes that it can be difficult to identify reliable data that are also suited for the Swedish conditions when using implicit pricing methods, such as DDMs. Therefore, this suggests that the estimated value from such a method can become volatile and uncertain.[458]

Electricity RFR

For electricity networks the EI follows the directions of the ordinance to set the RFR.The ordinance specifies that the nominal RFR should be estimated as the average of:[459]

- The annual return on 10-year government bonds for the four calendar years preceding the EI's revenue allowance decision for the regulatory period 2020-2023; and
- A market-based forecast of the return on 10-year government bonds during the regulatory period 2020-2023.

For the historical period, EI relies on continuous data on the annual return on 10-year Swedish government bonds from Sveriges riksbank for the period 2015-2018. The historical return is calculated based on all banking days during the relevant period. The historical average return was estimated as 0.64%.

455 Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.17.

456 Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.16.

457 Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.16.

458 Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.16.

459 Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.11.

For the forecast period, 2020-2023, EI relies on data from Konjunkturinstitutet's (KI) quarterly report, which includes a four-year forecast of the return on 10-year Swedish government bonds.[460] The forecast average return was estimated as 1.16%.

Therefore, the EI sets the nominal RFR to 0.90% for electricity networks for the regulatory period 2020-2023, following the method prescribed in the ordinance.

C.8.2.2. Gas Networks

Gas MRP

The EI refers to Kammarrätten i Jönköping's appeal decisions for the regulatory period 2015-2018, which set the MRP to 5%.[461] The Court's decision sided with EI's consultants (EY) analysis. EI's consultants considered a range of MRP studies in setting the MRP. EI's consultant based its decision primarily on the adjusted historical risk premium and PwC's MRP surveys in making its decision, and their own experience and judgement.[462] EI, therefore sets the MRP at 5% for the regulatory period 2019-2022.

Table C.12: Overview of MRP Studies Considered by EI's Consultants

Study	Time period	Market	Index	Average	MRP
Historical Risk Premium					
Ibbotson	1926-2007	USA	S&P 500	Arithmetic	6.7%
Dimson, Marsh & Staunton	1900-2001	Sweden	N/A	Arithmetic	7.1%
Dimson, Marsh & Staunton	1900-2001	Global	N/A	Arithmetic	5.4%
Surveys					
Welch (2001)	30 years	Global	N/A	N/A	5.5%
PwC (2012)	2012	Sweden	N/A	N/A	5.8%
PwC (2013)	2013	Sweden	N/A	N/A	6.0%
PwC (2014)	2014	Sweden	N/A	N/A	5.6%
Implicit Risk Premium					
Fama & French	1872-1949	USA	N/A	N/A	3.8%
Fama & French	1949-1999	USA	N/A	N/A	3.4%
Adjusted Historical Risk Premium					
Dimson, Marsh & Staunton/EY	1900-2001	Sweden	N/A	Arithmetic	5.0%
Dimson, et al.	1900-2001	Global	N/A	Arithmetic	3.7%

Source: EY (2 September 2014) Energimarknadsinspektionen: WACC för gasnätföretag för tilsynsperioderna 2012, 2013 samt 2015-2018, p.15.

We have not identified any discussion of the Wright approach or justification of EI's preference for the use of the MRP.

Gas RFR

460 Energimarknadsinspektionen (2019) Bilaga 7: Kalkylränta för elnätsföretag, För tillsynsperioden 2020 – 2023, p.12.

461 Energimarknadsinspektionen (2019), Bilaga 4: Kalkylränta för tillsynsperioden 2019–2022, p.7.

462 EY (2 September 2014) Energimarknadsinspektionen: WACC för gasnätföretag för tilsynsperioderna 2012, 2013 samt 2015-2018, p.17.

For gas networks, the EI uses the GDP method to set the RFR based on Kammarrätten i Jönköping's appeal decisions for the regulatory period 2015-2018.[463] The GDP method calculates the nominal RFR as the sum of: [464]

- the Swedish central bank's 2% long-term inflation; and
- the long-term real GDP growth, which Kammarätten determined to be 2%.

Hence, the EI sets the nominal RFR for gas networks for the regulatory period 2019-2022 to 4%.[465]

C.8.3. Determined Values

Table C.13 below sets out EI's estimated values for the TMR and the nominal RFR, with the MRP as the residual.

Table C.13: EI's determined MRP parameters (nominal)

Sector	Electricity DSO/TSO	Gas TSO/DSO
Regulatory period	2020-2023	2019-2022
TMR	7.58%	9.00%
RFR	0.90%	4.00%
MRP	6.68%	5.00%

Source: Energimarknadsinepektionen (2019), Kalkylränta för elnätsföretag för tillsynsperioden 2020-2023, Energimarknadsinepektionen (2018), Bilaga 4: Kalkylränta för tillsynsperioden 2019-2022.

We convert the EI's nominal TMR and RFR decisions into real CPI terms using the Swedish central bank's long-term inflation target of 2%, as this was also used for the Gas RFR determination, and the Fisher equation. Table C.14 sets out the MRP parameters in real CPI terms.

Table C.14: EI's MRP (real CPI)

Sector	Electricity DSO/TSO	Gas TSO/DSO
Regulatory period	2020-2023	2019-2022
TMR	5.60%	6.96%
RFR	-1.08%	1.96%
MRP	6.68%	5.00%

Note: TMR calculated as MRP+RFR. Source: Energimarknadsinepektionen (2019), Kalkylränta för elnätsföretag för tillsynsperioden 2020-2023, Energimarknadsinepektionen (2018), Bilaga 4: Kalkylränta för tillsynsperioden 2019-2022.

[463] Energimarknadsinspektionen (2019), Bilaga 4: Kalkylränta för tillsynsperioden 2019–2022, p.7.

[464] Energimarknadsinspektionen (2019), Bilaga 4: Kalkylränta för tillsynsperioden 2019–2022, p..7.

[465] Energimarknadsinspektionen (2019), Bilaga 4: Kalkylränta för tillsynsperioden 2019–2022, p.7.

C.9. SFOE's approach to TMR/MRP estimation Methodology

We describe the approach of the Swiss Federal Office of Energy ("SFOE") to the estimation of the MRP and RFR for Swiss energy networks, with its most recent decision published in 2020.

C.9.1. Background and Objectives of the Regime

In Switzerland, the Swiss Federal Office of Energy ("SFOE") calculates the WACC for electricity DSOs and TSOs. Its higher body, the Federal Department of the Environment, Transport, Energy and Communications ("DETEC"), formally publishes the WACC for the coming year before the end of March.[466] The SFOE operates in pursuit of the following objectives:

- Ensuring a sufficient, well-diversified and secure energy supply that is both economical and ecologically sustainable;
- Imposing high safety standards in energy production, transportation and distribution;
- Promoting efficient energy use, increasing the proportion of renewable energy in the overall energy mix and reducing the level of CO2 emissions;
- Promoting and coordinating energy research and supporting the development of new markets for the sustainable supply and use of energy; and
- Creating the necessary conditions for efficient electricity and gas markets and an adapted infrastructure.[467]

The SFOE's approach to the calculation of the WACC is laid down in Anhang 1 of the Stromversorgungsverordnung (Electricity Regulation, "StromVV"), published in 2013.

No such regulation has been adopted for gas networks yet. A draft gas network regulation has been published in October 2019 and is currently undergoing a public consultation process.[468] Details about the future calculation of the WACC for gas networks have not been published yet.

In the interim, the WACC for high-pressure gas networks is determined through an agreement between the Swiss Price Supervisor and the gas network operators until 30 September 2020.[469] The interim agreement is based on the WACC calculation for electricity but adds a premium for differences in business risk between gas and electricity networks.[470]

C.9.2. Estimation of MRP and RFR

C.9.2.1. The SFOE's approach to estimating the MRP

SFOE adopts a historic excess returns (HER) approach to the determination of the MRP, albeit with bounded values. The MRP is calculated as the historical difference between the annual Swiss stock

[466] Before publication, DETEC also consults the Federal Electricity Commission. StromVV, Anhang 1, Abs. 2.4.

[467] See Racine (July 2019), The energy regulation and markets review – Edition 8, Switzerland, chapter II, URL: https://thelawreviews.co.uk/edition/the-energy-regulation-and-markets-review-edition-8/1194572/switzerland

[468] SFOE, Bundesrat eröffnet Vernehmlassung zum Gasversorgungsgesetz, 30 October 2019, available at: https://www.admin.ch/gov/de/start/dokumentation/medienmitteilungen.msg-id-76849.html

[469] Preisüberwachung (2016), Zusatzvereinbarung zur Einvernehmlichen Regelung vom Oktober 2014.

[470] The current premium is 0.4%. The agreement determines that – independent of the development in the WACC for electricity – the premium shall never fall below 0.2%.

market return and the annual return of Swiss government bonds (Bundesobligationen) with a ten-year maturity.[471]

SFOE calculates the annual MRP as the average of the arithmetic and geometric mean of the annual difference since 1926.[472] The estimated MRP falls in one of the three brackets presented in Table C.15, which in turn determines the MRP that is used by SFOE in the calculation of the WACC. For example, the calculated MRP was 4.94 per cent in 2020 and the applied MRP thus 5.0 per cent.[473]

Table C.15: Brackets for Market Risk Premium

Calculated MRP	Applicable MRP
< 4.5%	4.5%
≥ 4.5% and < 5.5%	5.0%
≥ 5.5%	5.5%

Source: StromVV, Anhang 1, Abs. 4.3.

SFOE uses the Swiss stock market return as determined annually by Pictet & Cie, which is based on the Swiss Performance Index including dividends ("SPI").[474] The annual return of Swiss government bonds with a ten-year maturity is based on publications by the Swiss National Bank.[475]

There is no discussion or justification is provided about the preference for the use of an HER approach over the Wright approach in the documents reviewed. No discussion is also made on the DGM and its applicability as a cross-check or other purpose.

C.9.2.2. Estimation of the RFR (for equity)

The SFOE estimates a nominal RFR (equity) based on the average yield of ten-year Swiss government bonds in the year preceding the WACC decision.[476] Similar to the calculation of the MRP, a bounded approach is used to determine the applicable risk-free rate (equity). The lower bound is set at 2.5 per cent in nominal terms (see Table C.16), which in the current low-interest rate environment, this has effectively limited the decrease in the RFR.[477]

471 StromVV, Anhang 1, Abs. 4.2.

472 For 2020, the WACC is calculated in the first quarter of 2019 and the last available data point is 2018 (i.e. t-2).

473 SFOE (2019), Erläuterungen zur Berechnung des kalkulatorischen Zinssatzes, p. 3.

474 SFOE (2019), p. 3. For historical periods from 1926-1991, Pictet uses data from different studies as described in Pictet (1998), p.9. The SPI comprises nearly all Swiss-domiciled stocks listed on the Swiss exchange SIX. The SPI does not include shares of investment companies or stocks with a free float below 20%.

475 SNB, Statistische Monatshefte (monthly publication).

476 StromVV, Anhang 1, Abs. 3.1.

477 IFBC (2015), Risikogerechte Entschädigung für Schweizer Stromnetzbetreiber, para 4.1, p.19

Table C.16: Brackets for risk-free rate (equity)

Calculated risk-free rate (equity)	Applicable risk-free rate (equity)
< 3%	2.5%
≥ 3% and < 4%	3.5%
≥ 4% and < 5%	4.5%
≥ 5% and < 6%	5.5%
≥ 6%	6.5%

Source: StromVV, Anhang 1, Abs. 3.2.

C.9.3. Determined Values

Table C.17 below sets out SFOE's estimated values for the MRP and the RFR, and for TMR in nominal terms.

Table C.17: SFOE's MRP and RFR (nominal terms)

Sector	Electricity DSO/TSO
Regulatory period	2020
TMR	7.50%
RFR	2.50%
MRP	5.00%

Source: StromVV, Anhang 1, SFOE (2019), Erläuterungen zur Berechnung des kalkulatorischen Zinssatzes. PUE (2014), Zusatzvereinbarung zur Einvernehmlichen Regelung vom Oktober.

We convert the SFOE's nominal values into real CPI terms using the OECD's inflation forecast for Switzerland over the regulatory period (2020), and the Fisher equation, as set out in Table C.18.

Table C.18: SFOE's MRP and RFR (real terms)

Sector	Electricity DSO/TSO
Regulatory period	2020
TMR	7.09%
RFR	2.09%
MRP	5.00%

Source: StromVV, Anhang 1, SFOE (2019), Erläuterungen zur Berechnung des kalkulatorischen Zinssatzes. PUE (2014), Zusatzvereinbarung zur Einvernehmlichen Regelung vom Oktober, https://data.oecd.org/price/inflation-forecast.htm

C.10. Ofgem's approach to TMR/MRP estimation at RIIO-2 Sector Methodology

We describe the approach of the UK energy regulator Ofgem to the estimation of the MRP and RFR for UK energy networks, with its most recent decision published in 2019.

C.10.1. Background and Objectives of the Regime

Ofgem is the regulator of the electricity and gas sectors in the UK. Ofgem's statutory duties are established in UK law, mainly in the Gas Act 1986 and Electricity Act 1989, with provisions also appearing in other legislation, including the Competition Act 1998, Utilities Act 2000 and Energy Act 2013.[478]

Ofgem's principal regulatory objective, as set in Section 3A of the Electricity Act 1989 and section 4AA of the Gas Act 1986, is to protect the interests of existing and future electricity and gas consumers, including those that are in vulnerable situations or that are poorly served by the gas or electricity networks.[479] Those interests of existing and future consumers are their interests taken as a whole, to include the transition to a sustainable low-carbon energy system, the security of supply, and their interests in the fulfilment of the objectives set out in the EU energy directives.[480] Ofgem must inform its decision making in order to further its primary objective.

Overall, Ofgem consider its duty to protect and make a positive difference for all energy consumers, to deliver value for money and to promote security of supply and sustainability for current and future generations.[481] In accordance with its objectives, Ofgem sets regulations/price controls "to ensure that the private companies who have a monopoly on the operation of Great Britain's gas and electricity networks continue to act in the best interests of energy consumers".[482]

In furthering the principal objective (to protect consumers), Ofgem must have regard to the need to secure that licence holders are able to finance the activities which are the subject of obligations imposed.[483] It also has to carry out its functions to best promote efficiency and economy on the part of persons authorised by licences.[484]

The current regulatory period for gas and electricity transmission and gas distribution runs from 2013 to 2021 and for electricity distribution from 2015 to 2023.[485] The forthcoming price control period, RIIO-2, will run for the period 2021-2026 for electricity and gas transmission, gas distribution and the

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478 Ofgem (2014), Corporate Strategy, p.4 URL: https://www.ofgem.gov.uk/sites/default/files/docs/2014/12/corporate_strategy_0.pdf

479 Ofgem (2019), RIIO-2 Sector Specific Methodology – Core document, para 1.5, 12.76, p.4, 131

480 Ofgem (2014), Corporate Strategy, p.4 URL: https://www.ofgem.gov.uk/sites/default/files/docs/2014/12/corporate_strategy_0.pdf

481 Ofgem (2014), Corporate Strategy, p.5 URL: https://www.ofgem.gov.uk/sites/default/files/docs/2014/12/corporate_strategy_0.pdf

482 Ofgem (2019), RIIO-2 Sector Specific Methodology – Core document, para 1.3, p.4, URL: https://www.ofgem.gov.uk/system/files/docs/2019/05/riio-2_sector_specific_methodology_decision_-_core_30.5.19.pdf

483 Electricity Act 1989, Section 3A (1C) (2). Link: http://www.legislation.gov.uk/ukpga/1989/29/section/3A

484 Electricity Act 1989, Section 3A (1C) (5)

485 Ofgem (2020), Network regulation – The 'RIIO' Model, URL: https://www.ofgem.gov.uk/network-regulation-riio-model

electricity system operator (ESO). RIIO-2 will begin in April 2023 for electricity distribution network operators and Ofgem has not yet made a determination for that sector.[486]

C.10.2. Estimation of MRP and RFR

C.10.2.1. Ofgem has reaffirmed its use of the Wright Approach

For RIIO-2, Ofgem has decided to use the Wright approach for estimating the cost of equity, as it has done at previous reviews. The use of a Wright approach is also consistent with UK regulatory precedent including the CMA's approach in its most recent reviews (NIE 2014 and Bristol Water 2015).[487]

Ofgem does not provide an explicit justification for its use of the Wright approach over the HER approach. However, it makes reference to a number of studies they used to inform its decisions over the years on TMR and MRP.[488]

In a study in 2003 commissioned by Ofgem, Miles, Miller and Wright (MMW) argue that the decomposition of the CAPM pricing equation according to the Wright approach provides important insights, and a more practical approach to calculating the cost of equity capital due to two primary reasons:

- The reformulation of the CAPM under a Wright approach assigns less weight on the RfR for regulated companies with beta close to unity. While regulated industries are unlikely to perfectly reflect the market (beta = 1), the dominant element in their cost of capital estimation will always be the TMR over the RfR. That is, the authors note we can reformulate the CAPM as follows:

  $R^E = RFR + \beta(TMR - RFR) = RFR(1-\beta) + \beta(TMR)$

  In this formulation, the expected return on equity can be expressed as a weighted average of the RFR and the TMR with the weights depending on the equity beta. Where the equity beta is close to 1, or the average for the market, (as is often the case for energy networks), the weight on the RfR is low and the far greater the weight rests on the TMR.

- There is a rationale for viewing the expected market return as more explicable in terms of underlying theory and more stable over long historical samples than the return on safe assets. They go on to state that: "the standard practice of building up the average cost of equity by adding an estimate of the equity premium to an estimate of the safe rate may be, at best, a not particularly efficient way to proceed, and at worst, a source of misunderstanding and errors."[489]

MMW (2003) state that there is considerably more uncertainty about the true historical MRP and, hence the RFR, compared to the true cost of equity capital. For this reason, MMW regard the

[486] Ofgem (2019), RIIO-2 Sector Specific Methodology – Core document, para 2.1-2.2, p.9, URL: https://www.ofgem.gov.uk/system/files/docs/2019/05/riio-2_sector_specific_methodology_decision_-_core_30.5.19.pdf

[487] CMA (March 2014), NIE Limited price determination; CMA (October 2015), Bristol Water price determination

[488] Ofgem (2019), RIIO-2 Sector Specific Methodology Annex: Finance, p. 84-89, URL: https://www.ofgem.gov.uk/system/files/docs/2018/12/riio-2_finance_annex.pdf#page=84

[489] Wright et al., (2003), A study into certain aspects of the cost of capital for regulated utilities in the U.K, p.13, URL: https://www.ofgem.gov.uk/ofgem-publications/50794/2198-jointregscoc.pdf

standard HER approach to estimating the cost of equity as problematic and recommend the Wright approach.[490]

In a review commissioned by Ofgem, Wright and Smithers (2014) revisit the rationale for the MMW (2003) methodology. Their study states that a requirement for assuming a market return is constant in expectation is that it should historically have been stable, ex post. The evidence, both historical and more recent research, indicated a remarkable degree of stability in stock returns and a corresponding lack of stability in the risk-free rate, at any maturity. Consequently, there was no evidence of stability of the MRP. Without such evidence, there is no empirical basis for the assumption that falls in risk-free rates should translate to falls in expected market returns".[491]

The recent UKRN (2018) report further concludes that the Wright approach proposed in the original MMW (2003) study remains valid.[492] CEPA (2018), find some key flaws with the approach assuming that the MRP is stable, while the TMR is not:

- It produces a more volatile cost of equity
- It could lead to excessively low and unrealistic levels of total equity market returns when paired with very low interest rates.

Therefore, for regulatory reasons, CEPA consider that the Wright approach is superior since it avoids "excessive volatility between decisions, produces less volatile consumer bills, and provides some certainty to the businesses which supports long-term investment decisions".[493]

C.10.2.2. Ofgem's approach to estimating the TMR

As a first step, Ofgem has determined a TMR of 6.25 to 6.75 (real CPIH) drawing on three key pieces of evidence: [494]

- The 2018 UKRN report which provides a recommendation that the TMR is between 6 and 7 per cent (real CPIH), drawing on long run historical returns based on UK stock market data.
- The multi-stage DGM cross-check based on the analysis by CEPA, which supports an 8 per cent nominal (6 per cent real CPIH) TMR.
- The cross-check based on investment managers' forecasts, which support a TMR figure below Ofgem's estimated range (7.65 per cent nominal or 5.5 per cent real CPIH).

The primary source of evidence is the TMR estimated by UKRN of 6 to 7 per cent (real CPIH). The UKRN report recommends that historical real returns should be analysed with reference to historical

490 Wright et al., (2003), A study into certain aspects of the cost of capital for regulated utilities in the U.K, p.48, URL: https://www.ofgem.gov.uk/ofgem-publications/50794/2198-jointregscoc.pdf

491 Wright, S. and Smithers A. (2014), The cost of equity capital for regulated companies: A review for Ofgem, p. 13-15, URL: https://www.ofgem.gov.uk/ofgem-publications/86100/wrightsmithersequitymarketreturnpdf

492 Wright et al., (2018), Estimating the cost of capital for implementation of price controls by UK Regulators, p.36-38, 48, URL: https://www.ukrn.org.uk/wp-content/uploads/2018/11/2018-CoE-Study.pdf

493 CEPA (2018), REVIEW OF COST OF CAPITAL RANGES FOR OFGEM'S RIIO-2 FOR ONSHORE NETWORKS OFGEM, p.101, URL: https://www.ofgem.gov.uk/ofgem-publications/130262

494 Ofgem (May 2019), RIIO-2 Sector Specific Methodology Decision – Finance, p.31-42, and CEPA (February 2018), Review of cost of capital ranges for Ofgem's RIIO-2 for onshore networks Ofgem, p.112-117, URL: https://www.ofgem.gov.uk/ofgem-publications/130262

CPI inflation published in the Millennium dataset[495] and based on the longest historical time period from 1899 for the UK market.[496]

C.10.2.3. Estimation of RFR

Ofgem proposed an RFR based on spot market evidence, drawing on long-term 20-year RPI-linked gilts or alternatively nominal gilts less a forecast for inflation.[497] It also proposed to update the equity allowance during the RIIO-2 period based on the change in the RFR multiplied by a (1-beta) factor plus the TMR multiplied by beta, but where the TMR and beta are held constant during the price control review ("RFR indexation"). Ofgem's proposal falls back to updating the equity allowance based on the change in the RFR*(1-beta), as a consequence of assuming the TMR and beta are constant.[498]

Ofgem proposed to update the RFR using yields on 20-year RPI-linked bonds, adjusted for the difference between RPI and CPI forecasted by OBR.[499] In its Sector Decision, Ofgem noted it would present an updated view of the exact methodology for how the updated RFR will be calculated (i.e. derivation of real CPIH values, averaging period and tenor) at Draft Determinations.[500]

C.10.3. Determined Values

Table C.19 below sets out Ofgem's estimated values for the TMR and the RFR, with the MRP as the residual.

Table C.19: Ofgem's MRP range: GD2 and T2 average (CPIH-deflated)

Sector	**Gas & Electricity**	
Regulatory period	2020-2024	
	Low	High
TMR	6.25%	6.75%
RFR	-0.75%	-0.75%
MRP	7.00%	7.50%

Source: Ofgem (May 2019), RIIO-2 Sector Specific Methodology Decision – Finance Annex, Table 12, p. 78.

495 Wright, Burns, Mason, Pickford (2018), op.cit., p.31 and appendix D.

496 Ofgem (March 2018) RIIO-2 Framework Consultation, Appendix 2.

497 Ofgem (May 2019), RIIO-2 Sector Specific Methodology Decision – Finance, p.30, para 2.28.

498 Ofgem (March 2018), RIIO-2 Framework Consultation, para. 7.64.

499 Ofgem (December 2018), RIIO-2 Sector Specific Methodology Annex: Finance, para 3.47.

500 Ofgem (May 2019), RIIO-2 Sector Specific Methodology Decision – Finance, p.25-30.

C.11. Ofwat's approach to TMR/MRP estimation

We set out the approach of Ofwat, the water regulator for England and Wales (E&W), to estimating the TMR and its constituent elements, the RFR and MRP, in its recent PR19 final decision (FD).

C.11.1. Background and Objectives of the Regime

Ofwat (The Water Services Regulation Authority) is a non-ministerial government department. It regulates the water sector in England and Wales. The Water Industry Act 1991 as well as the Water Act 2014 set the legislative framework for UK economic water regulation.

Specifically, section 2 of the Water Industry Act 1991 (as amended), and as published by the Government on Ofwat's strategic objectives, set out Ofwat's primary duties:[501]

- Further the consumer objective to protect the interests of consumers, wherever appropriate by promoting effective competition;
- Secure that the functions of each undertaker are properly carried out;
- Secure that undertakers are able to finance the proper carrying out of their functions, in particular by securing reasonable returns on their capital;
- Secure that licensees (companies with water supply or sewerage licences) properly carry out their licenses activities and functions; and
- Further the resilience objective to secure the long-term resilience of undertakers' water supply and wastewater systems, and to secure they take steps to enable them, in the long term, to meet the need for water supplies and wastewater services.

Ofwat published its latest WACC decision in December 2019, covering the regulatory period 2020 to 2025.

C.11.2. Estimation of MRP and RFR

C.11.2.1. Ofwat draws on the Wright and DDM approach

Ofwat estimates the TMR directly, drawing on evidence based on historical market returns (Wright approach) as well as the DDM and survey evidence. It does not estimate the MRP directly using the historic excess returns (HER) approach.

C.11.2.2. Ofwat's approach to estimating the MRP

For the TMR, Ofwat considers three types of evidence, drawing on the general framework used in the CMA NIE 2014 appeal. These are: "historical ex-post" approaches which draw on long-run historical returns; "historical ex-ante" which adjust historical realised returns for past unexpected events or "good luck" and "forward looking" estimates, principally the dividend discount model (DDM) as well as survey evidence.[502]

[501] Water Industry Act 1991 Section 2; Department for Environment Food & Rural Affairs (Sep 2017), The government's strategic priorities and objectives for Ofwat, p.13.

[502] Ofwat (Dec 2019), PR19 final determinations, allowed return on capital appendix, p.51.

Its estimated TMR ranges based on the approaches as set out below overlap in the region of 6.5 to 6.6 per cent. Hence, Ofwat concludes on a real TMR point estimate of 6.5 per cent over PR19. [503]

Historical ex-post approach

For its historical ex-post approach to estimating the TMR, Ofwat draws on long-run historical real returns based on the DMS publication, covering the period 1900 to 2018.[504] Drawing on several averaging techniques, the 2018 UKRN report as well as international historical return evidence, Ofwat decided on a narrowed real TMR range of 6.5 to 6.6 per cent.[505]

Historical ex-ante approach

For its historical ex-ante approach to estimating the TMR, Ofwat relies on the Fama and French model, in which the expected return can be estimated as the sum of the average dividend yield and the average annual dividend growth rate. Drawing on data from the 2019 Barclays Equity Gilt Study, Ofwat estimates a real TMR range of 5.6 to 6.5 per cent, using the period 1900-2018 and 1990-2018 respectively. [506]

Forward-looking approach

For its forward-looking approach, Ofwat draws principally on the estimates of the multi-stage DDMs applied by its consultants Europe Economics and PwC[507], cross-checked against market to asset ratio analysis[508] as well as survey evidence.

It places proportionally more weight on the range provided by its DDM evidence relative to the market to asset ratio analysis and survey evidence. Ofwat considers that survey results are difficult to interpret as there is a lack of clarity around the assumptions used to propose estimates of the TMR. However, Ofwat applies a 10 bps downward adjustment to its DDM range because its market to asset ratio analysis and survey results suggest a lower range.[509]

For PR19 FD, Ofwat decides on a real TMR range of 6.1 to 6.9 per cent based primarily on the DDM.[510]

C.11.2.3. Estimation of RFR

In its FD, Ofwat estimated the RFR based on a one month average in September 2019 of UK RPI-linked gilt yields with 15 years maturity plus a forward uplift for the expected increase in yields over PR19. [511]

Ofwat's FD RFR estimate is -1.39 per cent (real, CPI deflated).[512]

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503 Ofwat (Dec 2019), PR19 final determinations, allowed return on capital appendix, p.4.

504 Ofwat (July 2019) PR19 draft determinations, cost of capital appendix, p.28.

505 Ofwat (July 2019) PR19 draft determinations, cost of capital appendix, p.34.

506 Ofwat (July 2019) PR19 draft determinations, cost of capital appendix, p.36.

507 Ofwat (Dec 2019), PR19 final determinations, allowed return on capital appendix, p.42, 51

508 The market to asset ratio analysis attempts to infer an investor cost of equity from the premium of the market valuation of regulatory equity over its face value, by solving for the discount rate which would equalise the present value of future cost of equity allowance cashflows to the monetary value of the residual premium.

509 Ofwat (July 2019) PR19 draft determinations, cost of capital appendix, p.43.

510 Ofwat (Dec 2019), PR19 final determinations, allowed return on capital appendix, p.51.

511 Ofwat (Dec 2019), PR19 final determinations, allowed return on capital appendix, p.40.

512 Ofwat (Dec 2019) PR19 final determinations, allowed return on capital appendix, p.4.

C.11.3. Determined Values

Table C.20 below sets out Ofwat's estimated values of the TMR of 6.5 per cent at PR19 FD, RFR based on short-run data, and the MRP calculated as the residual (i.e. TMR – RFR).

Table C.20: Ofwat's estimated MRP range at PR19 FD (real, CPI)

Sector	Water
Regulatory period	2020-2025
TMR	6.5%
RFR	-1.39%
MRP	7.89%

Source: Ofwat (Dec 2019) PR19 final determinations, allowed return on capital appendix, p.4.
Note: MRP calculated as TMR + RFR.

Appendix D. Letter of Instruction

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13 May 2020

Mr Will Taylor
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BY EMAIL

Dear Mr Taylor

Port of Melbourne

We act for the Port of Melbourne (**PoM**) in relation to the preparation of its Tariff Compliance Statement (**TCS**) for 2020-21 for submission to the Essential Services Commission of Victoria (**ESC**) by 31 May 2020. The TCS is required to be provided to the ESC pursuant to a Pricing Order made under the *Port Management Act 1995* (Vic) (**PMA**).

PoM wishes to engage you to prepare an expert report in connection with the TCS. This letter sets out the matters which PoM wishes you to address in your report and the requirements with which the report must comply.

1 Background and framework

PoM is subject to a form of "compliance" regulation under a Pricing Order made by the Governor in Council under section 49A of the PMA. A copy of the Pricing Order is attached to this letter.

The ESC is responsible for overseeing a number of economic regulatory functions applicable to PoM, including monitoring and reporting on PoM's compliance with the Pricing Order.

Clause 2.1.1(a) of the Pricing Order provides that Prescribed Service Tariffs are to be set so as to allow the Port Licence Holder (that is, PoM) a reasonable opportunity to recover the efficient cost of providing all Prescribed Services, determined by application of an accrual building block methodology. Prescribed Services provided by PoM include shipping channels, wharves and berthing facilities.

Pursuant to clause 4.1.1 of the Pricing Order, the accrual building block methodology applied by PoM must comprise:

(a) an allowance to recover a return on its capital base, commensurate with that which would be required by a benchmark efficient entity with a similar degree of risk as that which applies to PoM in respect of the provision of the Prescribed Services;

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(b) an allowance to recover the return of its capital base; and

(c) an allowance to recover its forecast operating expenses, commensurate with that which would be required by a prudent service provider acting efficiently; less

(d) an indexation allowance.

Clause 4.3.1 of the Pricing Order also requires that, in determining a rate of return on capital for the purposes of clause 4.1.1.(a), 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*". This must be determined on a pre-tax, nominal basis (clause 4.3.2).

The objectives of the regulatory regime, as set out in section 48 of the PMA, are:

(a) to promote efficient use of, and investment in, the provision of prescribed services for the long-term interests of users and Victorian consumers; and

(b) 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; and

(c) 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; and

(d) to facilitate and promote competition—

(i) between ports; and

(ii) between shippers; and

(iii) between other persons conducting other commercial activities in ports; and

(e) to eliminate resource allocation distortions by prohibiting a State sponsored port operator from providing a relevant service at a price lower than the competitively neutral price for that service.

As set out in section 8 of the *Essential Services Commission Act 2001* (Vic) (**ESC Act**):

(a) in performing its functions and exercising its powers, the objective of the ESC is to promote the long term interests of Victorian consumers (the **objective**); and

(b) in performing its functions and exercising its powers in relation to essential services, the ESC must, in seeking to achieve the objective, have regard to the price, quality and reliability of essential services.

2 Terms of Reference

In its 2020-21 TCS, PoM proposes to use the Sharpe-Linter Capital Asset Pricing Model to determine a weighted average cost of capital. Your report is to be prepared in the context of the approach to be adopted by PoM in determining the Market Risk Premium (**MRP**) as an input into the Sharpe-Linter Capital Asset Pricing Model.

PoM wishes to engage you to prepare an expert report which:

(a) Identifies regulatory regimes, both within Australia and overseas, that you consider are contextually similar or analogous to the regulatory regime applying to PoM (having regard to the background and framework set out above) (**relevant regimes**) and the reasons why, including the relevant features of each regime such as its regulatory objectives.

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(b) Reviews and summarises the current approaches to estimating the MRP taken by regulators in the relevant regimes, and identifies:

(i) which approaches are commonly utilised by those regulators to estimate the MRP and risk free rate and/or total market return (as the case may be) (whether as a direct input into the estimation of these, or indirectly such as a cross-check) and the reasons why;

(ii) how those approaches are implemented by those regulators in estimating the MRP and risk free rate and/or total market return, including whether used as direct input or a cross-check, and the methodologies applied in their implementation;

(iii) which approaches (if any) for estimating the MRP have been expressly rejected by those regulators and the reasons why,

with a particular focus on:

(iv) what is commonly known as the 'Wright approach'; and

(v) dividend discount models (DDMs) and dividend growth models (DGMs).

It is intended that your report will be submitted to the ESC with PoM's 2020-21 TCS. The report may be provided by the ESC to its own advisors. The report may also be considered by an appeal body, court or tribunal in the event that a relevant proceeding is commenced under the ESC Act.

The report will be reviewed by PoM's legal advisers and will be used by them to provide legal advice as to its respective rights under the Pricing Order and the PMA.

3 Compliance with the Expert Witness Code of Conduct

Attached are copies of:

- Form 44A to the *Supreme Court (General Civil Procedure) Rules 2015*, the Expert Witness Code of Conduct (**Code of Conduct**); and
- Victorian Civil & Administrative Tribunal Practice Note – PNVCAT2, *Expert Evidence* (**Practice Note**).

Please read and familiarise yourself with the Code of Conduct and the Practice Note and comply with them at all times in preparing your report and in the course of your engagement by PoM. Your report should contain a statement to the effect that the author of the report has read the Code of Conduct and the Practice Notice and agreed to be bound by them.

Your report must also clearly state your opinion(s) and the reasons for them and include the information and declarations required specifically by clause 3 of the Code of Conduct and clause 11 of the Practice Note.

Please also attach a copy of this letter of instruction to the report.

Yours faithfully

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