Port of Melbourne five-year review – WACC

Essential Services Commission

17 December 2021

FINAL REPORT

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1. INTRODUCTION

The Essential Services Commission (ESC) has engaged CEPA to review the Port of Melbourne's (PoM's or the Port's) approach and implementation of the return on capital.

1.1. REGULATORY CONTEXT

The Port's commercial operations have been managed by a private operator since 2016. Several of the services provided by the Port are 'prescribed services' for the purposes of the Port Management Act (the Act). In setting prices for these services ('prescribed service tariffs'), the Port is required to comply with a Pricing Order. This requires that the Port determine its Aggregate Revenue Requirement (ARR) using an accrual building block methodology. Among other matters, the Pricing Order sets out how the return on capital must be determined.

Under Clause 3, the Pricing Order also sets a Tariffs Adjustment Limit (TAL) for prescribed service tariffs, which limits annual tariff increases to the change in the Consumer Price Index (CPI) over the previous year. The Pricing Order establishes that Clause 3 will cease to apply, at the latest, 21 years from the commencement of the Port's lease.

The ESC has a role in administering the Pricing Order. Each year, the Port must submit an annual tariff compliance statement (TCS) to the ESC. This sets out the Port's prescribed service tariffs for the forthcoming financial year and explains how these tariffs are compliant with the Pricing Order. The TCS are also an input to formal five-yearly inquiries through which the ESC must examine the Port's compliance with the Pricing Order.

The ESC is now conducting its review of the Port's compliance with the Pricing Order over the period 1 July 2016 to 30 June 2021. This encompasses four TCS submitted by the Port, which cover tariffs from the period from 1 July 2017. The initial prescribed service tariffs that applied between 1 July 2016 and 30 June 2017 were set in a Schedule to the Pricing Order and deemed compliant with the pricing and cost allocation principles of the Pricing Order.[1] For the purposes of calculating its required return on capital and ARR in 2016-17, the Port assumed that the same WACC parameters estimated for 2017-18 applied in 2016-17.[2]

1.2. TERMS OF REFERENCE

CEPA has been engaged by the ESC to review the Port's approach to determining the return on capital over the five-yearly inquiry period. We have been asked to:

- Examine the method and approach adopted by the Port to calculate the weighted average cost of capital (WACC).
- Provide guidance to the ESC on the appropriateness of the method and approaches adopted by the Port to calculate the WACC parameters.
- If material shortcomings in the Port's estimates are identified, provide our views on reasonable ranges for the relevant WACC parameters.

1.3. STRUCTURE OF THIS REPORT

The remainder of this report is structured as follows:

[1] Pricing Order (2016), Clause 11.1.3.

[2] PoM (2017), *2017-2018 Tariff Compliance Statement*, Appendix B: PoM Regulatory Model.

- Section 2 discusses how we have interpreted the requirements of the Pricing Order and presents our overall conclusions of a reasonable range for the Port's return on capital.
- Section 3 contains our findings on the cost of equity.
- Section 4 contains our findings on the cost of debt and gearing.
- Section 5 contains our findings on the value of imputation credits (gamma).
- Further details are contained in the appendices:
    - Appendix A provides references to source documents.
    - Appendix B sets outs the relative risk assessment that supports our beta estimates.
    - Appendix C provides further details on the basis for selection of the comparator firms that we use to estimate beta and gearing.
    - Appendix D provides a full set of asset beta estimates for all comparators in our sample.

2. WELL ACCEPTED APPROACHES

This section discusses how we have reviewed the Port's approach to calculating the return on capital, given the requirements of the Pricing Order. We then set out our conclusions on a reasonable range for the return on capital, drawing on the analysis discussed in Sections 3 to 5.

2.1. REQUIREMENTS OF THE PRICING ORDER

The Pricing Order contains three requirements in relation to the return on capital (emphasis added):

- Clause 4.1.1. "*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)*".
- Clause 4.3.1. "*The Port Licence Holder must use* ***one or a combination of well accepted approaches*** *that distinguish the cost of equity and debt, and so derive a weighted average cost of capital.*"
- Clause 4.3.2. "*The rate of return … must be determined on a* ***pre tax, nominal basis*****"**

The concepts expressed in Clause 4.1.1 are common within Australian regulatory practice. For example, the rate of return for an electricity distribution company should be *"commensurate with the regulatory and commercial risks involved in providing the service"*.[3] The objective of this language is that the rate of return should be set to be that of an investment substitute for the Port, which means an asset with a similar degree of risk. The Pricing Order is made under powers granted by the Act (Section 49A) and one of the objectives of the Act (Section 48) is *"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"*.[4]

We consider that there are three clear ways in which the Pricing Order limits the approaches available to the Port beyond the requirements of a benchmark efficient entity.

Firstly, a working definition of *"approach"* is required. We discuss this in Section 2.1.1.

Secondly, in an Australian regulatory context, the requirement of Clause 4.3.1 that the approach to estimation is *"well accepted"* is not common and may be unique. Clause 4.3.1 is an additional restriction to Clause 4.1.1 and has the effect of limiting the approaches that the Port can use. We consider the appropriate interpretation of *"well accepted"* in the context of the Pricing Order in Section 2.1.2.

Thirdly, a limitation is introduced through the modifier *"well"* in *"well accepted"*. This means that the approach must meet a stricter criterion than merely being accepted. For an approach to be well accepted it must have wide acceptance. It is possible for an accepted approach to exist that performs better on some set of criteria and at the same time for this approach to not be well accepted.

2.1.1. Methodology and implementation

The Pricing Order requires that an "*approach*" be "*well accepted*". We consider that there are two parts to an "*approach'*:

- the theoretical, or high-level **methodology** for solving an issue / problem; and
- the **implementation** of the methodology.

[3] National Electricity Law, s.7A(5).

[4] Port Management Act 1995, 48(1)(c).

One example of this relates to the gamma parameter. This parameter is used to adjust post-tax returns in the context of Australia's imputation tax system, under which corporate tax paid in Australia is a pre-payment of personal tax. As we discuss in Section 5, there are two main methodologies applied to estimate gamma: the 'equity ownership approach' and the use of market data. Both the Australian Energy Regulator (AER) and the Economic Regulation Authority (ERA) of Western Australia use the equity ownership approach to estimate gamma. However, their implementation of this methodology produces different estimates, due to the data sources that each regulator relies on. While the estimates of gamma for the two regulators use the same methodology, because they implement the methodology in different ways, we consider that they have a different overall approach.

For a number of WACC parameters, we find that the Port has proposed well accepted *methodologies*. However, its *implementation* of these methodologies may not be well accepted.

2.1.2. Well accepted for what purpose?

Over the course of the five-yearly inquiry period, the Port's consultant Synergies have considered it appropriate to draw on approaches that are "*well accepted by regulators, financial practitioners and, in some cases, by academics*."[5] Synergies have weighted these approaches in various ways to make a judgement on the return on capital.

The ESC has provided guidance on the interpretation of "*well accepted"* in its 2020 Statement of Regulatory Approach (SORA).[6] The 2020 SORA construed the "*well accepted*" criterion more narrowly than Synergies, stating that it would be satisfied when the approach is generally used or considered appropriate for use in regulatory environments which aim to give a regulated company the returns appropriate for a benchmark efficient entity. It does, however, also state that "*the views and practices in the area of economic regulation may be informative…these professionals might include academics, economists, and finance practitioners*."

For the purpose of this advice, the ESC has asked CEPA to consider the following definition of 'well accepted' approach:

> *"The Commission considers that a "well accepted approach" is one that is accepted as appropriate for use when determining the cost of capital for a firm for the purposes of calculating a revenue requirement".*

The above definition is broader than that used in the 2020 SORA. The primary limitation that this definition places on the range of approaches available to the Port is that an approach must be accepted as appropriate for a specific *purpose* – namely, calculating a revenue requirement.

This definition clearly points to consideration of approaches adopted by regulators, as these are determined precisely for the purpose of calculating a revenue requirement using a building block methodology. As discussed in Section 2.1.1, an 'approach' comprises not only an overall methodology, but also choices around how the methodology is implemented. Such choices will often be guided by the available data and its limitations. Australian regulators consider Australian data, while also cross checking their conclusions against international practice. For this reason, we consider that Australian precedent is more useful for informing a judgement on *"well accepted"* approaches, compared to international jurisdictions.

There are also a range of characteristics of good regulation that should be satisfied by the methodologies used by regulators. These include transparency around the selection and analysis of evidence, robustness to legal challenge, and being sufficiently straightforward to be well understood by stakeholders in the regulatory process. The regulatory process means that the evidence has been challenged, scrutinised and found to be relevant and

[5] Synergies (2020), *Determining a WACC estimate for Port of Melbourne*, p. 34. Synergies have considered the approaches of regulators, financial practitioners and academics in all reports for the Port over the five-yearly inquiry period.

[6] ESC (2020), *Statement of Regulatory Approach*, version 2.0, Port of Melbourne pricing order, 28 April 2020.

admissible. Requirements for stakeholder consultation mean that it is possible to determine what is well accepted regulatory practice.

In contrast, it is difficult to undertake a complete and verifiable analysis of approaches that are used by financial practitioners. In particular, much of the necessary evidence to comprehensively survey the approaches adopted by financial practitioners is not in the public domain. Without a complete understanding of the spectrum of approaches used by these parties, it may not be possible to establish what is *"well accepted"*. Synergies has attempted to identify the approaches used by this cohort through: reviewing company valuation reports prepared for the purpose of proposed acquisitions; considering survey evidence; and noting the inclusion of particular approaches in the curriculum for finance qualifications.[7] While we have reservations around the completeness, accuracy and suitability of this evidence, it may nonetheless be representative of a particular sub-set of financial practitioners.

Further, the definition of *"well accepted"* that the ESC has adopted for this five-yearly inquiry could encompass approaches used outside of a regulatory setting. For example, financial practitioners make WACC estimates for a variety of purposes, including the valuation of cash flows for investment decisions, the valuation of cash flows for the purpose of reporting to investors and the valuation of assets for financial accounts. Such estimates are not, strictly, used for the purpose of calculating the firm's revenue requirement in a given period. They may, however, indicate what the return on capital element would need to be *if* the firm *was* calculating a revenue requirement using an accrual building block methodology. This means that there is an *a priori* case for considering the approaches of finance practitioners – and academics – when determining the range of *"well accepted"* approaches that is open to the Port.

Accordingly, in addition to reviewing regulatory approaches, our analysis in Sections 3 to 5 also considers whether the financial practitioner and academic evidence put forward by Synergies satisfies the *"well accepted"* criterion. In making this assessment, we have considered the ESC's definition of *"well accepted"* in the context of the other requirements of the Pricing Order. In particular:

- The approach needs to reflect the required revenue of a benchmark efficient entity, in line with Clause 4.1.1.
- The approach needs to be not just *"accepted"*, but *"well accepted"*, in line with Clause 4.3.1.
- An approach consists of an overall methodology and the implementation of the methodology. Both the methodology and implementation elements of an approach should be *"well accepted"*.

2.2. WELL ACCEPTED APPROACHES

This section summarises our conclusions on which approaches to setting the return on capital can be considered *"well accepted"*, based on the framework outlined in Section 2.1.

2.2.1. Financial practitioner and academic approaches

The Port has relied on financial practitioner and academic evidence to inform its view on a *"well accepted"* approach or approaches for certain WACC parameters. This is shown in the table below.

[7] For example, see Synergies (2020), p. 18 and 284.

Table 2.1: The Port's use of financial practitioner and academic evidence

Parameter	Financial practitioner evidence	Academic evidence
Cost of equity approach	✓	✓
Risk-free rate	✗	✗
Market risk premium	✓	✗
Beta	✓	✗
Gearing	✗	✗
Notional credit rating	✗	✗
Debt risk premium	✗	✗
Debt raising costs	✗	✗
Gamma	✓	✓

Source: CEPA analysis.

The Port's primary source of evidence for financial practitioner approaches is analysis of independent expert valuation reports undertaken by Synergies. To verify their assessment, we have undertaken our own review of a selected sample of these reports. In particular, we have reviewed valuation reports published between January 2013 and April 2021. To identify our sample, we undertook a search for target's statements using a Morningstar database filtered for ASX listed companies.[8] We then manually collated these statements and identified those that contained an independent expert report. There are 8 different independent experts represented in our sample.[9] This method was not designed to act as a comprehensive sample of independent expert reports undertaken during this period. However, we consider that it provides an appropriate cross check of the analysis presented by Synergies. We note that in many cases we agree with Synergies' findings on the content of the reports, but disagree on their interpretation in this context.

In the following chapters of this report, we set out our conclusions on whether the approaches of academics and financial practitioners that the Port has identified can be considered well accepted, based on the framework described in Section 2.1. Our reasoning is set out in the relevant chapter for each parameter.

Overall, we find that the approaches of academics and financial practitioners put forward by Synergies are not, in general, well accepted for the purpose of calculating a revenue requirement for a benchmark efficient entity. Accordingly, we have not placed weight on these approaches when calculating the range for the Port's return on capital that is summarised in the Section 2.3 below.

2.2.2. Regulatory approaches

We have undertaken a review of regulatory decisions that were in force during the five-yearly review period, summarised in the table below. For each year, we have considered the most recent decision taken by a regulator prior the submission of the TCS.

For the reasons noted above, our review has focussed on Australian regulatory precedent. However, where relevant we have supplemented this with commentary on the approaches adopted by international regulators.

[8] Morningstar DatAnalysis.

[9] These are: BDO, Deloitte, FTI, Grant Samuel, Grant Thornton, KPMG, Lonergan Edwards, and PWC.

Table 2.2: Regulatory precedent considered for each TCS (year of decision)

Regulator	2017-18 TCS[1]	2018-19 TCS	2019-20 TCS	2020-21 TCS
Australian Energy Regulator	AER (2016)[2]	AER (2017)[2]	AER (2018)	
Australian Competition and Consumer Commission	ACCC (2015)	ACCC (2017)	ACCC (2019)	
Economic Regulation Authority (WA)	ERA (2015)	ERA (2017)	ERA (2018)	ERA (2019)
Essential Services Commission of South Australia	ESCOSA (2015)			ESCOSA (2020)
Independent Pricing and Regulatory Tribunal	IPART (2013)		IPART (2018)	
Industry Panel / Independent Competition and Regulatory Commission	Industry Panel (2015)		ICRC (2018)	
Office of the Tasmanian Economic Regulator	OTTER (2015)		OTTER (2018)	
Queensland Competition Authority	QCA (2016)		QCA (2018)	QCA (2020)

Source: Detailed references for each regulatory decision are provided in Appendix A. In some cases, we refer to subsidiary documents that informed these decisions; these are referenced separately where necessary.

Note 1 – We have referred to the same regulatory precedent for the 2016-17 and 2017-18 years that are both covered by the 2017-18 TCS.

Note 2 – Draws on AER (2013).[10]

The intent of this review was to identify whether there have been substantial changes in regulatory practice over time, that might support a different conclusion on well accepted approaches in particular years of the review period. With the exception of the approach to setting the market risk premium (see Section 3.3), we have not noted material shifts in what well accepted approaches can be identified from regulatory precedent.

The table below summarises the results of our review, summarising across the review period.

[10] AER (2013), *Better Regulation - Explanatory Statement: Rate of Return Guideline*.

Table 2.3: Review of regulatory evidence

	The Port's approach	CEPA's review
Cost of equity approach	In the most recent 2020-21 TCS, the Port places 100% weight on the Sharpe-Linter Capital Asset Pricing Model (SL-CAPM). However, in the preceding TCS, some weight has been placed on the Black CAPM and Fama French Model (FFM).	Only the SL-CAPM is a well accepted methodology. The reliance placed on SL-CAPM by the Port in the 2020-21 TCS is well accepted by regulators. The reliance placed on the Black CAPM and the FFM in earlier years is not well accepted. Parts of the Port's implementation relating to individual SL-CAPM parameters are not well accepted, as noted below.
Risk-free rate	The Port has consistently applied a 20-day average of 10-year Commonwealth Government bond yields.	The Port's methodology and implementation is well accepted.
Market risk premium (MRP)	Over the five-year review period, the Port has placed varying degrees of weight on three approaches to estimating the MRP: historical excess returns (HER); the Wright method; and dividend discount models (DDMs).	The Port's methodologies (HER, Wright and DDMs) are well accepted. However, the Port has combined and implemented these methodologies in a way that is not well accepted, leading to MRP estimates outside the range of well accepted approaches across the entire review period.
Beta	The Port has varied the comparator sample that it uses to estimate the asset beta over time. In all periods, the Port has used comparators who are not port operators. This includes railway comparators (all years) and airports (2017-18 and 2018-19 TCS). The Port has adopted a variety of approaches to filtering the comparator sample, including minimum market capitalisation filters.	The Port's methodology for constructing a comparator sample (i.e., seeking to identify comparators with similar systematic risk exposure to the Port) is well accepted. Parts of the Port's implementation are not well accepted, including reliance on non-industry specific comparators, lack of an appropriate country filter and emphasis on monthly rather than weekly returns for estimation.
Gearing	Across the review period, the Port has used (i) the midpoint of gearing ratios for investment grade comparators and (ii) gearing ratios for Australian port privatisations.	The Port's methodology of examining credit ratings of comparators is well accepted. Parts of the Port's implementation are not well accepted, including its selection of comparators, referring only to investment grade comparators, and using port acquisitions to construct the sample range.
Notional credit rating	The Port has adopted a notional BBB credit rating in all years, based on its asset beta comparator sample.	The Port's methodology for examining credit ratings of comparators is well accepted. Using an investment grade (BBB) credit rating is well accepted.
Debt risk premium	The Port uses Bloomberg/RBA data to construct a cost of debt for a BBB rated entity, using a 10-year term to maturity. The Port has implemented a 10-year transition to a 10-year trailing average.	The Port's methodology and implementation are well accepted.
Debt raising costs	The Port has proposed debt raising costs based on evidence gathered by PwC for Australian corporates.	The Port's methodology and implementation are well accepted.
Gamma	The Port places one-third weight on a zero value for gamma. In the 2020-21 TCS, the remaining two-thirds weight was placed on the equity ownership approach. In all previous TCS, the remaining weight was divided between two versions of the utilisation approach: equity ownership and market valuation studies.	The Port's application of the utilisation approach based on equity ownership is well accepted. However, the utilisation approach based on market valuation studies is not well accepted. The Port's use of a zero gamma value is also not well accepted.

Source: CEPA analysis.

2.3. CONSIDERATION OF THE PORT'S RESPONSE

The Port and its advisors, Synergies and Incenta, have commented on a draft of this report. In this section, we discuss their responses to our overall approach to reviewing the Port's return on capital. We address their more detailed comments on the MRP, beta and gearing in the section of the report related to those parameters, under the heading *'Consideration of the Port's response'*.

2.3.1. The Port's response

Clause 4.3.1 of the Pricing Order states that the approach to determining the return on capital should be "well accepted".

The Port makes a number of assertions about the interpretation of clause 4.3.1. In particular, the Port considers that:[11]

- [redacted]
- [redacted]
- [redacted]
- [redacted]

2.3.2. CEPA's response

[redacted]

[11] PoM (2021), *Submission to ESC Inquiry Draft Report*, p. 26.

[redacted]

2.4. RETURN ON CAPITAL ESTIMATES

In line with our terms of reference, we have calculated parameters for which the Port has not followed a well accepted approach, namely the MRP, asset beta and gearing. Generally, we have not calculated parameters for which the Port has followed a well accepted approach, namely the risk-free rate, notional credit rating, debt risk premium, and debt raising costs. However, we have calculated the risk-free rate and cost of debt as of 31 March 2016 as input into our 2016-17 WACC range. We considered one of the Port's estimates for gamma to be well accepted (based on the equity ownership approach) and have reflected this in the overall WACC range.

The overall WACC resulting from these parameter estimates is summarised in the tables below for each TCS year.[12] Our supporting analysis for each parameter is set out in the following sections.

[12] CEPA equity beta figures in Table 2.4-Table 2.8 are rounded to two decimal places, but CEPA cost of equity and WACC estimates have been calculated without rounding the equity beta.

Table 2.4: CEPA's view of the range of well accepted WACC parameter values for the Port: 2016-17

Parameter	The Port's proposal	CEPA range (low)	CEPA range (high)
Gearing*	30%	20%	30%
Corporate tax rate	30%	30%	
Gamma*	0.25	0.45	
Notional credit rating	BBB	BBB	
Debt raising costs	0.10%	0.10%	
Cost of debt (pre-tax)*	5.45%	5.47%	
Risk-free rate*	2.81%	2.59%	
Asset beta*	0.7	0.65	0.7
Equity beta*	1.0	0.81	1.0
Market risk premium*	7.77%	6.00%	7.30%
Cost of equity (SL-CAPM, post-tax)	10.58%	7.47%	9.89%
Cost of equity (SL-CAPM, pre-tax) - 33.3%	13.66%	8.94%	11.84%
Cost of equity (Black CAPM, pre-tax) - 33.3%	13.66%	NA	NA
Cost of equity (FFM, pre-tax) - 33.3%	15.12%	NA	NA
Cost of equity (Average, pre-tax)	14.14%	8.94%	11.84%
WACC estimate (pre-tax)	**11.54%**	**8.25%**	**9.93%**

*Notes: The Port's proposed 2016-17 WACC parameters are set out in the 2017-18 TCS and are the same as the 2017-18 parameters. CEPA range assumes a theta of 0.643, in line with a gamma of 0.45 and a distribution rate of 0.7. * indicates parameter independently estimated by CEPA. In line with our terms of reference, we have only estimated parameters for which the Port has not adopted a well accepted approach. While we consider the Port's approach to the cost of debt and the risk-free rate is well accepted, we have re-estimated these parameters as of 31 March 2016.*

Table 2.5: Our view of the range of well accepted WACC parameter values for the Port: 2017-18 TCS

Parameter	The Port's proposal	CEPA range (low)	CEPA range (high)
Gearing*	30%	20%	30%
Corporate tax rate	30%	30%	
Gamma*	0.25	0.45	
Notional credit rating	BBB	BBB	
Debt raising costs	0.10%	0.10%	
Cost of debt (pre-tax)	5.45%	5.45%	
Risk-free rate	2.81%	2.81%	
Asset beta*	0.7	0.65	0.7
Equity beta*	1.0	0.81	1.0
Market risk premium*	7.77%	6.00%	7.65%
Cost of equity (SL-CAPM, post-tax)	10.58%	7.69%	10.46%
Cost of equity (SL-CAPM, pre-tax) - 33.3%	13.66%	9.20%	12.53%
Cost of equity (Black CAPM, pre-tax) - 33.3%	13.66%	NA	NA
Cost of equity (FFM, pre-tax) - 33.3%	15.12%	NA	NA
Cost of equity (Average, pre-tax)	14.14%	9.20%	12.53%
WACC estimate (pre-tax)	**11.54%**	**8.45%**	**10.40%**

Table 2.6: Our view of the range of well accepted WACC parameter values for the Port: 2018-19 TCS

Parameter	The Port's proposal	CEPA range (low)	CEPA range (high)
Gearing*	30%	20%	30%
Corporate tax rate	30%	30%	
Gamma*	0.25	0.45	
Notional credit rating	BBB	BBB	
Debt raising costs	0.10%	0.10%	
Cost of debt (pre-tax)	5.37%	5.37%	
Risk-free rate	2.74%	2.74%	
Asset beta*	0.7	0.65	0.7
Equity beta*	1.0	0.81	1.0
Market risk premium*	7.71%	6.00%	7.30%
Cost of equity (SL-CAPM, post-tax)	10.45%	7.62%	10.04%
Cost of equity (SL-CAPM, pre-tax) - 33.3%	13.48%	9.12%	12.02%
Cost of equity (Black CAPM, pre-tax) - 33.3%	13.48%	NA	NA
Cost of equity (FFM, pre-tax) - 33.3%	15.51%	NA	NA
Cost of equity (Average, pre-tax)	14.16%	9.12%	12.02%
WACC estimate (pre-tax)	**11.52%**	**8.37%**	**10.03%**

*Notes (Table 2.5 and 2.6): CEPA range assumes a theta of 0.643, in line with a gamma of 0.45 and a distribution rate of 0.7. * indicates parameter independently estimated by CEPA. In line with our terms of reference, we have only estimated parameters for which the Port has not adopted a well accepted approach.*

Table 2.7: Our view of the range of well accepted WACC parameter values for the Port: 2019-20 TCS

Parameter	The Port's proposal	CEPA range (low)	CEPA range (high)
Gearing*	30%	20%	30%
Corporate tax rate	30%	30%	
Gamma*	0.25	0.5	
Notional credit rating	BBB	BBB	
Debt raising costs	0.10%	0.10%	
Cost of debt (pre-tax)	5.24%	5.24%	
Risk-free rate	1.96%	1.96%	
Asset beta*	0.7	0.6	0.7
Equity beta*	1.0	0.75	1.0
Market risk premium*	7.77%	6.00%	6.50%
Cost of equity (SL-CAPM, post-tax)	9.73%	6.46%	8.46%
Cost of equity (SL-CAPM, pre-tax) - 90%	12.55%	7.60%	9.95%
Cost of equity (Black CAPM, pre-tax) - 5%	12.55%	NA	NA
Cost of equity (FFM, pre-tax) - 5%	15.37%	NA	NA
Cost of equity (Average, pre-tax)	12.69%	7.60%	9.95%
WACC estimate (pre-tax)	**10.46%**	**7.13%**	**8.54%**

*Notes: CEPA range assumes a theta of 0.714, in line with a gamma of 0.5 and a distribution rate of 0.7. * indicates parameter independently estimated by CEPA. In line with our terms of reference, we have only estimated parameters for which the Port has not adopted a well accepted approach.*

Table 2.8: Our view of the range of well accepted WACC parameter values for the Port: 2020-21 TCS

Parameter	The Port's proposal	CEPA range (low)	CEPA range (high)
Gearing*	30%	20%	30%
Corporate tax rate	30%	30%	
Gamma*	0.33	0.5	
Notional credit rating	BBB	BBB	
Debt raising costs	0.10%	0.10%	
Cost of debt (pre-tax)	5.04%	5.04%	
Risk-free rate	0.90%	0.90%	
Asset beta*	0.7	0.6	0.7
Equity beta*	1.0	0.75	1.0
Market risk premium*	7.57%	5.88%	7.30%
Cost of equity (SL-CAPM, post-tax)	8.47%	5.31%	8.20%
Cost of equity (SL-CAPM, pre-tax)	10.60%	6.25%	9.65%
WACC estimate (pre-tax)	**8.93%**	**6.01%**	**8.26%**

*Notes: CEPA range assumes a theta of 0.625, in line with a gamma of 0.5 and a distribution rate of 0.8. * indicates parameter independently estimated by CEPA. In line with our terms of reference, we have only estimated parameters for which the Port has not adopted a well accepted approach.*

3. COST OF EQUITY

3.1. OVERALL APPROACH

3.1.1. The Port's approach

The Port's advisor, Synergies, has considered three approaches to calculating the cost of equity:

- The Sharpe-Lintner Capital Asset Pricing Model (SL-CAPM). This is the original formulation of the CAPM, under which expected returns for an asset are equal to the risk-free rate plus the equity beta times the MRP, where the equity beta represents the extent to which market returns affect the returns on an individual security.
- The Black CAPM. The standard CAPM relies on the existence of a risk-free asset, the returns on which are the risk-free rate. The Black CAPM does not require a risk-free asset, but rather a zero-beta portfolio, and it is the returns on this that replace the risk-free rate in the standard CAPM formula. In academic literature, the Black CAPM addresses concerns that empirical applications of the standard CAPM do not appropriately reflect the returns of low beta securities.
- The Fama French Model (FFM). In addition to the covariance of a company's returns with those of the market, as represented by the equity beta, this model of stock market returns includes additional factors to explain expected returns (related to company size and the ratio of accounting to market value).

Over the course of the review period, Synergies has changed the weighting applied to the three approaches. This is summarised in Table 3.1 below.

Table 3.1: The Port's overall approach to the cost of equity - Weighting of each model

TCS	2016-17	2017-18	2018-19	2019-20	2020-21
SL-CAPM	33.33%	33.33%	33.33%	90%	100%
Black CAPM	33.33%	33.33%	33.33%	5%	0%
FFM	33.33%	33.33%	33.33%	5%	0%

Source: TCS. Note: 2016-17 weights are set out in the 2017-18 TCS.

In the first TCS for the period 2017-18 Synergies applied an average of all three cost of equity models, stating that:

> *"As each model has its own strengths and weaknesses, and in the absence of any substantive grounds to favour one model over the other, we have adopted an average of estimates derived from the application of these approaches to produce of a cost of equity estimate."*[13]

In support of this approach, Synergies referred to the use of all three models in the academic literature. They also considered that cost of capital methodologies adopted by financial practitioners in valuation reports are consistent with the principles of the Black CAPM and FFM. Finally, Synergies noted consideration of these approaches by Australian and international regulators. Synergies continued the approach of equally weighting the three models for the 2018-19 TCS.

For the 2019-20 TCS Synergies increased the weight placed on the SL-CAPM, noting that:

> *"In our view, based on model accuracy alone it may be reasonable to more heavily weight the FFM than the SL CAPM and Black CAPM given its demonstrably greater predictive power in regards to required market returns. However, issues sourcing country-specific FFM factors for the all of the*

[13] Synergies (2017), *Determining a WACC estimate for Port of Melbourne,* p. 5.

countries in PoM's comparator set, as well as the ongoing statistical insignificance of the zero-beta premium in the Black CAPM, have led us to place a lower weighting on these models".[14]

For the 2020-21 TCS Synergies further lowered the weightings for the Black CAPM and the FFM, relying only on these models as cross checks. Synergies noted that if estimation issues can be rectified, they may consider changing the weightings of the approaches in future TCS.

3.1.2. Financial practitioner evidence

The Port's view

As noted above, in the most recent 2020-21 TCS the Port places 100% weight on the SL-CAPM. However, in earlier TCS some weight has been placed on the Black CAPM and FFM.

Synergies note that there is no clear evidence that financial practitioners use the Black CAPM and FFM. However, they do consider that the adjustments that financial practitioners commonly make to SL-CAPM WACC estimates are consistent with the principles of these models. In particular: [15]

- **Black CAPM.** Synergies note that finance professionals appear to use risk-free rate estimates that are above prevailing spot rates. They consider this is consistent with the theory of the Black CAPM, which stipulates that investors may not be able to borrow and lend at the risk-free rate.
- **FFM.** Synergies note that some surveys report the use of this model by financial practitioners. In addition, finance professionals apply adjustments to risk premia to reflect company size, although not specifically within the FFM framework.

Combined with Synergies' view of academic evidence (see Section 3.1.3), this has been the basis for placing some weight on the Black CAPM and FFM over the five-year review period.

Assessment

In relation to the Black CAPM, we agree that it is common for valuation reports to adopt a forecast of the risk-free rate that is expected to apply over the duration of the cash flows that are being valued, or to combine a forecast risk-free rate with a prevailing spot rate estimate. However, we have seen no evidence that this practice reflects the Black-CAPM theory on the inability of investors to borrow and lend at the risk-free rate. Rather, this approach is simply intended to reflect the expected risk-free rate over the valuation horizon, which is typically much longer than the one-year horizon over which the Port sets prices. We elaborate on this point in our discussion of financial practitioner approaches to the MRP in Section 3.3.2 below.

In relation to the FFM, our review of the financial practitioner evidence indicates that adjustments and additional risk premia are commonly applied in valuation reports. The rationale for these adjustments generally falls into two categories:

- The SL-CAPM cost of equity is suitable for valuing cash flows that have been determined on an *expected value basis*. That is, provided that any non-systematic risks are properly reflected in the cash flows, the required rate of return does not need to account for these. However, if this is not the case, the valuer may adjust the SL-CAPM derived cost of capital to reflect this.[16]
- The valuer may be concerned that the comparator beta sample does not accurately capture the risk of the company being valued. Within this category of adjustment, we observe references to company size, but

[14] Synergies (2019a), *Determining a WACC estimate for Port of Melbourne*, p. 125.

[15] Synergies (2020), p. 86.

[16] See for example, Grant Samuel (2014), *Independent Expert's Report – Takeover Offer from Baosteel and Aurizon*, report for Aquila Resources Limited, June, p. 5.

also other factors such as whether the company is established or just starting up, exposure to bad debt, and exposure to regulatory, political or country risk.

In our view, there is no good evidence to suggest that the adjustments made by financial practitioners generally reflect the logic of the FFM, or that the effect of a financial practitioner applying these adjustments to estimate the cost of capital for the Port would be similar to the effect produced by Synergies' FFM estimates.

Overall, we find that the evidence put forward by Synergies does not support the contention that either the Black CAPM or FFM are well accepted by finance professionals for the purpose of calculating a revenue requirement for a benchmark efficient entity.

3.1.3. Academic evidence

The Port's view

In addition to their review of financial practitioner approaches, Synergies also consider that the Black CAPM and FFM are well accepted in the academic literature.

In relation to the Black CAPM, Synergies cite several academic articles whose findings are more consistent with the Black CAPM and less consistent with the SL-CAPM.[17] At the same time, they also acknowledge that, like the SL-CAPM, some academic studies find that expected returns generated by the Black CAPM model do not correspond well to actual observed returns.[18] Further, Synergies note that *"deriving a statistically significant estimate of the rate of return on the zero-beta portfolio has proven elusive in Australia"*.[19]

Synergies consider that the empirical performance of the FFM is superior to both the SL-CAPM and Black CAPM, in terms of the model's ability to generate predicted stock returns that correspond to actual observations. While noting that *"the model in the Australian market has sometimes yielded inconclusive results"*, Synergies contend that *"… Brailsford, Gaunt and O'Brian (2012) addressed these data issues and developed an Australian FFM that reconciled with US results"*.[20] However, in their most recent report for the Port, Synergies also acknowledge that the implementation of the FFM is not practical because *"it is not possible to source country-specific factor estimates for all of the firms in PoM's comparator set"*.[21]

Assessment

As noted in Section 2.1, we consider that approaches to estimating the cost of capital have two dimensions: the overarching methodology and its implementation. Accordingly, to qualify as a well accepted approach, it is not sufficient for a methodology to be accepted by the academic community as being useful on a conceptual level. Similarly, it is not sufficient for the methodology to have been applied empirically by academics in only limited or specific cases. Because calculating a revenue requirement is a practical undertaking, to be relevant for the purposes of the Pricing Order, we consider that cost of equity methodologies put forward by academics must also be:

- Accompanied by an established approach or approaches to implementation.
- Where this approach has been established as appropriate for circumstances comparable to setting a revenue requirement for a benchmark efficient entity in Australia.

The evidence that we have reviewed suggests this is not the case for either the Black CAPM or FFM methodologies.

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[17] For example, see Synergies (2020), Appendix A.1.2.

[18] Synergies (2020), p. 92.

[19] Synergies (2020), p. 92.

[20] Synergies (2020), p. 95.

[21] Synergies (2020), p. 97.

The Black CAPM requires the estimation of three parameters: the return on the market portfolio, the return on the zero beta portfolio, and the equity beta. In their advice to the AER's 2013 rate of return guideline, McKenzie and Partington find that *"there is no generally accepted empirical measurement of the zero beta return"*.[22] In this review, McKenzie and Partington also found that the estimation of the zero beta return is strongly sensitive to the choice of assumptions. This is reflected in Synergies' own acknowledgement that estimating the zero beta return in an Australian context is challenging.

The most common application of the FFM expands on the SL-CAPM by including two additional explanatory factors: the value premium and the size premium.[23] Although Synergies consider that the 2012 Brailsford, Gaunt and O'Brian study has successfully developed an Australian specification of the FFM, we do not consider that this constitutes a well accepted approach to implementing this cost of equity methodology. For example, this study also found that the risk premium for the size factor was negative, although statistically insignificant[24], which is contrary to Synergies' claim that the inclusion of the size factor offers an improvement over the SL-CAPM approach. This is consistent with McKenzie and Partington's conclusion in their 2012 advice to the AER that there is *"no clear theoretical foundation to identify the risk factors, if any that the* [FFM] *captures"*.[25] Synergies appear to agree that implementing the FFM for a benchmark efficient entity at this time is not well established, given the lack of country-specific factor estimates for some of the comparators that they propose for the Port.

Synergies consider that challenges associated with estimating the Black CAPM and FFM should not preclude these approaches from being well accepted.[26] We do not agree. The cost of equity estimates that result from a given methodology depend significantly on the underpinning implementation and data inputs. Accordingly, the acceptance of these elements is important for assessing whether an approach meets the requirements of the Pricing Order.

Overall, the evidence that Synergies has assembled does not indicate that there is a well accepted approach within the academic literature to addressing the implementation concerns noted above, in particular for a benchmark efficient entity in Australia. This is consistent with the views of most Australian regulators on the appropriateness of the Black CAPM and FFM for calculating a revenue requirement in a regulated setting

3.1.4. Regulatory evidence

We consider that well accepted Australian regulatory practice over the review period has been to use the SL-CAPM. The Black CAPM and FFM are not widely used, and while carefully considered by regulators have limited or no influence on their decisions.

Our review of regulatory precedent that was in force during the review period found eight instances where regulators or appeal tribunals (AER, ERA, IPART, ACT, QCA) specifically considered and rejected the use of the Black CAPM and FFM for determining the overall cost of equity. In two of these decisions – AER (2013) and ERA (2015) – the regulator considered that the principles of the Black CAPM were appropriate for informing the point estimate of the equity beta, for input into a SL-CAPM model. This approach was rejected in the subsequent decisions of these regulators. We found no evidence that other Australian regulators (ESCOSA, ICRC, OTTER and ACCC) place any reliance on the Black CAPM or FFM. These findings are summarised in Table 3.2.

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[22] M. McKenzie and G. Partington (2012), *Report to the AER: Review of NERA report on the Black CAPM*, August, p. 8.

[23] This refers to the 'three factor' FFM, noting that a range of alternative specifications exist. The value premium (also termed the high-minus-low factor) refers to the difference between returns for a portfolio of high book-to-market value shares and a portfolio of low book-to-market value shares. The size premium (also termed the small-minus-big factor) refers to the difference between returns for a portfolio of small capitalisation shares and a portfolio of large capitalisation shares.

[24] AER (2013), Appendices, p. 20.

[25] AER (2013), Appendices, p. 21.

[26] Synergies (2020), p. 96.

Table 3.2: Regulatory precedent - Black CAPM and FFM

Regulator	Precedent
AER	In the 2013 rate of return guideline, the AER considered whether the Black CAPM and three-factor FFM should form part of its approach to estimating the cost of equity. The review concluded that neither model was suitable for estimating the overall cost of equity. However, the AER did conclude that it was appropriate to consider the theoretical principles of the Black CAPM in determining a point estimate for the equity beta, although this should be used *"informatively rather than mechanistically"*.[27] Following this approach, the AER adopted an equity beta estimate of 0.7 from a range of 0.4 to 0.7. In part, this reflected the AER's view that *"[t]he theoretical principles underpinning the Black CAPM suggest the standard Sharpe-Lintner CAPM may underestimate the return on equity for firms with equity betas below 1.0."*[28] In the 2018 rate of return guideline, the AER considered whether an adjustment to the SL-CAPM using the Black CAPM should be made. They concluded that no adjustment was necessary. The AER stated they "*received no evidence of Australian market practitioners considering…or using the Black CAPM*".[29] They also concluded that "*Black CAPM has empirical issues including instability, sensitivity to choice of inputs, lack of consensus, and nonsensical and counter-intuitive results*." The AER also found "*no role*" for the three factor FFM. [30]
ERA	In its 2015 Rail WACC decision, the ERA adopted a similar approach to the AER's 2013 rate of return guideline. They found that while the Black CAPM is *"relevant for the purpose of estimating the return on equity"*, *"given it is not reliable and practical to estimate a robust return on equity using this model, the model will not be used directly, but only to inform the point estimate of the equity beta"*.[31] The FFM was found to be not relevant.[32] In its 2018 Gas Rate of Return Guidelines, the ERA agreed with the analysis presented in the AER's 2018 Rate of Return Guideline and decided to place no weight on the Black CAPM in determining the equity beta.[33] In its 2019 rail WACC decision, the ERA considered several different asset pricing models including Black CAPM and the FFM.[34] They concluded "*only the Sharpe-Lintner CAPM model was relevant for informing the estimation of the prevailing return on equity for the regulated firms*."
IPART	Over the review period, IPART has only used the SL-CAPM. However, in a recent decision they stated that they would "*monitor the impact that the Fama-French model would have* [and consider it] *at a future review*."[35] They also considered and rejected the use of Black-CAPM.[36] IPART accepted that there might be a low beta bias in SL-CAPM but concluded that the Vasicek adjustment they use during beta estimation mitigates it.

[27] AER (2013), Appendices, p. 85.

[28] AER (2013), p. 86.

[29] AER (2018a), *Rate of Return instrument – Explanatory Statement*, p. 196.

[30] AER (2018a), p. 83.

[31] ERA (2015), *Review of the method for estimating the Weighted Average Cost of Capital for the Regulated Railway Networks – Final Decision,* p. xv.

[32] ERA (2015), p.xv.

[33] ERA (2018), *Final Gas Rate of Return Guidelines Explanatory Statement*, p. 236.

[34] ERA (2019), *2018 and 2019 Weighted Average Cost of Capital – For the Freight and Urban Networks, and the Pilbara Railways – Final determination.*

[35] IPART (2018), *Review of our WACC method.*

[36] IPART (2017a), *Review of our WACC method.*

Regulator	Precedent
Australian Competition Tribunal (ACT)	On an application to review a decision made by the AER in 2015 the ACT concluded "[t]*he Tribunal does not consider the AER, by selecting SL CAPM as its foundational model, made an error of fact*".[37] The wording of the rate of return objective considered by the ACT was similar to that of the Pricing Order.[38] The rate of return objective required that the AER set *"the rate of return…commensurate with the efficient financing costs of a BEE* [benchmark efficient entity] *with a similar degree of risk"*.
QCA	In its 2018 WACC determination for Aurizon Network, the QCA considered submissions that the SL-CAPM underestimated the cost of equity due to low beta bias. After reviewing the evidence presented, the QCA concluded that it was *"not of the view that the SL CAPM model is deficient – and that another model is better – at this time."*[39] In relation to the FFM, the QCA noted that *"the lack of a theoretical basis is problematic, as it has contributed to disagreement over the specification of the model, including the choice of potential explanatory factors"*.[40]

Sources: See Appendix A for detailed references.

3.1.5. Assessment

We consider only the SL-CAPM has been well accepted by regulators over the review period. In Australia, there has been a careful assessment of the other models (including Black CAPM and FFM) by regulators, but these models are not used to set the cost of equity for the purpose of pricing for regulated entities.

Academics regularly consider alternative asset pricing approaches including Black CAPM and FFM amongst others. However, there does not appear to be a consensus on the appropriate implementation approach for these models in the context of estimating the cost of equity for an Australian benchmark efficient entity.

Financial practitioners also consider Black CAPM and FFM, for example for portfolio construction. However, we find no evidence to suggest that either the Black CAPM or FFM are well accepted by finance professionals for the purpose of calculating a revenue requirement for a benchmark efficient entity.

Overall, we find that the weight placed by the Port on the Black CAPM and FFM in the 2017-18, 2018-19 and 2019-20 TCS is not well accepted. The Port's reliance on the SL-CAPM model for the 2020-21 TCS is well accepted.

3.2. Risk-free rate

3.2.1. The Port's approach

Across all four TCS, the Port has proposed a risk-free rate calculated using 10-year Australian Government bond yields averaged over a 20-day period to the end of March in the year that the TCS was submitted. The estimates resulting from this approach are presented in the table below.

Table 3.3: The Port's estimated risk-free rate

TCS	2016-17	2017-18	2018-19	2019-20	2020-21
Risk-free rate	2.81%	2.81%	2.74%	1.96%	0.90%

Source: TCS. Note: The 2016-17 risk-free rate is set out in the 2017-18 TCS, which assumes it is equal to the 2017-18 risk-free rate.

[37] Australian Competition Tribunal (2016), *Applications by Public Interest Advocacy Centre Ltd and Ausgrid*, paragraph 735.

[38] Australian Competition Tribunal (2016), paragraph 710.

[39] QCA (2018), *Aurizon Network's 2017 draft access undertaking,* p. 123.

[40] QCA (2018), p. 124.

3.2.2. Financial practitioner and academic evidence

The Port has not put forward evidence from financial practitioners and academics in support of its approach to estimating the risk-free rate. The Port has considered evidence from these groups to inform its approach to estimating the total market return, being the combination of the risk-free rate and MRP. We consider this evidence in the discussion of the MRP in Section 3.3.

3.2.3. Regulatory evidence

The table below shows our findings from a review of Australian regulatory precedent over the five-yearly review period. We found consistent support for using yields on 10-year Commonwealth Government bonds and an averaging period of between 20 and 60 days. In a few cases, regulators (ERA, QCA) have opted to use shorter terms for the risk-free rate that match the length of the regulatory period or access determination. However, this approach is not common.

Table 3.4: Decisions on risk-free rates in recent Australian regulatory precedent

Regulator	Decision date	Instrument	Averaging period
AER	2018	10-year Commonwealth Government bonds	20-60 days[41]
AER	2013	10-year Commonwealth Government bonds	20 days
ACCC	2019	10-year Commonwealth Government bonds	40 days
ACCC	2015, 2017	10-year Commonwealth Government bonds	20 days
ERA	2015, 2019	10-year Commonwealth Government bonds	40 days
ERA[42]	2018	5-year Commonwealth Government bonds	20 days
ESCOSA	2020	10-year Commonwealth Government bonds	60 days
ESCOSA	2015	10-year Commonwealth Government bonds	20 days
ICRC	2018	10-year Commonwealth Government bonds	40 days
IPART	2013, 2018	10-year Commonwealth Government bonds[43]	40 days
OTTER	2015, 2018	10-year Commonwealth Government bonds	40 days
QCA	2020	10-year Commonwealth Government bonds	20 days
QCA	2018	4-year Commonwealth Government bonds	20 days
QCA	2016	5-year Commonwealth Government bonds	20 days

Source: See Appendix A.

3.2.4. Assessment

We consider the Port's approach to the risk-free rate to be well accepted. Accordingly, in line with our terms of reference we have not independently estimated this parameter, except for the year 2016-17, where our WACC estimates reflect a risk-free rate calculated using 10-year Australian Government bond yields averaged over a 20-day period to the end of March 2016. For this year, we estimate the risk-free rate at 2.59%, compared to the Port's estimate of 2.81%.

[41] Provider nominated.

[42] The ERA justified the difference between this approach for the 2018 Gas Rate of Return Guidelines and its approach for rail (10-year CGS yields) on the basis of differences in the regulatory framework. In particular, *"the term of the gas rate of return is conditioned by the five year term of the regulatory period… the term of the rail WACC is conditioned by the explicit requirement for a 'gross replacement value annuity', which is paid over the 'economic life' of the rail assets'"*. ERA (2018), p. 48.

[43] Note, IPART calculates a 'current' and 'historic' risk-free rate. The current estimate is based on a 5-year trailing average, and the historical estimate is based on a 10-year trailing average.

3.3. MARKET RISK PREMIUM (MRP)

The CAPM requires estimates of the risk-free rate and the MRP. While the risk-free rate is conventionally proxied by the return on government bonds, the MRP cannot be observed directly and is usually estimated with reference to the total market return (TMR). The TMR measures shareholders' gains from dividends and share prices and can be calculated using stock market data. Regulators use different approaches to estimating the MRP.

In this section, we review the Port's approach to estimating the MRP and compare it to the regulatory approaches adopted in various sectors and jurisdictions in Australia. We then consider whether this regulatory precedent supports the Port's approach, in terms of both the overall methodology used to estimate the MRP and its detailed implementation.

3.3.1. The Port's approach

Methodology

Throughout the review period, the Port's advisor Synergies has considered a weighted average of the following methods of estimating MRP:

- Historical excess returns (HER) approach. Also known as the Ibbotson method, the HER method calculates the MRP as the long-term historical average of the difference between the TMR and the risk-free rate. It assumes that the MRP is stable over time and the TMR fluctuates largely in line with the risk-free rate.
- The Wright method. This method calculates the MRP as the difference between the long-term historical average of market returns and the current risk-free rate. It assumes that the TMR is stable over time and the MRP is negatively correlated with the risk-free rate.
- Dividend Discount Models (DDMs) are forward-looking models which assume that the current stock market value is equal to the present value of future dividend payments, discounted using the TMR. The MRP can be obtained as the difference between the implied TMR and the risk-free rate.

Initially, Synergies relied only on HER and Wright estimates of the MRP. Synergies argued in their 2017-18 TCS that the majority of regulators had acknowledged the limitations of relying on only the HER approach and that several regulators had adopted the Wright approach. Synergies noted that although DDMs are well accepted, they are inherently unstable and there were disagreements on the terminal growth rate. Therefore, Synergies only used DDM evidence as a cross check.[44]

In the 2019-20 TCS, Synergies lowered the weighting for the Wright method and started giving weight to DDMs. This responded to comments made by the ESC in their interim commentary for the Port's 2018-19 TCS, where the ESC noted that the Wright approach had very limited support and usage by Australian regulators.[45] Synergies again lowered the weighting of DDMs and the Wright approach in their 2020-21 TCS and consequently increased the weighting of HER. Synergies commented that *"*[o]*verall, the combined weighting of 30% assigned to the Wright MRP and DDMs accommodates the observation that recent decreases in the risk-free rate have not always been offset with corresponding increases in the MRP by regulators and practitioners in equal measure".*[46]

The table below summarises Synergies' MRP approach and estimates.

[44] Synergies (2017), p. 66.

[45] ESC (2018), *Interim commentary – Port of Melbourne tariff compliance statement*.

[46] Synergies (2020), p. 148.

Table 3.5. Synergies' MRP estimates

Methodology	2017-18 TCS	2018-19 TCS	2019-20 TCS	2020-21 TCS
HER	6.53% (50%)	6.56% (50%)	6.48% (50%)	6.42% (70%)
Wright	9.01% (50%)	8.86% (50%)	9.54% (25%)	10.74% (15%)
DDMs	-	-	8.56% (25%)	9.75% (15%)
Weighted average MRP	**7.77%**	**7.71%**	**7.77%**	**7.57%**
Risk-free rate	2.81%	2.74%	1.96%	0.90%
TMR	10.58%	10.45%	9.73%	8.47%

Note: weights shown in parenthesis. The 2016-17 MRP is set out in the 2017-18 TCS and assumed equal to the 2017-18 MRP. Synergies' MRP estimates for 2016-17 to 2019-20 assume a theta of 0.35 and a utilisation rate of 0.7, consistent with a gamma of 0.25. Synergies' MRP estimates for 2020-21 assume a theta of 0.41 and a utilisation rate of 0.8, consistent with a gamma of 0.33. Source: Synergies (2017, 2018, 2019, 2020).

Implementation

HER Method

There are three key issues in the implementation of HER in the Australian context:

- **Source of market data** – Early Australian stock market returns series (1883-1961) constructed retrospectively by Lamberton and the Sydney Stock Exchange (SSE) are commonly considered to overestimate returns. To correct the bias, Australian regulators use adjusted datasets from two sources: Brailsford, Handley, and Maheswaran (BHM) and NERA. Throughout the review period, Synergies have relied on NERA data.
- **Averaging** – The average historical MRP can be calculated using arithmetic or geometric averaging. Geometric averages tend to be lower.[47] Synergies use arithmetic averaging.
- **Time period** – Most Australian regulators average the MRP over five time periods with the same start dates (1883, 1937, 1958, 1980, and 1988).[48] In the 2020-21 TCS, Synergies noted that 1883-present would be their preferred averaging period, because it uses all available data and is least susceptible to short-run fluctuations in market conditions. Synergies also acknowledged that Australian regulators also have regard to the shorter averaging periods, and adopted the median of all five periods as their HER point estimate for 2020-21.[49] However, in all previous TCS, Synergies based their estimates exclusively on the series starting in 1883.

Wright method

Synergies' calculation of the MRP under the Wright method is based on the following steps:

- For each year, the nominal TMR is converted to real using the Fisher equation and the year's inflation rate.

[47] The mathematical properties of averages imply that the geometric average of a list of non-negative real numbers is smaller than or at most equal to the arithmetic average of that list. The equality only holds if every number in the list is the same.

[48] 1883 is the earliest available year of Australian market returns data. Increases in data quality have become available in 1937, 1958, and 1980. More recent sampling periods, while more vulnerable to influence by the current stage of the business cycle or one-off events, may reflect more closely the current financial environment, particularly since financial deregulation (1980) and the introduction of the imputation credit taxation system (1988). See AER (2013), p. 82

[49] Synergies (2020), p. 132-133.

- The real TMR is averaged over time.
- The average TMR is converted back to nominal terms using expected inflation (Synergies use 2.5%, the mid-point of the RBA's target band).
- The current risk-free rate is subtracted from the TMR to obtain the MRP.

The issues set out above in relation to HER are also relevant to the calculation of the average TMR under the Wright method. Consistent with their implementation of HER, Synergies' implementation of Wright uses NERA data and arithmetic averaging. The first three TCS used only the period starting in 1883, but in 2020-21 Synergies adopted the median of the Wright estimates over the same five time periods used in the HER estimate.

Dividend Discount Models

DDMs assume that the value of a security, or the overall stock market, is the discounted value of its future dividends. There are a range of detailed assumptions that are typically required to implement DDMs: the sources of estimates of dividend growth and whether there are biases in these estimates; how injections and withdrawals of equity are taken account of; and the relationship between long-term dividend growth and economic growth (i.e., the number of stages). The range of plausible assumptions means that the implementation of the DDM can produce a wide range of estimates for the TMR and the MRP.

Prior to the 2020-21 TCS Synergies took a simple average of three different DDMs: Damadoran (2013), Bank of England (2010), and the Gordon Constant Growth Model. In the 2020-21 TCS, Synergies included additional models with the intent of bringing their estimation more in line with Australian regulatory practice. In addition, the Gordon Constant Growth Model was removed as it was not used by any Australian regulators. Synergies placed one-third weight on the ERA's two stage model, one-third on the QCA's Cornell DDM, and one-third on the average of three IPART DDMs (Damodaran (2013), Bank of England (2010), and Bank of England (2002)).

Text Box 1: Theta and distribution rate in the MRP calculation

Theta and the distribution rate, two parameters that are relevant to the calculation of gamma (further discussed in Section 5), also have an impact on the calculation of MRP:

- Theta, or utilisation rate, represents the value an investor places on $1 of franking credits. In the HER and Wright methods, theta is used to include the value of imputation credits in the calculation of historical market returns (although it only affects calculations after 1988, when the imputation credit taxation system was introduced).
- The distribution rate is the proportion of imputation credits generated by a company that are distributed to investors. In combination with theta and the corporate tax rate, the distribution rate is used to calculate an 'imputation factor' used by Australian regulators in their DDMs to adjust raw dividends to account for the contribution of franking credits to the return on equity.

The theta and distribution rate used in the MRP calculation should be consistent with the gamma used for the WACC calculation.

We find that the Port's approach in each TCS was internally consistent in this regard. However, in accordance with our finding that the Port's approach on gamma was not well accepted, our proposed WACC ranges reflect updated gamma estimates. Consequently, in our MRP calculations we have adopted a theta and distribution rate consistent with these updated gamma estimates.

We note that the impact of a higher theta or distribution rate, holding all else equal, is to increase MRP estimates. However, a higher theta or distribution rate are associated with a higher gamma, which can lead to a lower overall WACC.

3.3.2. Financial practitioner evidence

As noted above, over the five-year review period, Synergies has placed varying degrees of weight on three approaches to estimating MRP: HER; the Wright method; and DDMs. The weighting that Synergies places on the Wright approach relies, in part, on the observations that:[50]

- valuation reports tend to set risk-free rates above the prevailing spot rate; and
- some valuers explicitly state their view that there is an inverse relationship between the MRP and the risk-free rate.

Over the 2013 to 2021 period that we reviewed, independent experts tended to rely on a mixture of historical data, academic literature, and regulatory precedent when setting MRP. We also observed that over the entire period (2013 to 2021) the MRP applied was commonly 6% with no adjustment for the falling risk-free rate over this period. Nonetheless, as noted in Section 3.1.2 we agree that valuation reports do tend to set the risk-free rate above prevailing spot levels.

However, this appears to primarily reflect that the valuer is using a long-term estimate of both the risk-free rate and MRP in order to value long-term cash flows. This differs from the context of the Port. In particular, although the Port hold assets with long useful lives, the Port has been setting prices over a one-year horizon, rather than the generally much longer-term investment horizons reflected in company valuations. The distinction between a long-term valuation context and regulatory price-setting context is recognised by some financial practitioners. For example, in its 2017 valuation of Macmahon Holdings Limited, Lonergan Edwards note that (emphasis added):

> *"Whilst regulatory bodies in Australian generally favour the use of current CGB yields for the risk-free rate (rather than longer term averages or adjusted risk-free rates), it should be noted that these **regulatory bodies are not assessing the appropriate risk-free rate in the context of the long-term rate of return required by debt and equity investors (but rather the risk-free rate likely to prevail over a relatively short 5-year period, which is then subject to change depending on market conditions at that time**). As a result, the risk-free rates adopted by regulatory authorities in Australia are therefore not necessarily the appropriate risk-free rates to adopt when determining the appropriate discount rate for a business."*[51]

This means that to be consistent with the approach of a financial practitioner who is attempting to value long-term forecast cash flows, the Port does not need to reflect a long-term forecast of the risk-free rate in the cost of capital that it uses to set annual prices. This is because it can simply reflect prevailing risk-free rates as they change in each year, alongside a long-term value of the MRP; that is, over time, the average risk-free rate applied by the Port in its pricing will reflect a long-term risk-free rate forecast made at the start of the Port lease (assuming that the latter accurately predicts observed outcomes).

We agree with Synergies that some valuation reports do comment on a potential inverse relationship between the risk-free rate and the MRP, which is supportive of the Wright approach. For example, in their independent expert report for Aquila Resources (2014), Grant Samuel commented that:

> *"the market risk premium is not constant and changes over time. At various stages of the market cycle investors perceive that equities are more risky than at other times and will increase or decrease their expected premium. Indeed prior to 2008, there were arguments being put forward that the risk premium was lower than it had been historically while today there is evidence to indicate that current*

[50] For example, see Synergies (2020), section 6.2.1.

[51] Lonergan Edwards (2017), *Independent Expert's Report – Takeover offer for Macmahon Holdings Limited*, February, p. 60.

market risk premiums are above historical averages. However there is no accepted approach to deal with changes in market risk premium for current conditions"[52]

However, in the sample we have reviewed, most valuers do not appear to explicitly comment on this relationship. That is, the primary rationale for adopting a risk-free rate above spot levels appears to be linked to long-term expectations for the risk-free rate, not an assumed inverse relationship with the MRP.

On this basis, we do not think it is reasonable to conclude that the Wright approach is generally well accepted by finance practitioners.

3.3.3. Regulatory evidence

Methodology

Australian regulators rely on various MRP methodologies, summarised in the table below, either as weighted criteria or cross-checks. This reflects the regulator's assessment of the relative strengths and weaknesses and evidence supporting each method.

Table 3.6. MRP methods in Australian regulatory decisions in force during the review period

Entity	HER	Wright	DDM	Surveys/ expert reports	Siegel	Market indicators	Regulatory precedent	MRP estimate
2017-18 TCS								
PoM (2017)	50%	50%	-	-	-	-		7.77%
AER (2016)	Most reliance	-	Less reliance	Some reliance	-	Cross check	Cross check	6.50%
ACCC (2015)	Most reliance	-	-	Some reliance	-	Cross check	Some reliance	6.00%
ERA (2017)	Some reliance	Preferred historical estimate	Some reliance to lower half of the range	-	-	-	-	7.20%
ESCOSA (2015)	Most reliance	-	-	-	-	-	Most reliance	6.00%
QCA (2016b)	30%/35%	10%/5%	20%/15%	10%/15%	30%	Cross check	-	6.50%
IPART (2013)	50%	-	50% in combination with market indicators	-	-	Used in combination with 5 DDMs	-	7.65%[53]
OTTER (2015)	-	-	-	-	-	-	Based on 2012 decision	6.00%
Industry Panel (2015)	-	-	100%	-	-	-	-	7.23%
2018-19 TCS								
PoM (2018)	50%	50%	-	-	-	-		7.71%
AER (2017)	Most reliance	-	Second most reliance	Some reliance	-	Cross check	-	6.50%
ACCC (2017)	Most reliance	-	-	Some reliance	-	-	Some reliance	6.00%
ERA (2017)	Some reliance	Preferred historical estimate	Some reliance to lower half of the range	-	-	-	-	7.20%
ESCOSA (2015)	Most reliance	-	-	-	-	-	Most reliance	6.00%
QCA (2016b)	30%/35%	10%/5%	20%/15%	10%/15%	30%	Cross check	-	6.50%

[52] Grant Samuel (2014), p. 4.

[53] IPART (2017b), *spreadsheet-wacc-model-february-2017.xlsx*

Entity	HER	Wright	DDM	Surveys/ expert reports	Siegel	Market indicators	Regulatory precedent	MRP estimate
IPART (2018)	50%	-	33%	-	-	17%	-	7.30%[54]
OTTER (2015)	-	-	-	-	-	-	Based on 2012 decision	6.00%
ACT Industry Panel (2015)	-	-	100%	-	-	-	-	7.23%
2019-20 TCS								
PoM (2019)	50%	25%	25%	-	-	-		7.77%
AER (2018)	100%	-	-	Cross check	-	-		6.10%
ACCC (2017)	Most reliance	-	-	Some reliance	-	-	Some reliance	6.00%
ERA (2018)	Most reliance (ca. 80%)	-	Less reliance (ca. 20%)	-	-	Cross check	-	6.00%
ESCOSA (2015)	Most reliance	-	-	-	-	-	Most reliance	6.00%
QCA (2018)	25%	15%	25%	20%	15%	-	-	7.00%
IPART (2018)	50%	-	33%	-	-	17%	-	7.35%[55]
OTTER (2018)	-	-	-	-	-	-	Based on AER (2013)	6.50%
ICRC (2018)	-	-	-	-	-	-	Based on AER (2017c)	6.50%
2020-21 TCS								
PoM (2020)	70%	15%	15%	Cross check	-	-		7.57%
AER (2018)	100%	-	-	Cross check	-	-	-	6.10%
ACCC (2019)	-	-	-	-	-	-	Based on AER (2018)	6.10%
ERA (2019)	80%	-	20%	-	-	-	-	5.90%
ESCOSA (2020)	100%	-	-	Cross-check	-	-	-	6.00%
QCA (2020)	25%	15%	25%	20%	15%	-	-	7.00%
IPART (2020)	50%	-	33%	-	-	17%	-	7.85%
OTTER (2018)	-	-	-	-	-	-	Based on AER (2013)	6.50%
ICRC (2018)	-	-	-	-	-	-	Based on AER (2017c)	6.50%

Sources: See Appendix A for detailed references.

AER

When setting the MRP, the AER applies regulatory judgement to assess the usefulness of different types of evidence and how to use them to inform its MRP estimate. In its most recent rate of return instrument for electricity and gas networks (2018), the AER adopted an MRP estimate of 6.1% based on HER over the time period it considered most relevant (1988-2017). The AER explained that it relied on HER because this is directly observable, easily replicable, and transparent, and because it expected the MRP to change relatively slowly over time.[56] The

[54] As of March 2018. See IPART (2020b), *spreadsheet-wacc-model-august-2020*

[55] As of March 2019. See IPART (2020b), *spreadsheet-wacc-model-august-2020*

[56] AER (2018a), p. 220-221.

AER cross-checked the HER estimate against surveys of academics and market practitioners and a range of conditioning variables (i.e., market data and indicators that provide information on the potential risk in the market).[57]

In the 2018 RORI consultations, the AER considered some DDMs, but expressed concerns with their reliability and accuracy. The AER decided not to increase its MRP estimate based on the results of these models. The AER noted that DDMs rely on analyst forecasts which tend to be upwardly biased and that a further upward bias could be introduced in these models by 'sticky dividends' (i.e. the idea that firms may be slower to lower dividends in response to poor returns than to raise them due to good returns).[58] The AER explicitly rejected the Wright method, noting that it did not find significant evidence to support an estimable relationship between the MRP and the risk free rate.[59]

In previous decisions, in line with the 2013 rate of return guidelines, the AER relied on HER, its own specification of the DDM, surveys, and conditioning variables. The AER gave HER the most reliance. In the 2016 AusNet Services decision, the AER noted that the DDM was theoretically sound, but suffered from limitations in its practical implementation and was likely to be upwardly biased. As a result, the AER did not consider DDM estimates reliable enough to be used on their own, but relied on them to set an MRP point estimate above the range of historical returns. Other evidence was used merely as a cross-check.[60] In the 2017 ElectraNet transmission draft determination, the AER noted similar issues around the practical limitations of DDMs.[61]

ACCC

In its 2019 decision on Australia Post, the ACCC adopted an MRP of 6.1%, in line with the AER's 2018 rate of return instrument. The ACCC considered that the MRP should be estimated based on HER.[62] Previous ACCC decisions set the MRP at 6%, giving most relevance to HER as well as previous regulatory decisions by the AER and the ACCC itself.

ERA

In its most recent determinations, the ERA set the MRP based on HER and DDM estimates. While the ERA notes that it used regulatory discretion to reach a point estimate from these two methodologies, it appears to have placed 80% weight on the HER estimate and 20% weight on the DDM estimate. The ERA considered that HER is a simple and well accepted method and the best source of evidence available to calculate the MRP. The DDM, while having the benefit of taking the current economic outlook into account, suffers from weaknesses including sensitivity to assumptions and upward bias.[63] The ERA did not consider the Wright method due to empirical and theoretical concerns.[64]

In its 2017 rail determination, however, ERA gave weight to the Wright method, and regarded it as its preferred method based on historical data (over HER). ERA also considered DDMs but decided to rely primarily on the lower end of these estimates.

ESCOSA

ESCOSA's most recent determination of the MRP for SA Water is based on the HER method. While ESCOSA acknowledges concerns with this approach (including HER being backward-looking, volatile and potentially upward

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[57] AER (2018a), p. 236-238.

[58] AER (2018a), p. 265.

[59] AER (2018a), p. 231.

[60] AER (2016), p. 59.

[61] AER (2017a), p. 76.

[62] ACCC (2019), *Decision on Australian Postal Corporation 2019 price notification,* p. 37.

[63] ERA (2019), p. 52. ERA's HER estimate is 5.6%, the DDM estimate is 7.2%. 5.6%*80% + 7.2%*20% = ca. 5.9%.

[64] ERA (2019), p. 51-52.

biased due to technology change and the liberalisation of financial markets), it considers that the HER method is difficult to improve upon. ESCOSA also considered surveys and market-implied estimates as cross-checks.[65]

In their 2015 determination, ECOSA confirmed a 6% MRP estimate from a previous decision, having regard primarily to HER estimates.

QCA

In recent decisions, the QCA has relied on a range of MRP estimates combined as a weighted average: HER (25% weight), DDM (25%), surveys (20%), Wright (15%), and Siegel (15%).[66] According to the QCA, this set of weights places more emphasis on the two methods that are entirely independent of each other (the HER and DDM), thus maximising the use of available information (historical and forward-looking) and reducing the mean square error of the MRP estimate. In addition to the weighted average, the QCA also considers the simple average and the median of the MRP estimates, selecting a point estimate in between the three, rounded to the nearest 0.5%.[67]

Previously the QCA gave more weight to methods based on historical excess returns (HER and Siegel had a combined weight of 60%-65% in the 2016 Dalrymple Bay Coal Terminal decision) and less to Wright and DDM.

IPART

IPART sets the WACC as the midpoint of a lower estimate based on current market data and an upper estimate based on long-term averages. In practice this means that some WACC parameters, including the MRP, are the midpoint between historical and forward-looking estimates.[68] IPART considers that this is appropriate because investors take into account of both long- and short-term values when making their investment decisions.[69]

The long-term estimate of the MRP, which effectively receives 50% weight, is based on HER. The remaining 50% weight is placed on the 'current' MRP, which is currently calculated as the average between the median of five DDMs (with 2/3 weight) and the market indicators method (1/3 weight). [70] In their 2013 guidelines IPART instead used the midpoint of the six 'current' estimates.

OTTER

In its most recent water determination, OTTER adopted the MRP set by the AER in its 2013 rate of return guideline, which gave greatest consideration to HER followed by DDMs and then surveys – resulting in an MRP estimate of 6.5%, an uplift on the 6.0% HER-based point estimate.[71] OTTER's previous determination, in 2015, simply accepted TasWater's proposed MRP of 6%, which in turn confirmed a previous OTTER decision.

ICRC

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[65] ESCOSA (2020), *SA Water Regulatory Determination – Draft Determination: Statement of reasons*, p. 324-326.

[66] The Siegel method is an estimate of historical excess returns adjusted for the impact of unexpected inflation on the risk-free rate. The method is based on empirical evidence that historically unexpected inflation has artificially reduced the real returns on bonds but not the real returns on equities. To calculate the Siegel MRP, the QCA adds the long-term average real bond yield back into its HER estimate, then subtracts the expected long-run real risk-free rate (proxied by the average real yield on inflation-indexed bonds over the period since their issue in 1986). See QCA (2014), *Cost of capital: market parameters - Final decision*, August, p. 16, 59 and 62. The QCA's Siegel estimate of the MRP as of 31 March 2020 is 5.6% versus a HER estimate of 6.2%.

[67] QCA (2020), *Final report – Gladstone Area Water Board Price Monitoring 2020-25*, p. 89. QCA (2018), p 45.

[68] IPART (2020a), p. 258.

[69] IPART (2018), p. 50.

[70] IPART (2018), p. 59. The market indicators method adopted by IPART is to estimate, at each point in time, where in percentile terms the indicators lie on average relative to their historical distributions, and then apply this percentile to an assumed uniform distribution for the MRP. The indicators are: the risk-free rate, a term spread on Government bond yields, a measure of Government-corporate bond spread, and the market dividend yield. See SFG Consulting (2013), *Market Risk Premium*, May, p. 6-7 - attachment to IPART (2013).

[71] AER (2013), p. 93-95.

In its most recent water price review, the ICRC essentially adopted the MRP set by a 2017 AER gas transmission decision, considering that this was well supported by historical and current market information. The AER decision placed most reliance on HER, less reliance on DDMs, and some reliance on survey evidence and conditioning variables – resulting in an MRP estimate of 6.5%, an uplift on the 6.0% HER-based point estimate.[72]

ESC

Until 2016, the ESC set the MRP as part of the determination of return on equity for Victorian water companies. In 2008, the ESC adopted an MRP of 6%, informed by a range of long-run historical returns estimated over different time periods, as well as forward-looking estimates.[73] In 2013, the ESC again used an MRP of 6%, corroborated by Australian regulatory precedent and surveys of market practitioners.[74] For its 2016 Melbourne Water price review, the ESC maintained an MRP of 6%.[75]

In 2016, the ESC introduced the PREMO framework, under which the return on regulated equity of water businesses is based on the ESC's rating of their price proposal. Within this framework, the MRP is not set explicitly. From 2021, all Victorian water businesses are regulated under the PREMO framework.[76]

3.3.4. Comparison with the Port's approach

Methodology

We find that each of the individual MRP methodologies used by Synergies have been used by Australian regulators, at least in some decisions. However, compared to the vast majority of Australian regulators, Synergies have given more weight to the Wright and DDM methods (particularly in the last two TCS) and correspondingly understated the importance of HER:

- In the 2017-18 and 2018-19 TCS, Synergies placed 50% weight on the HER and Wright methods. At the time, only two regulators gave weight to the Wright method. The ERA (2017) did not apply specific weights to reach its point estimate of MRP, but regarded Wright as its preferred method based on historical data and considered it alongside HER and DDMs. The QCA only gave the method a weight of 5% to 10%. Regulators at the time placed most reliance on HER – this includes AER, ACCC, ESCOSA, and the QCA (which placed a combined 60%-65% weight on HER and Siegel) – although IPART placed 50% weight on HER and the rest on a combination of current MRP estimates (largely DDMs).[77]
- In the 2019-20 TCS, Synergies again placed 50% weight on HER, with the remaining weight divided between Wright and DDMs. A 25% weight on DDMs was broadly in line with the weight afforded to this method at the time by ERA and the QCA. However, by placing 25% weight on the Wright method, Synergies again overstated the importance of this approach in Australian regulatory practice, as at the time the QCA placed a 15% weight on Wright and was the only regulator to have regard to this method. Most regulators at the time relied primarily on HER, including AER, ACCC, ERA, and ESCOSA (as well as ICRC and OTTER, which referred to AER decisions based mostly on HER).
- In the 2020-21 TCS, Synergies increased the weight on HER to 70% and reduced the weight on Wright and DDMs to 15% each. At the time, only the QCA had regard to Wright, with a 15% weight. However, we note

[72] AER (2017c), *APA VTS gas access arrangement 2018 to 2022*, Attachment 3 – Rate of return, p. 81.

[73] ESC (2007), *2008 Water Price Review Guidance Paper*, March, p. 38.

[74] ESC (2013), *Price Review 2013: Regional Urban Water Businesses*, Draft Decision - Volume I, March, p. 114.

[75] ESC (2015), *Proposed approach to Melbourne Water's 2016 water price review*, February, p. 39.

[76] Except Goulburn Murray Water, a rural water corporation subject to a different regulatory framework and largely governed by Commonwealth rules.

[77] The Industry Panel (2015) placed 100% weight on a DDM, but we do not regard that decision as well accepted, as it was profoundly different from other regulatory approaches at the time. Industry Panel (2015), *Substituted price direction: Regulated water and sewerage services*.

that Wright is just one out of five methods the QCA uses, and that the QCA considers the weighted average of these estimates alongside the median, which effectively reduces the influence of the Wright method (as the median is not affected by the particularly high estimate derived from Wright). At the time, most regulators relied primarily if not exclusively on HER, including AER, ERA, and ESCOSA (as well as ICRC, OTTER, and ACCC, which referred to AER decisions based mostly on HER).

Overall, we find limited support for the Wright methodology in Australia over the five-yearly review period (particularly in the last two years), with several regulators (AER, ESCOSA, ERA) explicitly rejecting the Wright method in their most recent decisions, on the basis of theoretical and/ or empirical concerns. The AER, for example, concluded in its 2018 rate of return guideline that they "*see no strong evidence that the MRP and the risk free rate are inversely related […] if there is such a relationship, it is not estimable with sufficient precision for use in a regulatory decision*".[78]

We note that Synergies went from giving no weight to DDMs in the first two TCS, citing the inherent instability of the estimates and disagreements over the terminal growth rate to be used in these models, to giving 25% weight to this method in 2019-20, and 15% in 2020-21.

We consider that using DDMs, in combination with other methods, was an option that was open to the Port in any TCS year, including 2017-18 and 2018-19. In fact, DDMs have been used by a number of Australian regulators over the review period, including ERA, QCA, IPART and, in early years, AER. Synergies acknowledged this in the 2019-20 TCS, when it decided to give DDMs weight. At that stage, Synergies also considered that DDMs had the advantage of offering a forward-looking component to the Port's MRP estimate.[79]

Synergies' early criticism of DDMs is not unfounded. The DDMs' sensitivity to the specific functional form adopted as well as underlying data assumptions is a well-known limitation of this method, which has contributed to it receiving less weight than HER in Australian regulatory precedent. However, throughout the review period, the method could be regarded as well accepted, and we do not consider that its later adoption by Synergies is inconsistent with the Pricing Order.

Implementation

HER method

The table below provides a comparison between the Port's implementation of HER and Australian regulatory precedent. We find that the Port:

- Exclusively relied on NERA-adjusted market data. This is not well accepted among Australian regulators and leads to a higher MRP. For example, over the 1883-2019 period, HER based on BHM are 6.38%, compared to 6.72% based on NERA (assuming theta of 0.625). We discuss this in more detail in Text Box 2.
- Relied only on the period starting in 1883 in its first three TCS. At the time, this aspect of the implementation was not well accepted, as regulators considered a range or an average based on multiple periods. An exception to this was the QCA, who considered only the period starting in 1958. However, the period starting in 1883 provides the highest MRP estimate when using NERA data. The Port's choice of time periods in the 2020-21 TCS is well accepted.
- Exclusively relied on arithmetic rather than geometric averages. Arithmetic averaging produces higher estimates. However, we find that this aspect of the implementation is well accepted.
- Adopted a lower theta compared to Australian regulators. This leads to lower HER estimates but has the overall impact of increasing the WACC through a lower gamma. We discuss gamma in Section 5.

[78] AER (2018a).

[79] Synergies (2019a), p. 143.

Table 3.7: HER implementation

Entity	Market data	Period (start)	Averaging	Theta	Point estimate
2017-18 TCS					
PoM (2017)	NERA	1883	Arithmetic	0.35	
AER (2016)	BHM	1883, 1937, 1958, 1980, 1988	Arithmetic and geometric	0.60	Considered a range.
ERA (2017)	Average of NERA and BHM	1883, 1937, 1958, 1980, 1988	Arithmetic and geometric	0.53	Average of highest geometric and lowest arithmetic mean.
QCA (2016b)	Not relevant[80]	1958	Arithmetic	0.56	
IPART (2013)[81]	BHM	1883, 1937, 1958, 1980, 1988	Arithmetic	0.65	Point estimate of 6%.
2018-19 TCS					
PoM (2018)	NERA	1883	Arithmetic	0.35	
AER (2017)	BHM	1883, 1937, 1958, 1980, 1988	Arithmetic and geometric	0.60	Considered a range.
ERA (2017)	Average of NERA and BHM	1883, 1937, 1958, 1980, 1988	Arithmetic and geometric	0.53	Average of highest geometric and lowest arithmetic mean.
QCA (2016b)	Not relevant	1958	Arithmetic	0.56	
IPART (2018)	BHM	1883, 1937, 1958, 1980, 1988	Arithmetic	0.65	Point estimate of 6%.
2019-20 TCS					
PoM (2019)	NERA	1883	Arithmetic	0.35	
AER (2018)	BHM	1883, 1937, 1958, 1980, 1988	Arithmetic	0.65	Based on most recent period, with regard to the two longest periods.
ERA (2018)	Average of NERA and BHM	1883, 1937, 1958, 1980, 1988	Arithmetic and geometric	0.60	Average of highest geometric and lowest arithmetic mean.
QCA (2018)	Not relevant	1958	Arithmetic	0.55	
IPART (2018)	BHM	1883, 1937, 1958, 1980, 1988	Arithmetic	0.65	Point estimate of 6%.
2020-21 TCS					
PoM (2020)	NERA	1883, 1937, 1958, 1980, 1988	Arithmetic	0.41	Median of the five periods.

[80] QCA (2014, p. 56) commented on the NERA and BHM data. The QCA did not express a preference for one data source and reported results for both. However, this became a moot point as the QCA based its HER, Siegel, and Wright estimates only on the period starting in 1958 and noted that this is not affected by the choice of data.

[81] IPART's decisions in force throughout the review period maintained a HER estimate of 6%. These decisions refer back to IPART's established practice and ultimately to a 2009 WACC paper, where IPART examined HER estimates based on BHM data for several periods (although the focus seems to have been placed mostly on the periods starting in 1883, 1937, and 1958). IPART concluded that its existing practice of setting an MRP in the range of 5.5% to 6.5% continued to be appropriate. See IPART (2009), *IPART's cost of capital after the AER's WACC review: Lessons from the GFC*, p. 36-40.

Entity	Market data	Period (start)	Averaging	Theta	Point estimate
AER (2018)	BHM	1883, 1937, 1958, 1980, 1988	Arithmetic	0.65	Based on most recent period, with regard to the two longest periods.
ERA (2019)	Average of NERA and BHM	1883, 1937, 1958, 1980, 1988	Arithmetic and geometric	0.60	Average of highest geometric and lowest arithmetic mean.
QCA (2020)	Not relevant	1958	Arithmetic	0.55	
ESCOSA (2020)	Average of NERA and BHM	1883	Arithmetic and geometric	NA	Average of arithmetic and geometric.
IPART (2020)	BHM	1883, 1937, 1958, 1980, 1988	Arithmetic	0.65	Point estimate of 6%.

Note: the ACCC, OTTER, and ICRC rely on AER's estimates of HER. ESCOSA (2015) do not provide details of their implementation of the HER method.

Text Box 2: Adjustments to historical market data in the HER calculation

The series of historical market returns used in the calculation of the MRP in Australia under the HER and Wright methods represents year-on-year changes in the stock accumulation index (i.e., the annual with-dividend return of the market portfolio) for the Australian stock exchange.

For the period 1882-1961, the SSE originally constructed the stock accumulation index using dividend yield series compiled retrospectively by Lamberton and the SSE. The Lamberton/SSE series are calculated as the unweighted average yield on dividend paying stocks. Compared to the value-weighted average yield, the unweighted average used by Lamberton/SSE is biased towards high yielding small stocks. The Lamberton/SSE series also excludes non-dividend paying shares, which further overstates the overall market yield.[82]

Australian regulators have sought to correct this upward bias by adopting alternative data sources that adjust the Lamberton/SSE series. The main sources of adjusted data are BHM and NERA. BHM adjust the Lamberton/SSE yield by multiplying it by a constant 0.75 factor. Instead, the NERA adjustment factor varies over time, as it is based on NERA's own analysis of yield data for seven different quarters over the period in question (December 1891, December 1901, December 1911, December 1921, December 1931, December 1941, December 1951) and interpolation between those. NERA's adjustment factors are higher than BHM's until about 1930 and then slightly lower.[83]

The decision of whether to consider the NERA adjustment is one of the key points of contention in the regulatory determination of the HER MRP in Australia. The strongest impact on MRP estimates of adopting the NERA adjustment is on the longest data series considered by Australian regulators (1883-present), with the NERA adjustment producing a considerably higher MRP estimate, whereas estimates over shorter time periods are broadly similar across the two adjustments.

The AER (and regulators that follow the AER's MRP approach, such as ACCC, ICRC, and OTTER) rely exclusively on the BHM adjustment. The AER's approach is based on the conclusion that the NERA adjustment "*is not warranted or a clear, material improvement on the quality of the data*".[84] A key argument that has been put forward in favour of the NERA adjustment is that NERA relies on its own analysis of yield data for seven quarters during the period of the adjustment, whereas BHM only check yield data for February 1966 directly to test their approach. The AER, however, noted that BHM use that one check as one method (of several) to confirm the reasonableness of their adjustment. Instead, the AER argues that NERA has been unable to reconcile its data back to the original Lamberton series and its analysis of seven data points also fails to provide a comprehensive view of the 75-year period it is meant to cover.[85]

Other regulators have used an average of BHM and NERA data (ERA, ESCOSA). ERA in particular acknowledged the uncertainty around the most appropriate adjustment, arguing that averaging would minimise any potential error from using either series alone.[86] Exclusive reliance on the NERA adjustment (as proposed by the Port) does not appear to be supported by any recent regulatory decisions.

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[82] AER (2015), *Preliminary decision: Jemena distribution determination 2016 to 2020*, Attachment 3 – Rate of return, p. 378.

[83] NERA (2015), *Historical Estimates of the Market Risk Premium*, p. iv and 32-33.

[84] AER (2018), p. 249.

[85] AER (2015), p. 378-385.

[86] ERA (2016), *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020: Appendix 4 Rate of Return*, June, p. 110.

Source: AER (2015 and 2018a), ERA (2016), NERA (2015).

Wright method

As outlined above, we find limited support for the Wright method in Australian regulatory precedent. However, focusing only on implementation, the key area of the Port's approach that may not be well accepted is the sole reliance on NERA data.

Table 3.8: Implementation of the Wright method

Entity	Market data	Period (start)	Averaging	Theta	Inflation forecast	Point estimate
2017-18 to 2019-20 TCSs						
PoM (2017, 2018, 2019)	NERA	1883	Arithmetic	0.35[87]	2.50% (RBA midpoint)	
ERA (2017)	NERA and BHM	1883	Arithmetic	0.53	1.91% (10-yr forecast)	
QCA (2016b, 2018)	Not relevant	1958	Arithmetic	0.55, 0.56	2.50% (RBA midpoint)	
2020-21 TCS						
PoM (2020)	NERA	1883, 1937, 1958, 1980, 1988	Arithmetic	0.41	2.50%	Median of the five periods.
QCA (2020)	Not relevant	1958	Arithmetic	0.55	2.42% (based on RBA midpoint and most recent inflation forecast)	

Dividend Discount Models

In the 2019-20 TCS, Synergies relied on three DDM specifications, with equal weight: Damodaran (2013), Bank of England (2010), and Gordon Constant Growth model. We note that the first two specifications are used by IPART but the latter is not used by any regulators in Australia.

In the 2020-21 TCS, Synergies included additional models and removed the Gordon model with the intent of bringing their estimation more in line with Australian regulatory practice. Synergies placed one-third weight on the ERA's two stage model, one-third on the QCA's Cornell DDM, and one-third on the average of three IPART DDMs (Damodaran (2013), Bank of England (2010), and Bank of England (2002)). Synergies considered that this provided a balanced snapshot of Australian regulatory practice.

Given the variety of DDMs and their potential to produce widely different MRP estimates, we consider it appropriate that Synergies uses a range of DDMs that is as comprehensive and reflective of Australian regulatory precedent as possible. Therefore, Synergies' selection of DDMs in 2020-21 appears reasonable, although arguably the median, rather than the average of different DDM specifications, is more robust to extreme observations. Taking the median of different DDMs would also be in line with the approaches by IPART[88] and the QCA.[89]

[87] We note that in 2017-18, Synergies does not appear to have adjusted the Wright estimate for the value of imputation credits.

[88] We also note that IPART uses three models in addition to those estimated by Synergies to reach its forward-looking estimate of the MRP (Bloomberg, SFG analyst forecast, and SFG market indicator). Synergies disregards them because: 1) the Bloomberg model is protected by copyright and its outputs cannot be publicly reported; and 2) the SFG models are not DDMs (although IPART considers the analyst forecast methodology as another variation of the DDM). See IPART (2018), p. 52.

[89] The QCA estimates the Cornell DDM with six different combinations of assumptions on the long-term growth rate (4%, 4.6%, and 5.1%) and convergence scenarios (10-year and 20-year) and considers the median of the six DDM estimates. Synergies has replicated this aspect of the QCA's approach accurately in its estimates.

MRP estimates based on regulatory precedent

In the tables below, we present our estimates of the MRP in each year of the review period, based on the approaches of the Australian precedent we have reviewed. In certain cases, the approach of the regulator was not replicable. In such cases, we report the regulator's most recent estimate prior to the TCS year. Other methodological choices are captured in the notes to the tables.

Table 3.9: MRP estimates for 2016-17, based on regulatory approaches in force during the 2017-18 TCS year

Entity	Methodology	Estimate	Weight	Weighted average
PoM	HER	6.61%	50%	7.84%
	Wright	9.07%	50%	
AER	HER	5.5%-6%	Most reliance	6.50%
	DDM	7.6%-8.8%	Less reliance	
	Surveys/ reg. precedent	6%-6.5%	Some reliance	
ACCC	HER/ reg. precedent	6.00%	100%	6.00%
ERA	HER	5.30%	Some reliance	7.30%
	Wright	8.51%	Some reliance	
	DDM	5-6%-9.7%	Some reliance	
ESCOSA	HER/ reg. precedent	6.00%	100%	6.00%
QCA	HER	6.41%	30%	6.86%
	Wright	8.95%	10%	
	DDM	9.07%	20%	
	Surveys	6.00%[90]	10%	
	Siegel	5.41%[91]	30%	
IPART	HER	6.00%	50%	7.25%
	DDMs/Market indicators	8.50%	50%	
OTTER	Regulatory precedent	6.00%	100%	6.00%

Note: when possible, the estimates reported in this table have been re-calculated as of 31 March 2016, following PoM's/ regulators' approaches in force in 2017, but with a theta of 0.643 and a distribution rate of 0.7, in line with an assumed gamma of 0.45. For AER and ERA, which did not apply clear weights at the time, we directly report the estimates from the regulatory decisions that are closest in time to 31 March 2016: AER (2016) and ERA (2015). The IPART methodology cannot be re-estimated due to its reliance on proprietary methods and we have reported the January 2016 estimate from IPART (2016).[92] We also directly reported the estimates from ACCC (2015), ESCOSA (2015), and OTTER (2015), as these regulators largely relied on previous regulatory decisions to determine MRP.[93]

[90] As reported in QCA (2016a), *DBCT Management's 2015 draft access undertaking*, Draft decision, April.

[91] In its WACC methodology, the QCA (2014) defined *MRP(Siegel) = MRP(HER) + real risk-free rate (HER) – real long term risk-free rate*. This last parameter was defined as the average real yield on inflation-indexed bonds over the period since their issue (July 1986). We replicated the QCA estimate of Siegel in each year by calculating *real risk-free rate (HER) – real long term risk-free rate* from the most recent QCA report and adding it to our estimate of MRP based on the QCA implementation of HER.

[92] IPART (2016), *spreadsheet_-_wacc_calculator_-_february_2016.xlsx*

[93] ACCC (2015), *Public inquiry into final access determinations for fixed line services*, Final Decision. ESCOSA (2015), *SA Water regulatory rate of return 2016-2020*, Final Report. OTTER (2015), *2015 Water and sewerage price determination investigation*, Final Report.

Table 3.10: MRP estimates based on regulatory approaches in force during the 2017-18 TCS year

Entity	Methodology	Estimate	Weight	Weighted average
PoM	HER	6.64%	50%	7.82%
	Wright	9.01%	50%	
AER	HER	5.5%-6%	Most reliance	6.50%
	DDM	7.2%-8.5%	Less reliance	
	Surveys/ reg. precedent	6%-6.5%	Some reliance	
ACCC	HER/ reg. precedent	6.00%	100%	6.00%
ERA	HER	5.39%	Some reliance	7.20%
	Wright	8.32%	Some reliance	
	DDM	6.5%-7.8%	Some reliance	
ESCOSA	HER/ reg. precedent	6.00%	100%	6.00%
QCA	HER	6.49%	30%	6.42%
	Wright	8.79%	10%	
	DDM	5.86%	20%	
	Surveys	6.80%[94]	10%	
	Siegel	5.79%	30%	
IPART	HER	6.00%	50%	7.65%
	DDMs/Market indicators	9.30%	50%	
OTTER	Regulatory precedent	6.00%	100%	6.00%

Note: when possible, the estimates reported in this table have been re-calculated as of 31 March 2017, following PoM's/ regulators' approaches but with a theta of 0.643 and a distribution rate of 0.7, in line with an assumed gamma of 0.45. For AER and ERA, which did not apply clear weights at the time, we directly report the estimates from the regulatory decisions that are closest in time to 31 March 2017: AER (2017b)[95] and ERA (2017). The IPART methodology cannot be re-estimated due to its reliance on proprietary methods and we have reported the January 2017 estimate from IPART (2017a). We also directly reported the estimates from ACCC (2015), ESCOSA (2015), and OTTER (2015), as these regulators largely relied on previous regulatory decisions to determine MRP.

[94] As reported in QCA (2016b), *DBCT Management's 2015 draft access undertaking*, Final Decision.

[95] AER (2017b), *AusNet Services transmission determination 2017-2022*, Attachment 3 – Rate of return, April.

Table 3.11: MRP estimates based on regulatory approaches in force during the 2018-19 TCS year

Entity	Methodology	Estimate	Weight	Weighted average
PoM	HER	6.68%	50%	7.82%
	Wright	8.97%	50%	
AER	HER	5.5%-6%	Most reliance	6.50%
	DDM	6.9%-8.2%	Less reliance	
	Surveys/ reg. precedent	6%-6.5%	Some reliance	
ACCC	HER/ reg. precedent	6.00%	100%	6.00%
ERA	HER	5.39%	Some reliance	7.20%
	Wright	8.32%	Some reliance	
	DDM	6.5%-7.8%	Some reliance	
ESCOSA	HER/ reg. precedent	6.00%	100%	6.00%
QCA	HER	6.58%	30%	6.71%
	Wright	8.92%	10%	
	DDM	6.91%	20%	
	Surveys	7.00%[96]	10%	
	Siegel	5.88%	30%	
IPART	HER	6.00%	50%	7.30%
	DDMs/Market indicators	8.60%	50%	
OTTER	Regulatory precedent	6.00%	100%	6.00%

Note: when possible, estimates reported in this table have been re-calculated as of 31 March 2018, following PoM's / regulators' approaches but with a theta of 0.643 and a distribution rate of 0.7, in line with an assumed gamma of 0.45. For AER / ERA, which did not apply clear weights at the time, we directly report estimates from decisions that are closest in time to 31 March 2017: AER (2017) and ERA (2017). The IPART methodology cannot be re-estimated due to its reliance on proprietary methods and we have reported the March 2018 estimate from IPART (2020b). We also directly reported the estimates from ACCC (2017), ESCOSA (2015), and OTTER (2015), as these regulators largely relied on previous regulatory decisions to determine MRP.

Table 3.12: MRP estimates based on regulatory approaches in force during the 2019-20 TCS year

Entity	Methodology	Estimate	Weight	Weighted average
PoM	HER	6.62%	50%	7.87%
	Wright	9.68%	25%	
	DDM	8.56%	25%	
AER	HER	5.9%-6.3%	100%	5.87%-6.28%
ACCC	HER/ reg. precedent	6.00%	100%	6.00%
ERA	HER	5.50%	80%	6.00%
	DDM	8.00%	20%	
ESCOSA	HER/ reg. precedent	6.00%	100%	6.00%
QCA	HER	6.46%	25%	6.43% Midpoint of a range comprising median, simple average, and weighted average
	Wright	9.55%	15%	
	DDM	4.45%	25%	
	Surveys	6.40%[97]	20%	
	Siegel	5.86%	15%	
IPART	HER	6.00%	50%	7.35%
	DDMs/Market indicators	8.70%	50%	
OTTER	Regulatory precedent	6.50%	100%	6.50%
ICRC	Regulatory precedent	6.50%	100%	6.50%

[96] As reported in QCA (2017), *Aurizon Network's 2017 draft access undertaking*, Draft decision, December.

[97] As reported in QCA (2020b), *Gladstone Area Water Board price monitoring 2020–25 Part A: Overview. Draft report.*

Note: when possible, the estimates reported in this table have been re-calculated as of 31 March 2019, following PoM's/ regulators' approaches but with a theta of 0.714 and a distribution rate of 0.7, in line with an assumed gamma of 0.5. The IPART methodology cannot be re-estimated due to its reliance on proprietary methods and we have reported the March 2019 estimate from IPART (2020b). We also directly reported the estimates from ACCC (2017), OTTER (2018), ICRC (2018), and ESCOSA (2015), as these regulators largely relied on previous regulatory decisions to determine MRP. While the AER selects a point estimate based on different HER averaging period, we report the range of HER from the time periods the AER considers most relevant (1883-2018, 1937-2018, and 1988-2018).

Table 3.13: MRP estimates based on regulatory approaches in force during the 2020-21 TCS year

Entity	Methodology	Estimate	Weight	Weighted average
PoM	HER	6.68%	70%	7.84%
	Wright	10.82%	15%	
	DDM	10.31%	15%	
AER	HER	6.1-6.4%	100%	6.13-6.38%
ACCC	Regulatory precedent	6.10%	100%	6.10%
ERA	HER	5.67%	80%	6.52%
	DDM	9.92%	20%	
ESCOSA	HER	5.88%	100%	5.88%
QCA	HER	6.68%	25%	7.30% Midpoint of a range comprising median, simple average, and weighted average
	Wright	10.78%	15%	
	DDM	9.56%	25%	
	Surveys[98]	6.50%	20%	
	Siegel	6.08%	15%	
IPART	HER	6.00%	50%	7.85%
	DDMs/Market indicators	9.70%	50%	
OTTER	Regulatory precedent	6.50%	100%	6.50%
ICRC	Regulatory precedent	6.50%	100%	6.50%

Note: when possible, the estimates reported in this table have been re-calculated as of 31 March 2019, following PoM's/ regulators' approaches but with a theta of 0.625 and a distribution rate of 0.8, in line with an assumed gamma of 0.5. The IPART methodology cannot be re-estimated due to its reliance on proprietary methods and we have reported the March 2020 estimate from IPART (2020b). We also directly reported the estimates from ACCC (2019), OTTER (2018), and ICRC (2018), as these regulators largely relied on previous regulatory decisions to determine MRP.[99] While the AER selects a point estimate based on different HER averaging period, we report the range of HER from the time periods the AER considers most relevant (1883-2019, 1937-2019, and 1988-2019).

3.3.5. Assessment

In each TCS year, the Port has not replicated the approach of any one regulator but has rather combined its own implementation of existing methods in a unique way. The methods the Port relied on to set MRP (HER, Wright, DDM) may be considered well accepted, but the Port's implementation and combination of these methods is not well accepted. This includes:

- An implementation of the HER method that is not well accepted (due to the choice of data source and, in the first three TCS, the averaging period) and produces higher estimates compared to regulatory approaches.

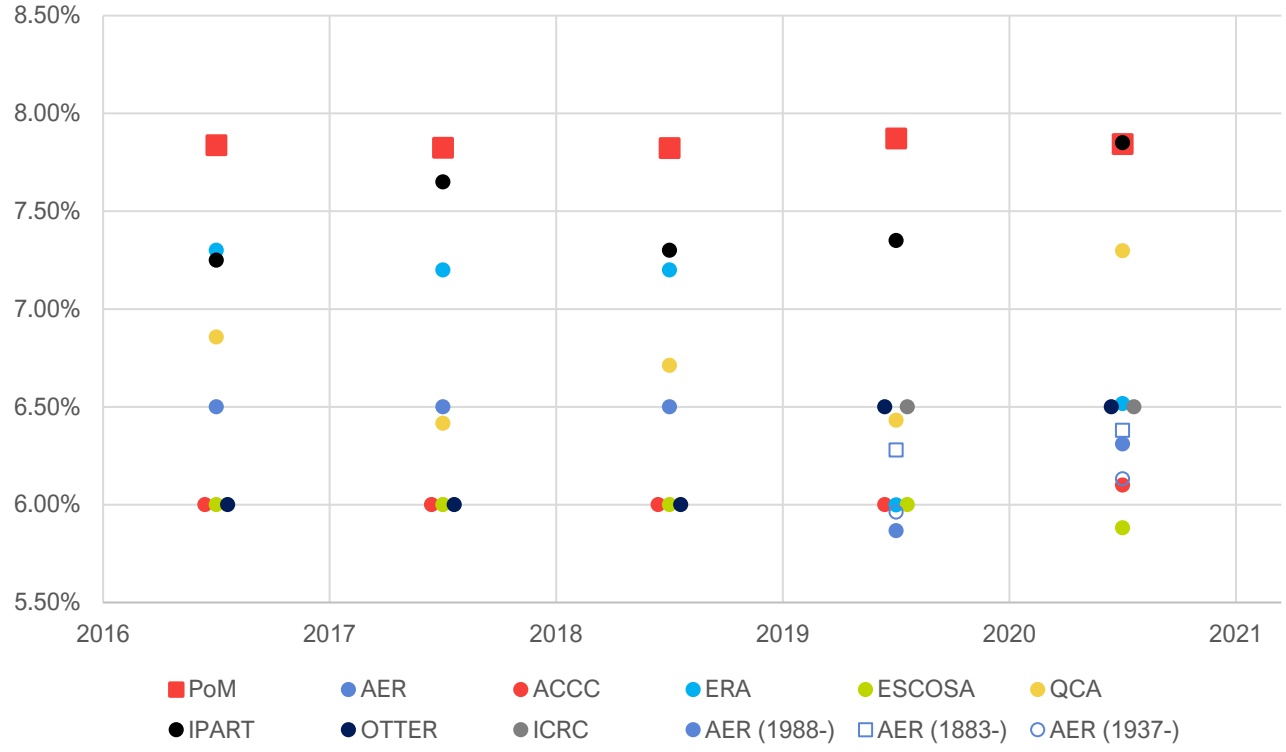
[98] As reported in QCA (2020a).

[99] OTTER (2018), *2018 Water and Sewerage Price Determination Investigation*, Final Report. ICRC (2018), *Regulated water and sewerage services prices 2018-23*.

- A choice of weights that places greater emphasis on high MRP estimates based on the Wright and DDM methods compared to most regulators.

As a result, throughout the course of the review period, the Port's overall MRP approach results in a particularly high MRP estimate, which is either significantly above or at least at the upper end of the range of estimates based on regulatory approaches. This is shown in Figure 3.1 below, which summarises our estimates of MRP based on regulatory approaches in force during each TCS year (drawing on the detailed tables in the preceding section).

Figure 3.1: MRP estimates based on regulatory approaches in force during the review period.



Source: CEPA analysis. Note: figures and assumptions are detailed in Table 3.9 – Table 3.13.

The Pricing Order states that the Port should use one or a combination of well accepted approaches. As discussed above, regulators place different weights on various MRP methods. This reflects the specific context of each regulatory decision, with regulators assessing the strengths and weaknesses of each method and the range of evidence available, as well as the implementation of each method. In some cases, regulators do not use specific weights to combine estimates from different methods, relying instead on their judgement to establish a point estimate.

Taking into account this variation, we can identify groups of regulatory approaches that are *broadly* similar to one another, suggesting that each detailed approach within the group can be considered well accepted. On the other hand, a regulatory approach may not be considered well accepted when it is *markedly* different to all other regulatory approaches adopted in Australia. Further, we find that what can be considered well accepted has evolved over time.

In this context, within the confines of the Pricing Order the Port can combine well accepted MRP approaches in a variety of ways, and more than one set of weights may be regarded as appropriate. However, we consider that this combination should not result in a final point estimate that is outside the range of well accepted approaches, i.e., higher than any of the well accepted approaches applied individually. Reflecting these considerations, we have calculated ranges of MRP estimates for the Port based on the groups of regulatory approaches that may have been considered well accepted in each TCS year.

Between 2016-17 and 2018-19 a majority of regulators placed most emphasis on the HER method, but two regulators, IPART and the ERA, gave considerable weight to DDMs and/or the Wright approach. We consider that in this period IPART and the ERA's methodologies could be regarded together as a distinct group of well accepted approaches, and provide an upper bound for the Port's MRP in these years. We note that IPART and ERA's approaches and rationale at the time were not identical, but shared significant similarities. IPART gave 50% weight to "current" MRP estimates (mainly DDMs) because it observed that the current MRP can be significantly different to the historical average and considered that current market conditions, along with long-term expectations captured by HER, are important to investors.[100] ERA regarded Wright as its preferred approach out of the range of estimates based on historical data (over HER), as it considered that the evidence at hand supported a view that the cost of equity is stable more than a view that MRP is stable. ERA also had significant regard to DDMs and considered Wright and DDMs similar in effect, in that the implied MRP will tend to increase as the current risk-free rate falls.[101]

In 2019-20 and 2020-21, the ERA changed its approach and rejected the Wright method, placing most weight on HER. This left IPART as the only regulator placing a high weight (50%) on DDMs and/or Wright. Therefore, we consider that in this period, IPART's approach was unique and could not be regarded as well accepted. We consider that the QCA approach is well accepted. While the QCA has placed a relatively large weight on Wright and DDM in recent years (40% in aggregate), the QCA considers the average of its estimates alongside the median. This reduces the impact of the Wright and DDM methods on the final MRP point estimate. For example, if the DDM and Wright are at the higher end of the QCA's estimates, they effectively receive a combined weight of 20% (40% on the average and 0% in the median), in line with ERA's approach.

From the evidence above, we consider that a range of MRP estimates for the Port based on well accepted approaches is:

- For 2016-17, between 6% and 7.30%, delimited at the lower end by ACCC, ESCOSA and OTTER, and at the higher end by ERA.
- For 2017-18, between 6% and 7.65%, delimited at the lower end by ACCC, ESCOSA and OTTER, and at the higher end by IPART.
- For 2018-19, between 6% and 7.30%, delimited at the lower end by ACCC, ESCOSA and OTTER, and at the higher end by IPART.
- For 2019-20, between 6% and 6.50%, delimited at the lower end by ACCC, ERA, and ESCOSA, and at the higher end by OTTER and ICRC.
- For 2020-21, between 5.88% and 7.30%, delimited at the lower end by ESCOSA and at the higher end by QCA.

Synergies' approach to the Port's MRP has led to estimates outside of well-accepted ranges for the whole review period, as shown in Table 3.14.

Table 3.14: Comparison of MRP estimates – Synergies approach versus well accepted MRP ranges

	2016-17	2017-18	2018-19	2019-20	2020-21
PoM's MRP (Synergies' approach)	7.84%	7.82%	7.82%	7.87%	7.84%
Well accepted MRP ranges (CEPA)	6.00% - 7.30%	6.00% - 7.65%	6.00% - 7.30%	6.00% - 6.50%	5.88% - 7.30%

Source: CEPA analysis

[100] IPART (2012), *Review of method for determining the WACC: Dealing with uncertainty and changing market conditions*, p. 67.

[101] ERA (2015), p. 127-135.

3.3.6. Consideration of the Port's response

The Port's response

Implementation of the HER method

[redacted]

Weighting different approaches

[redacted]

Valuation reports

[redacted]

Inconsistency with gamma

[redacted]

[102] Synergies (2021), *Port of Melbourne's compliance with the Pricing Order - Response to ESC Draft Report*, November, p. 3-4.

[103] Synergies (2021), p. 22-23.

[104] Synergies (2021), p. 23.

[105] Synergies (2021), p. 25.

[106] Synergies (2021), p. 23-24.

[redacted]

CEPA's response

Implementation of HER method

[redacted]

- [redacted]
- [redacted]
- [redacted]

Weighting different approaches

[redacted]

[redacted]

[redacted]

[107] Synergies (2021), p. 22.

[108] ESCOSA (2020), p. 324. We note that the fact that ESCOSA (and the ERA decision they rely on) used the same gamma of 0.5 that we have used in this report does not imply that ESCOSA used the same theta that we adopt. ESCOSA might have adopted a different theta to reach the same gamma, e.g., if they had a different assumption in terms of the distribution rate.

[109] ERA (2018), p. 180.

[110] ERA (2019), p. 42.

[redacted]

[redacted]

Valuation reports

[redacted]

Inconsistency with gamma

[redacted]

[redacted]

[redacted]

3.4. BETA

The Pricing Order requires a return to be commensurate with that required by a benchmark efficient entity providing services with a similar degree of risk. Within the framework of cost of capital estimation and the SL-CAPM, risk is assessed through the beta parameter. This measures systematic risk, which is the extent to which returns are correlated with those of the market as a whole. An equity beta includes the effect of debt on returns while an asset beta has these effects removed, thus allowing risk to be compared for companies with different gearing.

As with other parameters beta must be determined using one or a combination of well accepted approaches. Regulators rely on data from equity markets to estimate beta. However, as the Port is not listed, an estimate of its beta must rely on data from companies which may be considered comparators; that is, they are considered by investors to be investment substitutes and have the same degree of systematic risk as the Port. The approach to comparator selection and detailed methods of estimation both affect the estimate of beta.

3.4.1. The Port's approach

In this section, we consider the Port's approach to selecting the comparator sample used to calculate its beta, before outlining their approach to estimation. In the 2017-18 to 2019-20 TCS years, the Port was advised by Synergies. In the 2020-21 TCS, the Port obtained advice from both Synergies and Incenta on an appropriate equity beta. While Synergies and Incenta adopt different approaches, the Port considers both to be well accepted and to support an equity beta of 1.0. This sub-section briefly sets out the high-level approach employed by Incenta and Synergies. We highlight the differences between the two approaches, and the changes in Synergies' approach over time.

Selection of comparators

Synergies

In 2017-18 Synergies used Bloomberg to select companies in the following GICS categories: Marine Port and Service, Railroads and Airports. Railroads and airports were selected because Synergies considered these sectors to have similar infrastructure characteristics to the Port. Synergies then reviewed business descriptions of the companies, with those considered to have limited relevance to the Port's operations removed from the sample. A US$100m minimum market capitalisation filter was applied. This approach resulted in a comparator set of 45 companies for the 2017-18 TCS. In 2018-19, Synergies followed the same method, with the exception that the US$100m filter was removed in response to the ESC's interim commentary. This resulted in a comparator set of 51 companies.

In the 2019-20 TCS, Synergies removed airports from their comparator set. This was in response to comments in the 2018 ESC interim commentary, where the ESC noted that unlike the circumstances of the Port, revenue from freight is a small proportion of airport revenues.[111] Synergies' comparator set for the 2019-20 TCS contained 19 companies. In the 2020-21 TCS, Synergies applied a US$200m market capitalisation filter, which reduced the comparator set to 13 companies. A market capitalisation filter was reintroduced, as Synergies considered that it was unlikely that a relatively small company could perform activities that are comparable to the benchmark efficient entity.

Incenta

For the 2020-21 TCS, the Port was also advised by Incenta Economic Consulting on estimating beta. Incenta starts by considering several different industry categories, including ports, railways, airports and toll roads. They state that only a small number of businesses that are port owners or port owner-operators are valid comparators for the Port. They then apply several filters to get to their final list of comparators:

- A market capitalisation filter of US$200 million is applied. Incenta also considered reducing this to US$100 million, but found that given the other filters, this would not affect their final sample.
- Incenta eliminated port businesses where landlord port operations appeared to constitute less than 60 percent of value of the business. For the other industry comparators, these were eliminated where 60 percent of the value of the business was not in railways, airports or toll-roads.
- Incenta eliminated port businesses where containers accounted for less than approximately 20 percent of cargo.
- Incenta applied individual analysis of port comparators, including examining segmental analysis, financial indicators and descriptions of the businesses provided in annual reports and investor presentations.
- Incenta applied a market liquidity filter, excluding firms where free float is less than US$100 million. Incenta also considered Bloomberg's liquidity measure.

[111] Synergies (2019a), p. 150.

- Incenta considered the impact of takeover bids and other changes of control which they argue can distort estimates of systematic risk.
- Incenta compared the market in which the firm is listed and the location of its major operations. They excluded firms where the market of operation and listing were different and where those markets were not reasonably aligned. Alignment was defined as having a market-to-market beta of less than 0.75.
- Incenta removed businesses with less than 36 of the required 60 monthly observations when calculated back from 31 December 2019.

Estimation

Synergies

After constructing a comparator sample Synergies proceeds with beta estimation. The key estimation decisions include:

- Using the Brealey-Myers approach for de-levering equity betas to produce asset betas.[112]
- Gearing was calculated based on long-term debt and the market value of equity.
- Estimation period was 5-year or 10-year years and return window was monthly or weekly frequency.

Synergies also undertakes a first principles assessment and considers several cross-checks which includes examining industry beta estimates for transportation from Damodaran, beta estimates from independent expert reports and beta estimates for firms listed in non-FTSE developed countries.

Incenta

The key estimation decisions of Incenta include:

- Use the Harris-Pringle formula for de-levering of equity betas.[113]
- Gearing was calculated using net debt and market capitalisation.
- Estimation period was 5 or 10 years and the return window was monthly.

3.4.2. Regulatory evidence

We consider the estimation of beta in two distinct stages: the construction of the comparator sample; and the estimation procedure. We assessed Australian regulatory precedent to understand what the 'well accepted' approach for these steps is and whether the Port's proposal is in line with these.

Construction of comparator sample

High level approach

Australian regulators use a broad range of implementation approaches for constructing a comparator sample. Some examine individual comparators in detail and compare these against a description of the regulated entity's operations, ruling certain comparators in or out on the basis of these characteristics. ERA's approach is typical of this.[114] For example, in a recent decision ERA ruled out comparators stating "*initial screening of companies returned Toll Holdings Limited…The Authority considers that Toll Holdings is not a relevant comparator…due to the higher systematic risk of freight transportation…In addition, two British companies were excluded…based on their*

[112] The Brealey-Myers deleveraging formula: $\beta_e = \beta_a * (1+D/E)$, where β_e is the equity beta, β_a is the asset beta, D is the proportion of debt within the assumed capital structure and E is the proportion of equity within the assumed capital structure.

[113] This is equivalent to the Brealey-Myers formula when the debt beta is assumed to be zero.

[114] ERA (2015).

high historical growth rates". We would characterise the Port's approach over the review period as being most similar to this approach.

Other regulators use a broad range of proxy companies. This approach is typified by IPART which does not consider individual comparator characteristics, and "*give[s]…the opportunity to propose additional comparable **industries** that meet our criteria, but not individual **stocks**.*"[115] We consider the QCA and AER's approaches to be between these two extremes. There are many examples of international regulators constructing comparator samples for beta estimation, and we observe a similar range of approaches.

This results in three main different characteristics of the sample: the geography of listing and/or operation, the inclusion or not of companies outside the specific sector, and the number of companies used for the sample. The table below sets out a comparison of different regulatory approaches for decisions from different regulators.

Table 3.15: Number of comparators used in Australian regulatory decisions[116]

Regulator	Year	Number of comparators	Use of international comparators	Use of comparators outside sector
AER	2013, 2018	9	No	No
ACCC	2019	8/5[3]	Yes	No
ACCC	2015	22	Yes	No
ERA	2019	5, 7 and 11[1]	Yes	Yes
ERA	2018	4	No	No
ERA	2015	5,11,8.	Yes	Yes
IPART	2020	35	Yes	No
QCA	2020	16/18[2]	Yes	No
QCA	2018	Not clear	Yes	Yes
QCA	2016	114	Yes	Yes

Notes: 1. Depending on the company being considered. 2. Depending on the period. 3. Depending on segment of firm being considered.

Australian regulatory precedent over the review period demonstrates strong support for using **international** comparators. However, where international firms have been included limits are often placed on which countries these can be drawn from. Nonetheless, there does not appear to be a unified framework. We agree with Synergies' 2020-21 TCS conclusion that in general *"Australian regulators do not appear to have presented an explicit framework for how countries are selected."* There are however several examples of comparators being drawn from countries outside of the FTSE Developed classification used by Synergies for its comparator sample. Furthermore, Synergies has itself previously relied upon comparators from FTSE Advanced Emerging countries for regulatory purposes.[117]

Table 3.16: Justifications used for introducing international comparators in Australian regulatory decisions

Regulator	Year	Summary of justification	Country filter
IPART	2020	IPART "*seeks markets that approximate Australia's sovereign characteristics*". This includes considering if the government bond and equity markets are "*sufficiently deep and liquid*" and whether the firm's headquarters is consistent with their actual operating market.[118]	Water company sample included Malaysia, India, Europe, Philippines, Brazil, Hong Kong, Vietnam, Chile, Thailand, US. IPART removed companies that are listed on Chinese,

[115] IPART (2018).

[116] We also reviewed decisions by ESCOSA, ICRC and OTTER, but these did not undertake independent beta estimation using a comparator selection procedure. Parameter decisions were based on other Australian regulatory precedent.

[117] Synergies (2019b), *Review of the WACC for Gladstone Area Water Board*.

[118] IPART (2019), *Estimating Equity Beta*.

Regulator	Year	Summary of justification	Country filter
			Russian and a selection of African stock exchanges.
QCA	2020	Companies *"from markets that have well developed stock markets and have similar liquidity to that seen in Australia"*.[119]	FTSE Developed and Advanced Emerging classifications.
ACCC	2019	We were unable to determine a clear justification for country choices.	International comparators include German, British, Dutch, Belgian, Austrian, Singaporean, Portuguese and Malaysian companies.
ERA	2019	ERA finds there are insufficient Australian comparators, *"in recognition of the small data sets for some parameters… gearing, credit rating and equity beta – the Authority utilises international comparators for the gearing, credit rating and equity beta parameters"*.[120] Comparators must be located in *"a similarly developed country to Australia in order to capture the risks faced…countries, such as the United States, United Kingdom, New Zealand and Canada are an acceptable proxy to the risks faced by an Australian passenger rail operator. These countries have similar economic, political and social conditions…"*.[121]	Relevant comparator company must be located in: USA, Canada and New Zealand
QCA	2016, 2018	We were unable to determine a clear justification for country choices.	Sample included firms from the US, Australia, Canada, UK and New Zealand.[122]
ERA	2015	The ERA considers that there is "*insufficient domestic data to construct solely domestic benchmark samples for the rail network, given the limited number of Australia comparator companies"*[123] ERA therefore introduces international comparators "*Europe and America have similar political, social and economic characteristics as Australia, so meet the first two of the Authority's considerations when developing the criteria for selecting the benchmark sample"*[124]	International comparators include developed countries in Europe and America.
ACCC	2015	We were unable to determine a clear justification for country choices.	International comparators include the United States, Austrian, Italian, Greek, Danish, Swedish, German, French, Dutch, Swiss, Japanese, Singaporean, Hong Kong, Israeli and New Zealand companies.

Sources: See Appendix A.

[119] From consultants' report, CEPA (2019), *Advice on an appropriate asset beta, capital structure, credit rating, and debt risk premium for GAWB's 2020-25 pricing period.*

[120] ERA (2015).

[121] ERA (2015).

[122] We have been unable to find a full list of comparators used in the QCA's 2016 decision for the Dalrymple Bay Coal Terminal. The total number of comparators included 67 from the regulated energy and water sector. Incenta advised the QCA on WACC parameters in both 2016 and 2018 and in both cases recommended the regulated energy and water sector as appropriate for creating a sample. We have therefore assumed overlap in the sample used by the QCA in both 2016 and 2018.

[123] ERA (2015), p. 153.

[124] ERA (2015), p. 153.

Compared to using international comparators we consider there is more limited support for the use of comparators **outside the sector** of the firm being regulated. The main examples we found were the ERA and QCA, summarised in the table below.

Table 3.17: Use of outside sector comparators

Regulator	Year	Commentary
ERA	2019	The ERA has used comparators that have operations outside rail in its rail WACC decisions.[125]
QCA	2018	In its 2018 decision for Aurizon Networks, the QCA assessed potential sectors based on their risk and whether this risk was comparable to Aurizon Networks.[126] Aurizon network manages a coal export rail in central Queensland. The QCA assessed several industries including North American pipelines, freight rail transport, regulated energy and water and toll roads. Of these, the QCA considered regulated energy and water as suitable comparators, citing their advisor Incenta: *"Incenta also considered that regulated energy and water businesses are the best available comparators at this time to estimate Aurizon Network's systematic risk. Incenta said both Aurizon Network and regulated energy and water businesses are monopoly service providers, have a 'captured' customer base with resilient demand for the service, and are subject to cost-based regulation for pre-set periods, which largely insulates their cash flows. The regulatory approaches for Aurizon Network and regulated energy and water businesses are cost-based, set controls for a pre-determined period of time, and ensure recovery of revenues with a high degree of probability.* *Incenta considered that these common characteristics jointly result in low sensitivity of demand/revenue to GDP shocks. As such, Incenta expects Aurizon Network and regulated energy and water businesses to have similar levels of exposure to systematic risk."*[127] Toll roads were considered as an upper bound cross-check for the beta.
QCA	2016	In their 2016 Dalrymple Bay Coal Terminal decision, the QCA's advisors Incenta also considered that regulated energy and water companies were appropriate comparators due to their similar risk profile. The QCA stated that they agreed with Incenta's comparator analysis as it "*'looks through' the physical characteristics of the operations to the economic fundamentals"*.[128]

Sources: See Appendix A.

In addition to these examples, other regulators use estimates of beta from other industries as a cross check. Synergies highlights some of these examples in their submission.[129] For example, in a recent decision IPART considered a "*broader set of comparable firms"* when considering a freight rail company which included coal mining, coal fired electricity generation and a broader range of rail transport businesses.[130]

Overall, we find there is evidence that Australian regulators may place reliance on comparators from industries outside the regulated entities sector, if there are insufficient within-sector comparators and if suitable alternative comparators exist. However, we consider that this is not as common as approaches that rely on comparators within the same sector, and the regulator must be satisfied that the out-of-sector comparators are appropriate.

Finally, Table 3.15 shows that there is not strong evidence on the sample size used. Small samples, in the single digits, have been used, for example by the AER which stated that "*a small set of comparators does not necessarily justify expanding the comparator set just for the sake of increasing sample size. If the additional firms do not carry a similar degree of risk or cannot be appropriately adjusted…then they can inappropriately bias estimates*". [131]

[125] ERA (2019).

[126] QCA (2018), p. 78.

[127] QCA (2018), p. 102.

[128] QCA (2016b), p. 87.

[129] Synergies (2020), Table 25.

[130] IPART (2019).

[131] AER (2018a), p. 96.

At present, the approach of regulators to constructing comparator samples appears to be rightfully dependent on the availability of companies to include. Where there is sufficient evidence in the right sector and geography, then that is used; if there is insufficient data then consideration of different sectors and geographies is used.

Use of market capitalisation and liquidity filters

Australian regulatory precedent provides mixed support for using a market capitalisation filter. The table below examines the use of market capitalisation filters in Australian regulatory precedent over the review period. Explicit market capitalisation cut-offs are uncommon but as Synergies argue there is evidence that an implicit threshold may exist. For example, we found that ERA makes reference to comparators being "*of similar size*". In the 2020-21 TCS, Synergies draws the conclusion that IPART, AER and ACCC also support an implicit threshold as the lowest market capitalisation of comparators was $USD 520 million.

We also find mixed support for the use of a liquidity filter in recent Australian regulatory precedent. The use of a market capitalisation filter and market of listing filter may interact with this filter. Companies with a larger market capitalisation and listed in mature markets may be more liquid. One of the assumptions of the CAPM model is no transaction costs, so there may be a strong theoretical argument for applying a liquidity filter.

On this evidence, regulatory precedent in Australia does not impose limits on market capitalisation and / or liquidity filters, and so an approach that is considered in the circumstances to provide the best estimate of the beta of a benchmark efficient operator should be used.

Table 3.18: Evidence for a market capitalisation threshold and liquidity filter in Australian regulatory precedent

Regulator	Year	Market capitalisation threshold	Liquidity filter
AER	2013, 2018	None.	None.
ACCC	2015, 2019	None.	None.
ERA	2019	Not explicit, comparators should be "*of similar size*".	None.
ERA	2015, 2018	None.	None.
IPART	2020	None.	Yes, Amihud measure.
IPART	2013	None.	None.
QCA	2020	Explicit $US100 million.	Yes, bid-ask spread.
QCA	2016, 2018	None.	None.

Sources: See Appendix A

Estimation of beta

The next stage after selecting comparators is to estimate beta. There are several different ways in which beta can be estimated. We consider the key estimation decisions to include:

- Period over which beta is estimated, for example whether the last five or ten years of data is used.
- Whether beta is estimated against a local or international market index.
- The return specification used, for example whether monthly or weekly returns are used. We refer to using weekly returns but all days of the week (Monday to Friday) as Weekly/AD in the table below.
- Which de-leveraging formula is used to transform equity betas into asset betas and vice-versa.
- What estimation procedure is used, for example ordinary least squares (OLS) or an alternative.
- Whether any special adjustments are applied.

Table 3.19: Beta estimation procedures in recent Australian regulatory precedent

Regulator	Year	Period	Index selection	Return specification	De-leveraging formula	Estimation procedure	Special adjustments
AER	2018	Multiple periods[1]	Local	Weekly	Brealey-Myers	OLS	None
AER	2016, 2017	Multiple	Local	Weekly (monthly cross check)	Brealey-Myers	OLS (LAD cross check)	None
ACCC	2015, 2019	5-year	Local	Weekly and monthly	Brealey-Myers	OLS	None
ERA	2019	10-year	Local	Weekly/AD[2]	Brealey-Myers	OLS, LAD, MM, T-S[3]	None
ERA	2015, 2018	5-year	Local	Weekly	Brealey-Myers	OLS, LAD, MM and T-S	None
IPART	2020	5-years	Local	Weekly/AD	Brealey-Myers	OLS	Vasicek
QCA	2020	5-year/10-year	Local	Weekly/AD and four-weekly	Conine[4]	OLS	None
QCA	2018	10-year/5-year	Local	Weekly and monthly	Conine	Bloomberg	None
QCA	2016	10-year	Local	Monthly	Conine	Bloomberg	None

1. AER considers multiple periods but places most weight on the longest available period. 2. An older 2015 decision refers to using weekly returns with all days of the week and concluding that this is appropriate.[132] However, subsequent decisions only refer to "weekly returns" without specifying whether all days are used. 3. Least Absolute Deviations (LAD), Maximum Likelihood Robust (MM) and Theil-Sen (T-S). 4. QCA uses the Conine formula which adjusts for the effects of dividend imputation on the tax rate and assumes a non-zero debt beta: $\beta_e = \beta_a + (\beta_a - \beta_d)(1 - t)(D/E)$.

The table above shows the estimation parameters in Australian regulatory precedent. We find unanimous support for using a local market index. We also find near unanimous support for using the Brealey-Myers formula for de-leveraging, using OLS for estimation and not applying any special adjustments.

Recent Australian regulatory precedent provides strong support for using weekly returns including using all trading days rather than just end of weeks. Although less common, regard is also had to monthly returns alongside weekly estimates.

3.4.3. Assessment

Both Synergies and Incenta (in the 2020-21 TCS) have chosen to follow a high-level approach to construction of their comparator samples that is well accepted in Australian regulatory precedent. Furthermore, the procedure they use to estimate asset betas for their comparators is also mostly well accepted.

There are, however, some elements of their implementation which may not be well accepted, which include:

- Synergies includes in its sample companies outside the sector the Port operates in (railroads and, in earlier years, airports) as direct comparators, rather than cross checks. On the other hand, Incenta only includes firms in its port sample that (in Incenta's view) undertake the core function of a port owner or port owner-operator. This has the effect of removing Qube Holdings and Hamburger Hafen und Logistik, which Incenta defines as logistics firms.

[132] ERA (2015).

- The appropriateness of their chosen country filter. Both Incenta and Synergies draw on international comparators. However, Synergies includes a filter for listing market requiring comparators to be drawn from FTSE Developed markets, while Incenta does not apply a country filter. This has the effect of increasing the number of 'port' comparators in Incenta's sample relative to Synergies.
- The focus on monthly rather than weekly betas by both Synergies and Incenta. While monthly returns are considered, the evidence suggests that Australian regulatory precedent has put more emphasis on weekly returns. Incenta places most weight on monthly betas, while Synergies appears to place equal weight on weekly and monthly betas.
- There are slight differences in the way betas are estimated, although the effect of these decisions is minor compared to the comparator sample. In particular, Incenta uses net debt when calculating gearing while Synergies uses a measure of long-term debt. Incenta includes a liquidity filter while Synergies does not.

Sensitivity to return specification

We find both Synergies' and Incenta's estimates of asset beta using their port comparator samples are sensitive to the return specification employed. The return specification refers to the period over which returns are measured. For example, a weekly beta uses returns of the index and stock price over weekly intervals. A related issue is the 'reference day' used for the calculation interval. For example, weekly returns can be calculated using the price at the end of each week, but this implicitly assumes that the appropriate weekly return interval is Friday to Friday. As highlighted in Table 3.19 above a commonly accepted alternative (in the more recent part of the five-yearly review period) is to separately estimate the beta for each weekly return interval (Monday to Monday, Tuesday to Tuesday etc.) and then take the average. We refer to this as 'Weekly AD'.

We find that given Synergies' and Incenta's samples, monthly returns produce a higher asset beta estimate. The table below provides a comparison of different approaches. While we have attempted to replicate the asset beta estimates produced by the Port's advisors by using their comparators, we were unable to do so exactly. This is due to differences in estimates of gearing, in particular Synergies' use of long term debt rather than net debt to calculate gearing.[133] Incenta does not provide estimates using weekly returns but Synergies' estimates using weekly returns are also below their monthly estimate. The table below provides the average beta estimate by return specification.

Table 3.20: Port of Melbourne Sample – Asset beta impact of return specification

Estimate	2016-17	2017-18	2018-19	2019-20	2020-21
5-year					
Synergies sample					
Synergies (monthly)		0.69	0.72	0.76	0.76
Synergies (weekly)		-	-	-	0.74
CEPA (monthly)	0.74	0.75	0.74	0.78	0.78
CEPA (weekly)	0.69	0.66	0.65	0.68	0.75
CEPA (weekly AD)	0.69	0.68	0.66	0.69	0.78
Incenta sample					
Incenta (monthly)		-	-	-	0.85

[133] To calculate gearing we have used the market value of equity and net debt as reported by Bloomberg. As noted in Section 4.1, we find that Synergies' and Incenta's measures of gearing for the same comparators differ from our own. In the case of Synergies, this appears to primarily reflect the use of long term debt rather than net debt to calculate gearing. While we and Incenta calculate gearing using net debt, Incenta calculates gearing on an annual basis while we have calculated gearing on each reference day, which may explain our slight differences in estimations.

Estimate	2016-17	2017-18	2018-19	2019-20	2020-21
CEPA (monthly)[134]		-	-	-	0.84
CEPA (weekly AD)		-	-	-	0.80
10-year					
Synergies sample					
Synergies (monthly)		0.74	0.75	0.72	0.77
Synergies (weekly)		-	-	-	0.78
CEPA (monthly)	0.78	0.78	0.76	0.79	0.73
CEPA (weekly)	0.79	0.75	0.69	0.76	0.69
CEPA (weekly AD)	0.78	0.76	0.73	0.77	0.70
Incenta sample					
Incenta (monthly)		-	-	-	0.86
CEPA (monthly)		-	-	-	0.87
CEPA (weekly AD)		-	-	-	0.77

Source: CEPA estimates

3.4.4. Estimating beta with well accepted approaches

We consider Australian regulatory precedent does not provide a sufficient guide for a single approach to constructing a comparator sample. For this reason, we have considered several different combinations of comparators which are constructed by applying different filters. Appendix C provides a breakdown of potential comparator firms and which criteria they meet. When it comes to constructing a comparator sample IPART's approach stands apart from other Australian regulatory approaches. If a similar approach were followed it would result in a larger comparator set. We have not attempted to replicate an IPART type approach.

On the other hand, we consider there is sufficient agreement among Australian regulators on the key issues related to beta estimation to proceed with a single version. This includes:

- Estimating betas over a 5 and 10-year period.[135]
- Using the local market index.
- Using a weekly return specification including all trading days and monthly returns primarily as a cross-check. This means instead of just calculating weekly returns to each end of week we calculate weekly returns for each day compared to the same day one week prior.
- Using the Brealey-Myers formula to de-lever equity betas.[136]
- Estimating beta using OLS and not undertaking any special adjustments.

The figure below sets out potential filters and the number of comparators remaining after each one. For simplicity this figure only presents the number of comparators for 5-year betas where we end up with 14 potential

[134] Using Incenta's port sample, data cutoff date was 31/12/2019.

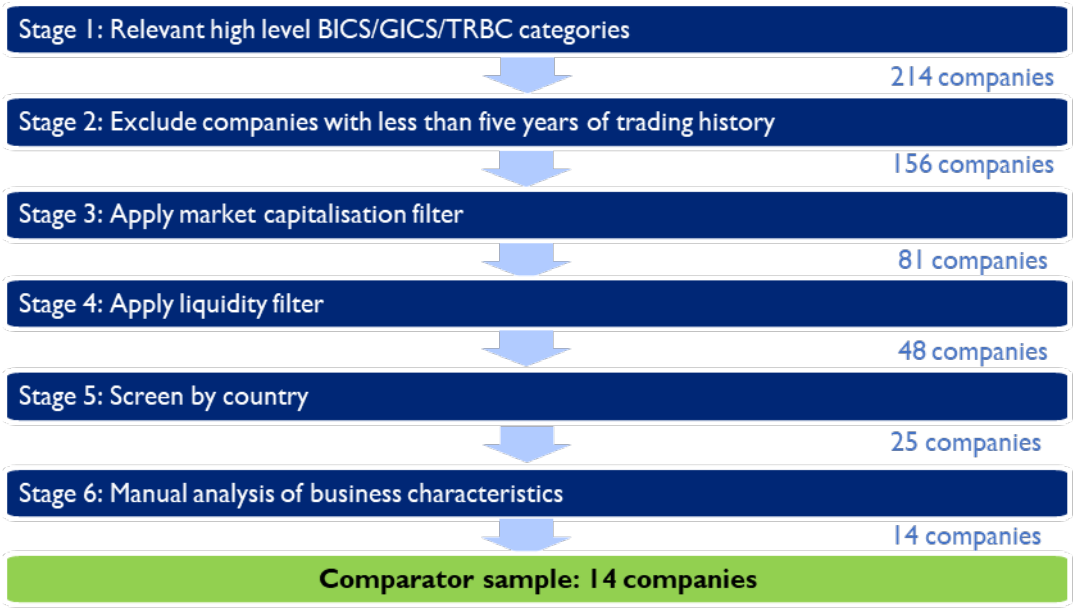
[135] The end date of our beta estimation period was 31 March for each year (i.e. for the 2020/21 TCS, our cut-off date was 31/03/2020). The start date was calculated as the end date minus the period required (for example 5 years) multiplied by 365 days.

[136] To apply the Brealey-Myers formula requires an estimate of gearing. In our calculation gearing was the average gearing over the same days and same period used for beta estimation.

comparators. As the 10-year beta estimate requires a longer trading history, we only end up with 10 comparators using the same procedure.

- At the first stage we identified active companies that met one of three high-level categories. These were Thompson Reuters Business Classification (TRBC) "*Marine Port Services*", Global Industry Classification Standard (GICS) "*Marine Ports & Services*" or Bloomberg Industry Classification System (BICS) "*Port & Harbor Operations*".[137]
- We excluded companies with less than five years of trading history.
- We removed companies with less than US$100 million market capitalisation.
- We applied a liquidity filter which removed companies where the percentage of trading days where no trading occurred exceeded 20% of available trading days and where the average bid-ask spread for the period exceeded 1%.
- We applied a country filter which removed companies not listed in FTSE Russell "*Developed*" or "*Advanced Emerging*" countries.
- We undertook manual analysis to remove companies where the description of their operations provide evidence that they did not provide port services. The list of companies removed at this stage is shown in Appendix C.

Figure 3.2: CEPA comparator sampling process (5-year betas)



The manual analysis stage removes 11 companies, leaving a comparator sample of 14 (for the 5-year betas). This is a judgement and we provide our reasoning for each company removed in Appendix C. We also provide the reasoning the Port's advisors used for removing these companies from their comparator samples where this was available. However, of the 14 companies in our comparator sample there are some which provide services which may not be sufficiently similar to the benchmark efficient entity. The table below provides a list of these companies. We have considered an estimate of beta without these companies.

[137] We agree with Synergies' view that the use of a single reputable classification system is supported by Australian regulatory precedent (for example using only GICS). We have used multiple classification systems here to produce a full a list of comparators at the first stage as possible.

Australian regulatory precedent is not settled on the use of liquidity filters or a market capitalisation filter. Accordingly, we consider how our beta estimate changes if we remove these filters, with and without adjustment to the sample to exclude comparators who may not be sufficiently similar to the Port (described in the table below). Appendix D provides the expanded comparator samples without these filters.

In our judgement there is sufficient regulatory precedent to apply a country filter when determining the sample. While the exact form of country filter is not settled, most Australian regulators appear to restrict their comparator samples to countries with similar characteristics to Australia, for example in terms of the depth and liquidity of the stock market, or in relation to political, social and economic conditions. Accordingly, we consider that the lack of country filter applied by Incenta, and the resulting concentration of Chinese companies within their sample, is not consistent with a well accepted approach. Synergies' application of a country filter is consistent with a well accepted approach.

Given the above we have constructed four separate samples:

- **Sample A** – This follows the sampling process as shown in Figure 3.2, resulting in 14 comparators for the 5-year betas and 10 comparators for the 10-year betas. [138]
- **Sample B** – This is the same as sample A with the companies shown in Table 3.21 below removed, resulting in 9 comparators for the 5-year betas and 7 comparators for the 10-year betas.
- **Sample C** – This follows the same sampling process as shown in Figure 3.2 but with the market capitalisation and liquidity filters removed, resulting in 29 comparators for the 5-year betas and 22 comparators for the 10-year betas.
- **Sample D** – This is the same as sample C with the companies shown in Table 3.21 below removed, resulting in 21 comparators for the 5-year betas and 16 comparators for the 10-year betas.

The size of our comparator samples falls within the ranges used by Australian regulators, suggesting that it is not necessary to augment the samples with out-of-sector comparators.

Table 3.21: Comparators where prescribed services may not be sufficiently similar to the Port

Company[139]	Comment
Toyo Wharf & Warehouse Co Ltd	Removed from sample B and D Synergies states that port and harbour operations only make up 23% of revenues. A further 30% of revenue is made up of port warehousing. Port operations include containers, exposure is low but we were unable to determine the exact proportion in terms of revenue.
Qube Holdings Ltd	Removed from sample B and D Synergies includes Qube Holdings stating that Patrick (a stevedoring operator which Qube owns half of) and the Ports and Bulk divisions account for 60% of revenue. In addition, 90% of Qube's revenue is earned in Australia. On the other hand, Incenta does not include Qube, arguing that its main activities are stevedoring, logistics and intermodal activity.
Westshore Terminals Investment Corp.	Removed from sample B and D Westshore is a coal storage and loading port. Synergies removes this company because of single commodity exposure and Incenta removes this company because it is a "*coal terminal with no containers*".

[138] The number of comparators reported here is the maximum for each sample. In certain years, some comparators are removed if there is insufficient historical data for a given beta estimation window. Please refer to Appendix D for the full list of comparators included in each year.

[139] Incenta also removes Hamburger Hafen und Logistik stating that it is a logistics company while Synergies includes this company. We find that 58% of Hamburger Hafen und Logistik's revenues come from port container operations. We agree with Synergies' conclusion that Hamburger Hafen und Logistik is a major container terminal handling company and should be included as a comparator.

Company[139]	Comment
Qinhuangdao Port Co Ltd	Removed from sample B and D In 2019 Qinhuangdao Port reported only 1.3% of revenue from containers while 92% of revenues were from coal, metal ores and related. Incenta removes this company as it has "*almost no container trade*".
Namyong Terminal PCL	Removed from B and D Namyong Terminal is a roll on roll off terminal operator. It has no container trade.
Bremer Lagerhaus-Gesellschaft AG	Removed from sample D Synergies removes this company from their sample as they find it to have a negative beta. We estimate that this company has a beta above zero.
Bintulu Port Holdings Bhd	Removed from sample D Incenta removes this company as their main cargo is LNG with containers making up only a small fraction of revenue.
Marsden Maritime Holdings Ltd	Removed from sample D Incenta removes this company as it operates a marina port that does not reflect the Port's characteristics. Synergies removes this company as it is a holding company that includes a diverse range of activities.
South Port New Zealand Ltd	Removed from sample D We estimate that this company has a slightly negative beta for earlier TCS periods.

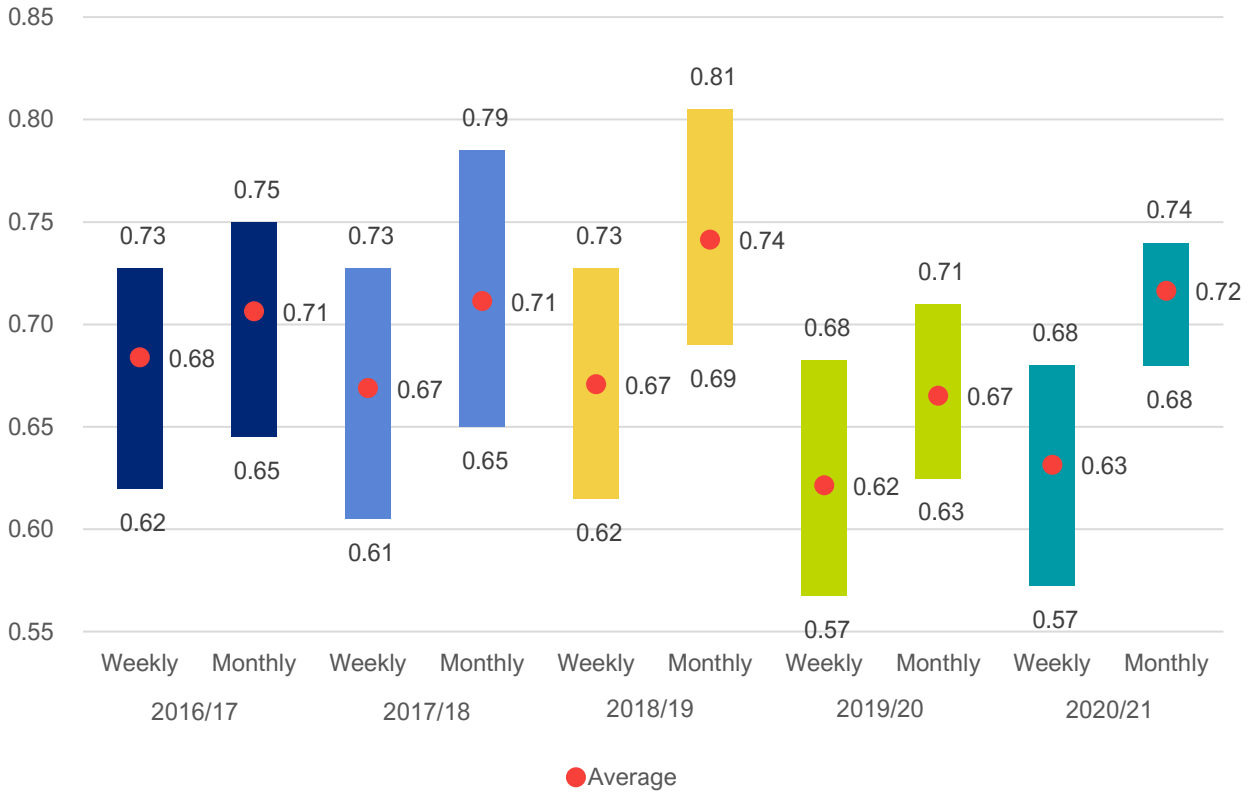
Source: CEPA Analysis

Comparison between well accepted approaches and the Port's approach

The table overleaf provides our estimates of beta for our four samples across two time periods.

This data is summarised in the figure and table below. This indicates that, averaging across the four comparator samples, the Port's weekly asset beta over the five-yearly review period has fallen within a range of 0.6 to 0.7. The monthly estimates are higher in all years, which supports a point estimate towards top of the weekly range, particularly in the early part of the five-yearly review period. Accordingly, we have proposed a range of 0.65 to 0.70 for the earlier years, broadening to 0.60 to 0.70 in the most recent two TCS.

Figure 3.3: CEPA asset beta ranges



Source: CEPA analysis. Note: Weekly captures both 'weekly' and 'weekly AD' estimates. The upper / lower ends of the range represents the highest / lowest value for averaged 5 and 10 year beta estimates across the four comparator samples (A, B, C, D). The average is a simple unweighted average of the averaged 5 and 10 year beta estimates for the four comparator samples.

Table 3.22: Asset beta estimates - CEPA comparator samples

Estimate	2016-17			2017-18			2018-19			2019-20			2020-21		
	5-year	10-year	Avg	5-year	10-year	Avg	5-year	10-year	Avg	5-year	10-year	Avg	5-year	10-year	Avg
Sample A															
Monthly	0.76	0.74	**0.75**	0.80	0.77	**0.79**	0.84	0.77	**0.81**	0.67	0.72	**0.70**	0.75	0.72	**0.74**
Weekly	0.70	0.76	**0.73**	0.71	0.76	**0.74**	0.72	0.75	**0.74**	0.68	0.70	**0.69**	0.69	0.67	**0.68**
Weekly AD	0.69	0.76	**0.73**	0.69	0.75	**0.72**	0.70	0.74	**0.72**	0.66	0.69	**0.68**	0.69	0.67	**0.68**
Sample B															
Monthly	0.69	0.71	**0.70**	0.68	0.70	**0.69**	0.66	0.72	**0.69**	0.58	0.68	**0.63**	0.74	0.68	**0.71**
Weekly	0.65	0.75	**0.70**	0.62	0.75	**0.69**	0.61	0.74	**0.68**	0.59	0.66	**0.63**	0.66	0.66	**0.66**
Weekly AD	0.66	0.78	**0.72**	0.63	0.77	**0.70**	0.62	0.75	**0.69**	0.61	0.67	**0.64**	0.68	0.67	**0.68**
Sample C															
Monthly	0.65	0.64	**0.65**	0.65	0.65	**0.65**	0.84	0.64	**0.74**	0.64	0.61	**0.63**	0.70	0.66	**0.68**
Weekly	0.61	0.63	**0.62**	0.61	0.61	**0.61**	0.70	0.58	**0.64**	0.57	0.57	**0.57**	0.57	0.57	**0.57**
Weekly AD	0.61	0.63	**0.62**	0.59	0.61	**0.60**	0.60	0.58	**0.59**	0.55	0.58	**0.57**	0.57	0.58	**0.58**
Sample D															
Monthly	0.73	0.73	**0.73**	0.72	0.72	**0.72**	0.73	0.73	**0.73**	0.72	0.70	**0.71**	0.77	0.71	**0.74**
Weekly	0.64	0.71	**0.68**	0.63	0.67	**0.65**	0.67	0.67	**0.67**	0.59	0.61	**0.60**	0.59	0.61	**0.60**
Weekly AD	0.65	0.71	**0.68**	0.61	0.69	**0.65**	0.62	0.68	**0.65**	0.57	0.64	**0.61**	0.59	0.63	**0.61**
Avg weekly/weekly AD	**0.65**	**0.72**	**0.68**	**0.64**	**0.70**	**0.67**	**0.66**	**0.69**	**0.67**	**0.60**	**0.64**	**0.62**	**0.63**	**0.63**	**0.63**
Avg monthly	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.71**	**0.77**	**0.72**	**0.74**	**0.65**	**0.68**	**0.67**	**0.74**	**0.69**	**0.72**

Table 3.23: Comparison of our proposed range to the Port's proposed estimates

Estimator	2016-17 TCS	2017-18 TCS	2018-19 TCS	2019-20 TCS	2020-21 TCS
CEPA	0.65 – 0.70	0.65 – 0.70	0.65 – 0.70	0.60 – 0.70	0.60 – 0.70
Synergies	0.70-0.75	0.70 – 0.75	0.70 – 0.75	0.70 – 0.75	0.70 – 0.75
Incenta		-	-	-	0.70 – 0.80

Source: CEPA analysis

There are two key reasons why our average estimates of beta vary from the Port's estimates:

- As supported by Australian regulatory precedent, we have placed emphasis on weekly returns using monthly returns as a cross-check. Over the five-yearly review period, the Port has instead placed most emphasis on monthly returns.
- The selection of different comparators. The previous sub-section sets our approach for selecting a comparator sample and why this approach is well accepted. Appendix C provides a detailed breakdown of our proposed comparators compared to the Port.

In the following sections, we consider the response of the Port and its advisors to our analysis.

3.4.5. Consideration of the Port's response

3.4.5.1. Overarching issues

The Port's response

[redacted]

[redacted]

- [redacted]
- [redacted]

[redacted]

[140] PoM (2021), *Submission to ESC Inquiry Draft Report,* November, p. 29.

[141] Incenta (2021), *Review of the CEPA report*, November, p. 4-5.

[142] PoM (2021), p. 30.

[143] Incenta (2021), p. 5.

[redacted]

CEPA's response

[redacted]

[redacted]

[redacted]

[redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

[redacted]

3.4.5.2. Construction of the comparator sample

The Port's response

[redacted]

[144] Incenta (2021), p. 5.

[145] CEPA quoted in PoM (2021), p. 30.

[redacted]

CEPA's response

[redacted]

Sample A

[redacted]

[146] Incenta (2021), p. 7.

[147] Incenta (2021), p. 8.

[148] PoM (2021), p. 31.

[149] Synergies (2021), p. 15.

[redacted]

[redacted]

[redacted]

[redacted]

- [redacted]
- [redacted]

[redacted]

[redacted]

[150] ACCC (2020), *Container stevedoring monitoring report 2019-20*, p. 31.

[151] While Incenta consider that Hamburger Hafen und Logistik is not sufficiently similar due to its logistics activities and operating leverage, Synergies and CEPA both agree that by virtue of its substantial container operations, it is sufficiently similar to usefully inform the beta estimate. While Synergies do not include the Pireaus Port Authority or Qingdao Port International Co in their sample, both we and Incenta judge these comparators to be relevant (see footnote below for Incenta's view on the use of Pireaus in the 10-year estimate).

[152] We note that Incenta consider that the Pireaus, included in our 5-year and 10-year samples, should only be considered after March 2016, when it was fully privatised; that is, it should only be included in the 5-year sample. While we have not been able to investigate this fully in the time available, we note that excluding Piraeus from our 10-year sample has an immaterial effect on our estimates for sample B (i.e., at most an increase of 0.01 to the average 5-year and 10-year results the weekly and monthly estimates).

[153] For example, the ERA included two non-rail comparators, Toll and Asciano. While the ERA *"considered that non-rail operators were a less valid proxy company compared to the rail operators […] these comparators either incorporated rail operations (Asciano) or operated in similar markets for (Toll)"*. Similarly, in relation to the Port of Tauranga – another comparator - the ERA noted that relative to Arc Infrastructure *"it was expected [the port] would have a lower level of systematic risk, given the diverse nature of port operations covering road, rail and shipping"*. ERA (2019), paragraph 279.

[redacted]

[redacted]

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

3.4.5.3. Comparator sample size and country filter

The Port's response

[redacted]

[redacted]

> [redacted]

[redacted]

> [redacted]

[154] Incenta (2021), p. 23

[155] Incenta (2021), p. 22

[156] Incenta (2020), p. 12-13

[redacted]

[redacted]

[redacted]

CEPA's response

[redacted]

[redacted]

3.4.5.4. Market capitalisation and liquidity filters

The Port's response

[redacted]

[157] Incenta (2021), p. 22

[158] Incenta (2021), p. 4-5

[159] Incenta (2021), p. 5

[160] Incenta (2021), p. 24

[161] ACCC (2019), ERA (2018).

[162] Civil Aviation Authority (2013), *Estimating the cost of capital: a technical appendix to the CAA's Final Proposal for economic regulation of Heathrow and Gatwick after April 2014*.

[redacted]

CEPA's response

[redacted]

[163] Incenta (2021), p. 5-6 and 20-21.

[164] Although, we note that our conclusion on this point can also accommodate examples of financial practitioners (e.g., Grant Samuel in the Europort valuation) who have considered it appropriate to include such filters, implicitly or otherwise.

[165] Incenta (2021), p. 20-21.

3.4.5.5. Estimation issues

The Port's Response

Frequency

[redacted]

Estimation horizon

[redacted]

The impact of Covid-19 beta estimates

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[166] Incenta (2021), p. 6.

[167] Incenta (2021), p. 12.

[168] Incenta (2021), p. 15.

[169] Incenta (2021), p. 6-7.

[170] Incenta (2021), p. 15-16.

[171] Incenta (2021), p. 14.

[172] Incenta (2021), p. 7.

[redacted]

[redacted]

CEPA's response

Frequency

[redacted]

[redacted]

- [redacted]
- [redacted]
- [redacted]

[redacted]

- [redacted]

[173] Incenta (2021), p. 10.

[174] Incenta (2021), p. 12.

[175] SIRCA: https://www.sirca.org.au/2011/07/risk-measurement-service/. Accessed December 2021.

[176] Brealey, R. A., Myers, S. A., and Allen, F. (2011), *Principles of Corporate Finance*.

[177] Damodaran (1999), *Estimating Risk Parameters*.

[redacted]

[178] Gilbert, T., Hrdlicka, C., Kalodimos, J. and Siegel, S. (2014), *Daily Data is Bad for Beta: Opacity and Frequency-Dependent Betas*, Review of Asset Pricing Studies, Vol. 4 (1), pp.78-117.

[179] Gregory, A., Hua, S. and Tharyan, R. (2018), *In search of beta*, The British Accounting Review, vol. 50, no. 4, pp. 425–441.

[180] Economic Insights (2021), *Methodological issues in estimating the equity beta for Australian network energy businesses*, June, p. 42.

[181] Economic Insights (2021), p. iv and 52-53.

[182] QCA (2021), *Rate of return review*, November, p. 77.

[183] Incenta (2021), p. 16.

Estimation horizon

[redacted]

The impact of Covid-19 on beta estimates

[redacted]

[184] ERA (2018), p. 228.

[185] Incenta (2021), p. 10.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[186] Economic Insights (2021), p. 48.

4. GEARING AND COST OF DEBT

The Pricing Order requires that the cost of equity and debt are distinguished and used to derive the WACC. Implicitly, the Pricing Order also requires that gearing, which is the weighting of debt in the WACC, to relate to the gearing of the benchmark efficient entity. This section considers the appropriate method to obtain this weighting.

In this section we also consider the cost of debt. The overall cost of debt is the sum of the risk-free rate, a debt risk premium and in addition debt raising costs are often included, depending on the approach adopted.

4.1. GEARING

Gearing affects the WACC estimate as follows:

- Directly, through the weighting on debt and equity. This effect is negative, because as gearing increases, the weighting on lower cost debt increases.
- Indirectly, through the asset beta. This effect is positive, because higher gearing increases risk and expected return.

In the WACC formula combined with the equity beta formula used by regulators in Australia, and the one used by the Port, the second effect dominates and the net impact of higher gearing is to increase the measured cost of capital.

4.1.1. The Port's approach

The Port has proposed a gearing level of 30% over the five-yearly review period. The table below summarises the evidence provided by Synergies and Incenta to support this proposal.

Table 4.1: Summary of the Port's evidence on gearing

	TCS	Gearing	Evidence
Synergies	2017-18	30%	Midpoint (to five decimal places) of median gearing for 17 investment-grade comparators (22%) and average acquisition gearing of Australian port privatisations (42%). The comparator set used for this includes five ports, seven railroads and five airports.
Synergies	2018-19	30%	Maintained same approach as 2017-18 and updated numbers.
Synergies	2019-20	30%	Midpoint of median gearing for 10 investment-grade comparators (21%) and average acquisition gearing of Australian port privatisations (42%). The comparator set used for this includes three ports, six North American Class 1 railroads and one Australian railroad.
Synergies	2020-21	30%	Midpoint of median gearing for 9 investment-grade comparators (20%) and average acquisition gearing of Australian port privatisations (42%). The comparator set used for this includes three ports and six North American Class 1 railroads.
Incenta	2020-21	25% / 22%	Both the 5-year and 10-year average gearing of the comparator set was 22%. Medians were 19% and 23% respectively.

Note: Gearing is defined here as the ratio of debt to debt plus equity. In Synergies' gearing calculation, debt is defined as long-term debt and equity is the market value of equity. Incenta base their gearing calculation on net debt and market capitalisation.

While Synergies have focussed primarily on investment grade comparators, they also consider the whole comparator sample average gearing as a cross check.

4.1.2. Regulatory evidence

Australian regulatory precedent provides strong support for using the observed gearing of an appropriate comparator sample to set benchmark gearing. In the regulatory decisions that we reviewed over the five-yearly period, five regulators drew on evidence from comparators while the remaining three either based their decisions on findings by other regulators or maintained gearing at a previously determined value.[187] Of the Australian regulatory precedent we reviewed we did not find evidence that data on acquisitions is used to inform benchmark gearing. However, regulators do look at acquisition data for other aspects of their decision making.[188] In addition, most regulators consider a wider range of evidence than simply using the gearing of a comparator sample.

For the same companies our gearing estimates vary from those calculated by Synergies and slightly from those calculated by Incenta. We calculated gearing as *Debt / (Debt + Equity)*, using the book value of net debt and the market value of equity over the same period and dates used for beta estimation. This may mean the period over which gearing is estimated varies slightly from Incenta's estimate, explaining the slight difference. We understand that Synergies uses long-term debt in its gearing calculation, which affects estimated gearing. As the estimate of gearing is used to de-leverage equity betas it also has an impact on asset betas.

There is some disagreement among Australian regulators regarding the appropriate measure of debt to use for gearing calculations. The AER reviewed this issue recently and concluded that "[i]*n principle both debt and equity values should be obtained from the same…source (either book or market data)".*[189] The AER noted that primary weight should be placed on gearing estimates from market values.[190] However, market data on debt securities is either illiquid or unavailable and the book value of debt is typically used as a proxy for the market value of debt.

The AER also concluded that it is inappropriate to use net debt and a measure of gross debt should be used instead,[191] but there is no consensus on this point. The ERA uses net debt for gearing calculations and other regulators have used net debt in their estimate of gearing for the purposes of assessing financeability.[192] We did not find support in Australian regulatory precedent for estimating gearing using only long-term debt.

The table overleaf provides average and median gearing estimates from our comparator samples over 5-year and 10-year periods for each TCS year.[193]

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[187] AER, ERA, IPART, QCA and ACCC used a comparator sample in at least some decisions. We note that some earlier ACCC decisions – ACCC (2015) and ACCC (2017) – as well as other regulators, chose to maintain the gearing assumption from previous determinations. When the gearing estimate is based on a comparator sample, it is usually the same sample used to derive beta.

[188] For example, AER examined acquisition multipliers to consider historical profitability – AER (2018a).

[189] AER (2018b), *Discussion paper – Gearing*, p. 17.

[190] AER (2018a).

[191] AER (2018b), p. 20.

[192] See ERA (2015), ERA (2018), ERA (2019) - and in financeability assessments ESCOSA (2020), Industry Panel (2015), ICRC (2015). Other regulatory decisions are not definitive on this point.

[193] In some cases, there was insufficient data for a 10-year estimate.

Table 4.2: Gearing estimates - CEPA comparator samples

Comparator sample	2016-17			2017-18			2018-19			2019-20			2020-21		
	5-year	10-year	Avg	5-year	10-year	Avg	5-year	10-year	Avg	5-year	10-year	Avg	5-year	10-year	Avg
Sample A - Average	25%	29%	**27%**	26%	28%	**27%**	24%	26%	**25%**	24%	23%	**24%**	19%	24%	**22%**
Sample B - Average	26%	25%	**26%**	24%	26%	**25%**	23%	24%	**24%**	21%	24%	**23%**	22%	26%	**24%**
Sample C – Average	20%	21%	**21%**	39%	23%	**31%**	35%	21%	**28%**	34%	20%	**27%**	31%	21%	**26%**
Sample D - Average	23%	23%	**23%**	46%	24%	**35%**	40%	23%	**32%**	39%	23%	**31%**	34%	26%	**30%**
Sample A – Median	16%	20%	**18%**	18%	20%	**19%**	18%	17%	**18%**	20%	19%	**20%**	19%	19%	**19%**
Sample B - Median	18%	15%	**17%**	18%	20%	**19%**	19%	18%	**19%**	18%	19%	**19%**	19%	22%	**21%**
Sample C – Median	14%	16%	**15%**	19%	16%	**18%**	20%	14%	**17%**	21%	14%	**18%**	26%	16%	**21%**
Sample D - Median	16%	17%	**17%**	25%	24%	**25%**	25%	19%	**22%**	24%	19%	**22%**	28%	27%	**28%**

Source: CEPA analysis

4.1.3. Assessment

The Port has adopted the Synergies approach in its TCS over the five-yearly review period. We consider that this is not well accepted. In particular:

- The use of acquisition gearing levels is not used by Australian regulators as evidence of the gearing level for a benchmark efficient entity.
- Long-term debt does not appear to be commonly used in gearing calculations.
- Where Australian regulators estimate gearing using the beta comparator sample, it does not appear that they commonly focus on only on a subset of the beta comparator sample (e.g. only investment grade comparators, as Synergies has done). Rather, the full comparator sample is usually considered.

We find support for gearing levels of between 20% to 30% across the five-yearly review period, based on analysis of our full comparator samples, which is well accepted.

4.1.4. Consideration of the Port's response

The Port's response

[redacted]

[194] Incenta (2021), p. 25-26.

[195] Incenta (2021), p. 26.

[196] Synergies (2021), p. 9.

[197] Synergies (2021), p. 9-10.

[198] Synergies (2021), p. 10.

[199] Synergies (2021), p. 12.

[redacted]

CEPA's response

[redacted]

4.2. CREDIT RATING

Across the five-yearly review period, the Port has proposed a notional credit rating of BBB. The selection of credit rating feeds into the estimation of the debt margin. BBB would represent a minimum investment grade rating. We agree with Synergies' conclusion that in Australian regulatory practice the adoption of an investment grade credit rating has not been contentious. However, it is important to consider whether the benchmark efficient entity in this case may have a higher credit rating. Australian regulators often do this by examining the credit ratings of comparator companies. The port comparators provide limited evidence as most have not been issued a credit rating by Moody's, S&P or Fitch. Port of Tauranga has an S&P rating of A- while China Merchants Port Holdings is rated BBB.

Synergies highlights in practice the choice between a BBB and BBB+ rating often has no practical consequence as the data regulators rely on only provides a broader BBB corporate bond category. We observe some Australian

[200] Synergies (2021), p. 12.

[201] Synergies (2017), p. 4.

[202] Synergies (2017), p. 36 and Attachment A.

regulators have attempted to move away from this broad categorisation as shown in the table below. None the less, we agree that using a BBB credit rating is well accepted. It is possible that a higher rating is consistent with our assumed gearing for ports, but we have insufficient evidence to assess this. However, even if a higher rating were to be adopted, the overall impact on the WACC estimate would be low because of the relatively low weight of debt assumed in the capital structure. The average difference in spreads between BBB- and A- bonds in the last 15 years is 73bps; with 20% gearing assumed, this would have an impact on the WACC of less than 15bps.

Table 4.7: Credit ratings used in Australian regulatory precedent

Regulator	Decision date	Target credit rating
AER	2013, 2018	BBB+
ACCC	2019	AA-
ACCC	2017	BBB
ACCC	2015	A
ERA	2015, 2019	A, BBB+ and BBB- depending on company.
ERA	2018	BBB+
ESCOSA	2015, 2020	BBB
ICRC	2018	BBB
IPART	2018	BBB
OTTER	2015, 2018	BBB
QCA	2019, 2020	BBB
QCA	2018	BBB+

Source: See Appendix A.

4.3. DEBT RISK PREMIUM

At a high level there are four elements that feed into estimating the debt risk premium for Australian regulatory purposes:

- **Target credit rating** - where a broad BBB rating is well accepted (as explained in the section above).
- **Term to maturity** - Synergies has proposed ten years in each TCS report for the Port. We agree that this is well accepted.
- **Data used to construct the estimate** - Synergies highlights that it is well accepted for Australian regulators to use an independent third-party data provider, such as Bloomberg or the RBA. We agree with this assessment. Synergies use these data sources for their calculations, adopting a 50:50 average from both of these sources as their BBB corporate bond yield.
- **Estimation procedure** - This includes any adjustments required to set term to maturity to ten-years, adjustments to set the appropriate credit rating given the data source and a decision on any averaging procedure (such as on-the-day or a trailing average). Synergies have used a 20-day averaging period combined with a trailing average approach and a transition period. This means that in the first TCS adopted an 'on the day' approach, in which the cost of debt was 100% based on a 20-day averaging period in 2017. Over subsequent TCS, the cost of debt progressively transitions to reflect the trailing average. This means the cost of debt in 2020 is weighted 70% on a 20-day averaging period in 2017, 10% on 2018, 10% on 2019 and 10% on 2020.

Table 4.8: The Port's DRP estimates

	2017-18 TCS	2018-19 TCS	2019-20 TCS	2020-21 TCS
Synergies' estimate	2.54%	2.53%	3.18%	4.04%

Source: TCS.

The table below provides a summary of the estimation procedures used in recent Australian regulatory decisions on cost of debt. We agree with Synergies' finding that both on-the-day and trailing average approaches are well accepting by Australian regulators, particularly in the later part of the five-yearly review period. We also find support for using a transition period.

Table 4.9: Summary of cost of debt approaches in Australian regulatory precedent

Regulator	Decision date	Cost of debt approach
AER	2013	On-the-day, with averaging period of 10 days – 12 months nominated by the service provider.
AER	2018	10-year trailing average with a transition period. Calculated annually using a service provider nominated averaging period.
ACCC	2015, 2017, 2019	On-the-day 20 day averaging period.
ERA	2015, 2019	On-the-day 40 day averaging period.
ERA	2018	10-year trailing average with transition period.
ESCOSA	2015, 2020	10-year trailing simple average.
IPART	2013	Combination of 10-year average for historic component and current component based on on-the-day 40 day averaging period.
ICRC	2018	10-year trailing average set each year using a 12-month simple average. Transitional arrangement in place.
IPART	2018	Combination of 10-year trailing average for historic component and short-term trailing average equal to length of regulatory period for current component. 40-day averaging period.
OTTER	2015, 2018	Mid-point of ten-year simple average and an average of the last two RBA observations.
QCA	2016b, 2018, 2020	On-the-day 20 day averaging period.

Source: See Appendix A.

We calculated estimates for 2020 to test the accuracy of Synergies' estimates. We use an identical risk-free rate. To estimate the DRP we followed the AER's most recent methodology.[203]

While similar to Synergies' proposed method there are two minor differences which relate to how RBA data is used. RBA data is only available at month ends. Synergies overcomes this problem by using the three most recent month ends (January, February and March). In comparison we only use the two most recent month ends. Furthermore, the average tenor of the ten-year estimate is below ten years and extrapolation to match exactly ten years is required. Synergies does this by approximating the slope of the RBA's yield curve using the three, five, seven and ten-year estimates. We only use the seven and ten-year estimates. Despite these differences we produce an almost identical estimate using RBA data, 2.67% compared to 2.68%.

We get a slightly higher estimate than Synergies using Bloomberg data. We understand Bloomberg publishes semi-annually compounded rates which need to be converted to effective annual rates, which may explain the difference.

[203] AER (2018a).

Table 4.10: Comparison of estimates of DRP to 31 March 2020

	RBA	Bloomberg	Average
CEPA estimate	2.67%	2.20%	2.44%
Synergies estimate	2.68%	2.16%	2.42%

Source: Synergies and CEPA analysis.

4.3.1. Assessment

We consider the Port's approach to the debt risk premium to be well accepted.

4.4. DEBT RAISING COSTS

4.4.1. The Port's approach

Across all four TCS, Synergies has proposed debt raising costs of ten basis points (0.1%). This is based on evidence gathered by PwC on debt raising costs for Australian corporates. The table below provides a summary of the debt raising costs applied in Australian regulatory decisions over the five-yearly review period. Debt raising costs of ten basis points are in line with this precedent.

4.4.2. Regulatory evidence

Regulator	Decision data	Allowance for debt raising costs
AER	2013, 2018	Part of opex allowance.
ERA	2018, 2019	0.1%
IPART	2013, 2018	0.125%
QCA	2016, 2018, 2020	0.108%
ESCOSA	2015, 2020	0.125%
ICRC	2018	0.125%
OTTER	2018	0.1%
ACCC	2017, 2019	0.095%
ERA	2015	0.125%

Source: See Appendix A.

4.4.3. Assessment

We consider the Port's approach to debt raising costs to be well accepted.

4.5. OVERALL COST OF DEBT

As noted in the sections above, we consider the Port's approach to the cost of debt elements to be well accepted. Accordingly, in line with our terms of reference, we have not recalculated their estimates (reported below), except for the year 2016-17, where our WACC estimates reflect a cost of debt calculated as of the end of March 2016.

Table 4.11: The Port's cost of debt estimates

	2016-17 (CEPA)	2016-17 and 2017-18 TCS	2018-19 TCS	2019-20 TCS	2020-21 TCS
RFR	2.59%	2.81%	2.74%	1.96%	0.90%
Debt risk premium	2.78%	2.54%	2.53%	3.18%	4.04%
Debt raising costs	0.10%	0.10%	0.10%	0.10%	0.10%
Cost of debt	5.47%	5.45%	5.37%	5.24%	5.04%

Source: TCSs and CEPA analysis. Note: the Port sets out its 2016-17 estimate in the 2017-18 TCS, where the 2016-17 cost of debt is assumed to be the same as in 2017-18.

5. GAMMA

Australia operates an imputation tax system. This means that eligible investors (Australian taxpayers) receive imputation credits for tax paid, on Australian income, at the company level.[204] These credits can then be used by the eligible shareholders to offset their tax liabilities.

One dollar of company tax paid generates imputation credits with a value of one dollar. Companies may attach imputation credits to their dividends but can also chose to retain them in a franking account balance. The imputation tax system means that eligible investors would accept an investment with a lower rate of return than if the system did not exist.

The adjustment to the pre-tax WACC for imputation credits is commonly referred to as *gamma*. The value of gamma lies within a range of zero to one. A zero value implies that investors receive no benefit from imputation credits, while a value of one assumes that investors receive the full benefit of all credits generated by the company. A non-zero value for gamma reduces the pre-tax WACC. This reflects that if equity investors receive value from the imputation credits, they will require a lower rate of return than would otherwise be the case.

Gamma is commonly estimated through the **utilisation approach** as the product of a distribution rate and a utilisation rate ($\gamma = F \times \theta$):

- the **distribution rate** (F) is the proportion of imputation credits generated by a company that are distributed to investors; and
- the **utilisation rate** (θ or theta) is the value of the imputation credits distributed to investors.

There are different approaches to estimating the distribution and utilisation rate inputs to the utilisation approach. The distribution rate can be estimated using:

- Selected companies' financial reports (e.g., the top 20 or 50 ASX-listed firms) to estimate the changes in their franking account balances relative to dividends paid out.
- Australian Tax Office (ATO) tax statistics on changes in franking account balances.[205]

Theta can also be estimated in several different ways:

- Equity ownership estimates, which reflect the proportion of domestic and foreign ownership of Australian equity, based on Australian Bureau of Statistics (ABS) data. This requires an underlying assumption that domestic investors value imputation credits at their face value (i.e. for domestic investors, the value of theta is one).
- Market value studies, such as dividend drop-off studies.[206] Dividend drop-off studies compare share prices with and without dividend entitlements, specifically prices between: the cum-dividend date (the last day on which investors are eligible to receive dividends and associated imputation credits); and the ex-dividend date (the first day on which investors will not be eligible to receive dividends and associated imputation credits).

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[204] https://www.ato.gov.au/individuals/investing/in-detail/investing-in-shares/refunding-franking-credits---individuals/?page=1#Dividends_and_franking_credits, accessed 21 September 2020.

[205] We note that the ATO has advised the AER that there are significant issues with using the ATO's franking account balance (FAB) data. Australian Tax Office (ATO, 2018), *ATO note to the AER: Clarification of points in previous note titled 'Franking account balance- tax of time series data from Taxation Statistics'*, 14 September.

[206] Other market value approaches include: comparative pricing studies, which seek to assess the value of imputation credits by analysing prices for securities that are comparable, but offer varying dividend and/or imputation credit entitlements; returns / price analysis, which consider the relationship between imputation credits and realised returns, or between imputation credits and asset prices.

- Using estimates on the utilisation of franking credits from dividend data published by the ATO.[207]

5.1. THE PORT'S APPROACH

The Port's adviser, Synergies, defines theta as *"the value the **marginal investor** places on $1 of franking credits"* (CEPA's emphasis).[208] As we discuss further below, the concept of the marginal investor is an important factor in one of the three approaches that Synergies have used to estimate gamma.

Over the review period, Synergies have adopted a combination of approaches to estimate gamma. In the 2017-18, 2018-19 and 2019-20 TCS, Synergies proposed an equal one-third weighting of:

- The utilisation approach, where theta is calculated using the **equity ownership** approach. Synergies' estimates are based on Australian regulatory decisions that use this approach.
- The utilisation approach, where **market valuation** studies are used to calculate theta. Synergies' estimates for this approach are predominantly based on IPART's regulatory decisions.
- A **zero gamma value**, based on Synergies' review of approaches used by academics and financial practitioners.

In the 2020-21 TCS, Synergies updated their approach to apply a two-thirds weight to **equity ownership** estimates and a one-third weight a **zero gamma value**. Although Synergies continue to consider that market valuation studies have merit, this approach was removed from their 2020-21 TCS estimate in recognition that it is currently given material weight by only one regulator (IPART).[209]

The distribution rate (F), utilisation rate (θ) and gamma estimates adopted by Synergies are shown in Table 5.1. Over 2017-18 to 2019-20, Synergies have assumed a distribution rate of 0.7.[210] In the 2020-21 TCS, this was updated to 0.8.

Table 5.1: Synergies' estimates of gamma

	2017-18 & 2018-19 TCS[1]			2019-20 TCS			2020-21 TCS		
	F	θ	Gamma	F	θ	Gamma	F	θ	Gamma
Zero value	-	-	0.0	-	-	0.0	-	-	0.0
Market valuation	0.7	0.35	0.25	0.7	0.35	0.25	-	-	-
Equity ownership[2]	-	0.6 – 0.7	0.45	-	0.6 – 0.7	0.50	-	-	0.50
Overall estimate	**0.7**	**0.35**	**0.25[3]**	**0.7**	**0.35**	**0.25**	**0.8**	**0.41**	**0.33**

Note 1 – In the 2017-18 TCS, Synergies assumed the same gamma value for the 2016-17.

Note 2 – Synergies have not explicitly specified all inputs to the equity ownership approach. The overall gamma value for this approach is based on Synergies' review of recent regulatory decisions. However, in the 2020-21 TCS, Synergies note that their MRP calculations assume a theta of 0.4125, consistent with their assumed gamma of 0.33 and an assumed distribution rate of 0.8 (based on the midpoint of regulatory decisions).[211]

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[207] ATO data has been used in the past however the ATO (2018) advised the AER that it was not appropriate to use its publicly available data in this way.

[208] Synergies (2017), p. 84.

[209] Synergies (2020), p. 247.

[210] Synergies MRP models.

[211] Synergies (2020), p. 133 and 235.

Note 3 - Rounded up from 0.23, which is the simple average of the gamma estimates from the three approaches.

In the following sections, we discuss Synergies' rationale for adopting a zero gamma approach, and its use of market valuation estimates prior to the 2020-21 TCS.

5.1.1. Synergies' zero gamma value approach

Synergies have presented two categories of evidence in support of placing a one-third weight on a zero gamma value. These are (i) findings from academic literature and (ii) evidence of the methodologies adopted by financial practitioners in company valuation reports.

Synergies' review of academic evidence

Synergies argue that academic publications support a zero value for gamma where the 'marginal investor' is not an Australian taxpayer and cannot realise any value from the imputation credits that are distributed to them.[212] The marginal investor concept is not fully explained in their reports for the Port. However, it is implied that Synergies consider that asset prices in equilibrium are set by a single marginal investor.[213] If asset prices are set by a marginal investor who cannot derive value from imputation credits, it follows that imputation credits will not be reflected in asset prices or, by extension, the expected or required return on equity implied by those prices.

Synergies further propose that the marginal investor is very likely to be a non-Australian taxpayer. In support of this view, they cite academic studies which find little evidence that imputation credits affect asset prices. Synergies consider this consistent with the view that the marginal investor does not value imputation credits.[214] They also note that foreign equity accounts for just under half of the total equity holdings in major Australian transport and energy infrastructure.[215] Overall, Synergies find that *"it cannot be concluded that the marginal investor in an efficient Australian benchmark efficient entity is anything but a foreign investor who places no value on imputation credits."*[216]

In the 2017-18 to 2019-20 TCS reports for the Port, Synergies rely on this evidence to place a one-third weighting on a zero value for gamma. In the 2020-21 TCS, Synergies instead state that they have used academic evidence as a cross-check, and find that it is consistent with the adoption of a zero gamma value by finance practitioners (see below).[217]

Assessment

The academic evidence presented by Synergies may not be suitable for the purpose of calculating the required revenue for a benchmark efficient entity.

Firstly, Synergies' arguments rely on the presumption that there is broad agreement within the academic community that a single marginal investor sets asset prices. The academic publications that Synergies cite are consistent with this perspective.[218] However, we do not agree that it is well accepted. For example, Handley (2014) and Lally and van Zijl (2003) both consider that in equilibrium, the value of theta will be determined by the weighted average of the utilisation rates of all investors in the market, where the weights are based on their levels of wealth

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[212] For example, see Synergies (2017), p. 85 and Synergies (2020), p. 230.

[213] For example, Synergies explain that while domestic equity providers do receive value from imputation credits, they are "inframarginal" and therefore do not set asset prices. Synergies (2017), p. 95.

[214] Synergies (2017), p. 85-86.

[215] Synergies (2017), p. 95.

[216] Synergies (2017), p. 95.

[217] Synergies (2020), p. 232 and 250-251.

[218] For example, Siau et al (2015), *Are imputation credits capitalised into stock prices?*, p. 243 and Cannavan et al (2004), *The value of dividend imputation tax credits in Australia*, p. 168.

and risk aversion.[219] In their 2015 review of the academic literature on the value of imputation credits, Ainsworth et al (2015) find that *"whether prices are set by a marginal investor, or by aggregation across investors, is an open question"*.[220]

Secondly, Synergies contend that empirical academic studies consistently find that the value of gamma reflected in asset prices is zero. However, Synergies' review of the literature on this topic appears to exclude several studies, including some that find non-zero values for gamma.[221] Further, in other sections of their reports, Synergies refer to the results of dividend drop-off studies conducted by academics.[222] These studies indicate that the value of gamma is not zero, but these are not discussed in Synergies' synthesis of the academic evidence that supports the use of a zero gamma value. Overall, a more balanced interpretation of the evidence would conclude that estimates of gamma reported in the academic literature vary and are not generally accepted to be zero.

Finally, we do not accept that a zero gamma value is well accepted by the academic community *for the purpose of calculating a revenue requirement for a benchmark efficient entity*. This is because the purpose of these studies has been to estimate the impact of imputation credits on asset prices, not to estimate the value of imputation credits to investors in a benchmark efficient entity. Some of these studies highlight – albeit indirectly – that adopting a zero gamma value for the latter purpose may be problematic. For example, Siau et al (2015) consider it likely that imputation credits are not reflected in share prices because the marginal investor does not value them. This means that *"prices would then be lower and expected returns higher for stocks paying imputation credits than if [imputation credits] were priced"*.[223] The authors go on to say that:[224]

> *"if market returns are not lowered by the presence of imputation credits, then investors who benefit from dividend imputation may capture the full value of their imputation credits as a bonus or 'consumer surplus' over and above the market clearing rate of return – they can 'have their cake and eat it too'."*

That is, regardless of whether imputation credits affect asset prices, unless an assumption is made that *all* investors in the benchmark efficient entity are non-Australian taxpayers, imputation credits will nonetheless be a source of value to *some* investors. Accordingly, failing to account for this value would tend to overestimate required revenues, which is not consistent with the requirements of the Pricing Order.

Overall, we do not accept that a zero gamma value is well accepted by the academic community for the purpose of calculating a revenue requirement for a benchmark efficient entity.

Synergies' review of financial practitioner evidence

The second body of evidence that Synergies rely on in placing a one-third weight on a zero value for gamma comes from financial practitioners. In particular, Synergies justify their approach on the basis that:

- Valuation reports do not typically include gamma factors in discount rates.
- Surveys of financial practitioner valuation approaches also indicate that in this context a gamma adjustment is not commonly applied to the discount rate.

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[219] Handley, J. C. (2014), *Advice on the Value of Imputation Credits*, Report prepared for the Australian Energy Regulator. Lally, M., and van Zijl, T. (2003), *Capital gains tax and the Capital Asset Pricing Model*.

[220] Ainsworth et al. (2015), *Do Franking Credits Matter? Exploring the Financial Implications of Dividend Imputation*, p. 7.

[221] For example, as summarised in Ainsworth et al (2015), p. 18.

[222] For example, in Synergies (2020), dividend drop-off studies are reported in Section 10.2.3, while other academic evidence is reviewed separately in Section 10.2.5.

[223] Siau et al (2015), p. 273.

[224] Siau et al (2015), p. 273.

Assessment

Our view of the **survey** evidence put forward by Synergies finds that it does not clearly support their interpretation. For instance, we consider that Synergies has incorrectly interpreted Truong et al (2008).[225] Synergies state:

> *"The ESC then goes on to reference a market practice survey (Truong, Partington and Peat, 2005, which we have cited in previous reports and have done so again above), which finds that some valuation experts (15%) assign value to imputation credits. In our view, this survey reinforces that the weight of evidence is that imputation credits are not valued by the vast majority of independent experts."*[226]

This is incorrect. The survey's findings were that 85% of respondents did not adjust for imputation in estimating beta or the MRP. 17% made an adjustment for imputation credits for project evaluation. However, only 10% considered that the value of imputation credits had zero market value.[227] Independent experts may not place an explicit value on imputation credits in order to value the company as a whole, but they do consider that there is value for Australian investors from imputation credits.

Synergies refer to the KPMG 2019 survey to which 92% of respondents state that they do not make a gamma adjustment to discount rates for the purpose of valuations.[228] Synergies consider that this *"reaffirms unambiguously that the well accepted approach to gamma among financial practitioners is to apply no value to imputation credits"*.[229] However, the value of imputation credits need not be reflected in the discount rate; an adjustment can instead be made to cash flows. KPMG does ask the following question: "*Where imputation benefits are included as an adjustment to the cash flows, what utilisation factor do you assume?*"[230] 64% of respondents to this question said that they assume a positive utilisation factor, while the average utilisation factor being applied was 36.4%. 32% reported using a utilisation factor of zero. This does not tell us the overall proportion of respondents that make an imputation credit adjustment to either the discount rate or cash flows. Accordingly, the survey cannot be taken as conclusive evidence that valuers typically assign zero value to imputation credits.

In relation to **valuation reports**, the sample that we have reviewed is consistent with Synergies' conclusion that the majority of such reports do adopt a zero value for gamma. However, we do not agree that these reports suggest that finance practitioners believe that the value of imputation credits to investors is zero.

For example, Synergies rely strongly on statements made by Grant Samuel, making the following claim:

> *"Most prominently, Grant Samuel has stated unequivocally on multiple occasions (see reports cited in this section) that it does not believe that Australian equity prices incorporate a value for franking credits, nor does it believe that gamma adjustments are made by asset acquirers, as shown below."*[231]

They then go on to cite a 2019 Grant Samuel independent expert report:

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[225] We note that Synergies cite the study as 2005 in the main text, but provide a reference to the study as being in 2008 in its footnotes.

[226] Synergies (2020), p. 240.

[227] Truong et al (2008), *Cost-of-Capital Estimation and Capital Budgeting Practice in Australia*, p. 116.

[228] KPMG (2019), *What's it worth? Determining value in the continuing low interest rate environment, KPMG Valuation Practices Survey 2019*, p. 14.

[229] Synergies (2020), p. 242.

[230] KPMG (2019), p. 14.

[231] Synergies (2020), p. 239-240.

> *"While acquirers are attracted by franking credits, there is no clear evidence that they will actually pay extra for a company with them."*[232]

Synergies also note that "G*rant Samuel did acknowledge that imputation credits may have value to some shareholders but argued that they do not affect the underlying value of the company itself.*"[233] They go on to conclude that *"In our view, Grant Samuel's stance strongly implies that imputation credits do not have value for the marginal price-setting investor, who is central to the determination of firm value."*[234]

We have commented above on the lack of consensus that asset prices are set by a single marginal investor. Further, Synergies' statements and quote of Grant Samuel's report is misleading. The full quote from the above is:

> *"while acquirers are attracted by franking credits there is no clear evidence that they will actually pay extra for a company with them (**at any rate the share market evidence used by Grant Samuel in valuing the Bellamy's business will already reflect the value impact of the existence of franking credits**). Further, franking credits are not an asset of the company in the sense that they can be readily realised for a cash sum that is capable of being received by all shareholders. The value of franking credits can only be realised by shareholders themselves when they receive distributions. Importantly, the value of franking credits is dependent on the tax position of each individual shareholder. To some shareholders (e.g. overseas shareholders) they may have very little or no value. Similarly, if they are attached to a distribution which would otherwise take the form of a capital gain taxed at concessional rates there may be minimal net benefit (in fact, there may be some categories of shareholders who are worse off in this situation such as shareholders with a capital loss on disposal of the shares).*
>
> *Accordingly, while **franking credits may have value to some shareholders they do not affect the underlying value of the company itself**. No value has therefore been attributed to the accumulated franking credit position of Bellamy's in the context of the value of Bellamy's as a whole."*[235] [Emphasis added]

Either Australian shareholders value imputation credits and this is reflected in equity prices or they do not. You cannot have a bet both ways. It is also clear that Grant Samuel is discussing the valuation of Bellamy's. Grant Samuel is not estimating what the required rate of return would be for investors in a regulated asset for which the return is calculated based on an accrual building blocks method.

Our review of independent valuation reports suggests that the primary reason why valuers do not make an adjustment for gamma is that they do not believe that there is a universal adjustment that would appropriately reflect the value of imputation credits for *all* investors, who are the audience for their reports. For example, in a 2015 Independent Expert Report, Grant Samuel stated:

> *"**There is undoubtedly merit in the proposition that dividend imputation affects returns**. Over time dividend imputation may become factored into the determination of discount rates by corporations and investors. In Grant Samuel's view, however, the evidence gathered to date as to the value the market attributes to franking credits is insufficient to rely on for valuation purposes. The studies that measure the value attributed to franking credits are based on the immediate value of franking credits distributed and do not address the risk and other issues associated with the ability to utilise them over the longer term. More importantly, Grant Samuel does not believe that such adjustments are widely used by acquirers of assets at present. While acquirers are undoubtedly*

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[232] Synergies (2020), p. 241.

[233] Synergies (2020), p. 241.

[234] Synergies (2020), p. 241.

[235] Grant Samuel (2019), *Independent Expert Report, Bellamy's Australia Limited Scheme Book*, p. 59.

attracted by franking credits there is no clear evidence that they will actually pay extra for them or build it into values based on long term cash flows. In Grant Samuel's opinion, ***the better view is that dividend franking enhances the returns to Australian investors (compared to offshore investors)*** *rather than impacting on market values. Accordingly, it is not appropriate to make any adjustment."*[236] [Emphasis added]

In addition, we note that Grant Samuel does not make an allowance for imputation credits in its MRP.[237] In a subsequent independent expert report on Asciano, Grant Samuel noted:

> *"Nevertheless, it needs to be recognised that, where part of the consideration under a takeover offer or scheme comprises a franked dividend,* ***some shareholders may realise additional value from the franking credits****"*[238] [Emphasis added]

Accordingly, not taking account of the value of these credits risk setting the Port's tariffs at a level that targets a return above what the Australian investors require for the level of systematic risk associated with the Port.

Overall, we find that while adopting a zero gamma value may be considered appropriate in the context of a valuation report targeted at a diverse investor base, there is no evidence to suggest that financial practitioners would endorse this approach for the purpose of determining a revenue requirement for a benchmark efficient entity. In contrast, regulatory approaches to gamma do explicitly account for the fact that some, but not all, investors in a benchmark efficient entity will derive value from imputation credits.

5.1.2. Implied market value studies

Synergies' approach

As noted above, in the 2017-18, 2018-19 and 2019-20 TCS, Synergies placed a one-third weighting on a utilisation approach in which market valuation studies were used to calculate theta.

Synergies' estimates for this approach are based on a 2014 dividend drop off study (see further elaboration below) by SFG Consulting, which determined a value of 0.35 for theta. Combined with a distribution rate of 0.70 (Synergies' assumption for the 2017-18 – 2019-20 TCS), this provides a value for gamma of 0.25. While other dividend drop off studies have been undertaken, Synergies consider that the SFG study is *"the most authoritative"*.[239] Synergies note that they have based their reliance on SFG on the Australian Competition Tribunal's 2011 conclusion that this was the most robust dividend drop off study available at the time (albeit an earlier iteration of the updated version that Synergies consider).[240]

An SFG theta estimate of 0.35 (and associated gamma estimate of 0.25) is also used by IPART in its regulatory determinations. IPART consider that while dividend drop off estimates *"tend to be 'noisy', the underlying signal contains information about the value investors place on those dividends, taking full account of their tax position and ability to use imputation credits"*.[241] In contrast, IPART consider the equity ownership method for estimating theta to be *"imprecise"*, given the assumption that domestic investors are able to take full advantage of imputation credits and the observation that domestic ownership ratios vary over time and across companies.

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[236] Grant Samuel (2015), *Independent Expert's Report, Annexure A of Asciano scheme booklet*, p. 326.

[237] Grant Samuel (2015), p. 319.

[238] Grant Samuel (2016), *Independent Expert's Report*, Annexure A of Asciano scheme booklet, p. 180.

[239] See for example Synergies (2017), p. 10.

[240] Synergies (2019a), p. 190.

[241] IPART (2018), p. 81.

Assessment

There are multiple methodologies that are used to estimate the implied market value of theta. Broadly speaking, these studies seek to compare prices for securities in circumstances where there is a difference in the imputation credit entitlement associated with those securities. The difference in prices is taken to represent the market value of the entitlement. The range of implied market value methodologies includes:[242]

- **Dividend drop off studies**, which are the primary method used to infer an estimate of theta from market data. These studies compare share prices with and without dividend entitlements, specifically prices before and after two events: the cum-dividend date (the last day on which investors are eligible to receive dividends and associated imputation credits); and the ex-dividend date (the first day on which investors will not be eligible to receive dividends and associated imputation credits).
- **Comparative pricing studies**, which seek to assess the value of imputation credits by analysing prices for securities that are comparable, but offer varying dividend and/or imputation credit entitlements. For example, this includes studies that consider simultaneous trading of shares with and without entitlements, and simultaneous trading of futures/derivatives and the underlying shares.
- **Returns / price analysis**, which considers the relationship between imputation credits and realised returns, or between imputation credits and asset prices.

In its 2013 rate of return guideline, the AER conducted a survey of market valuation studies that had been published up to that date (December 2013). The table below reproduces a sub-set of studies they identified, excluding those that only provided results based on data prior to 2000.[243] Although the AER considered that not all studies were equally robust, their survey indicated the range of theta values that these methodologies can produce.[244]

Table 5.2: AER 2013 rate of return guideline - Survey of market valuation estimates of theta (post-2000 results only)

Study	Data range	Theta estimate (post-2000 result)
Dividend drop off studies		
Vo et al (2013)	2001-2012	0.35 - 0.55
SFG (2013a)[245]	2001-2012	0.35
SFG (2011)	2001-2010	0.35
Minney (2010)	2001-2009	0.39
Beggs and Keels (2006)	1986-2004	0.57
Comparative pricing studies		
SFG (2013b)	2000-2013	0.12
Cummings and Frio (2008)	2002-2005	0.53
Returns / price analysis		
NERA (2013b)	1988-2012	-1.9
Lajbcygier and Wheatley (2012)	1988-2009	-1.68

[242] See AER (2013) and Ainsworth et al (2015) for further details on the different types of approaches.

[243] In 2000, there was a change in tax law that allowed unused credits for eligible investors to be refunded. While the AER considered that earlier estimates had some informative value, they were deemed to be less relevant.

[244] For example, of the dividend drop off studies, the AER considered that Vo et al (2013) and SFG (2013a) were the most relevant, given that both used up to date econometric techniques and data from 2000. AER (2013), p. 165.

[245] We note that more recent studies have updated the SFG analysis and maintained the 0.35 estimate for theta. For example, Cannavan and Gray (2017).

Study	Data range	Theta estimate (post-2000 result)
Siau et al (2013)	1996-2011	-0.3 to 0.3

Source: AER (2013), p. 172-174.

The key question for the purpose of the Pricing Order is whether any of these approaches, and in particular the dividend drop off study relied on by Synergies, can be considered well accepted. As illustrated from the sample above, various implied market value methodologies have been used by academics to estimate the value of theta, resulting in a range of estimates. However, we have not identified a general consensus within the academic community around whether these approaches, or a subset, are appropriate for the purpose of setting the required rate of return for a benchmark efficient entity. This is reflected in the differing views put forward by academics in the context of regulatory proceedings.[246]

In relation to regulatory practice, we find that with the exception of IPART, most Australian regulators do not place weight on evidence from these studies, either explicitly or implicitly.[247] Of the regulators who have considered these studies in detail, this reflects a view that such estimates have empirical and conceptual shortcomings, as summarised in the table below.

Table 5.3: Regulatory views of market valuation approaches to estimating theta

Regulator	Position
AER	In its 2013 rate of return guideline, the AER set out a number of concerns regarding the appropriateness of market valuation approaches for estimating theta: • Dividend drop off studies reflect differences in the combined value of dividends, the attached imputation credit, the tax position of investors, discounting for the time value of money and potentially transaction costs. This 'allocation problem' means that assumptions are required to isolate the difference in security prices that is attributable to imputation credits alone. The basis for these assumptions is uncertain.[248] • The econometric techniques used in dividend drop-off studies introduce some challenges, including: differences in trading prices between the cum-dividend and ex-dividend dates may reflect changes unrelated to dividends (although studies typically attempt to correct for this), or may not fully capture the effect of dividend distributions; such studies can be highly sensitive to the input data; results may be affected by thin trading in particular securities; and estimates from these studies have high standard errors.[249] • Investors trading around the cum-dividend/ex-dividend dates are not likely to be representative of a 'typical' investor.[250] • While the utilisation rate is set as a market-wide (rather than sector or firm-specific) parameter, some market valuation studies rely on analysis of specific events that do not occur frequently, or for all firms in the market. For example, the AER noted that although the SFG (2013b) study referred to above reflected data on 98 firms, 50 per cent of the data points related to just six firms.[251] • There is some disagreement around the appropriate interpretation of the regression coefficients determined through implied market valuation studies, and how this relates to the utilisation rate.[252] Accordingly, in decisions based on the 2013 rate of return guideline, the AER did not place substantial weight on evidence from market valuation studies. No weight was placed on this evidence for the 2018 rate of return guideline.

[246] For example, see the debates documented in the AER's 2013 Rate of Return Guidelines.

[247] That is, those Australian regulators who have based their gamma decisions on other regulatory precedent (rather than explicitly considering market valuation studies) have not adopted values from precedent that is based on implied market valuation estimates of theta.

[248] AER (2013), p. 167-168.

[249] AER (2013), p. 168-169.

[250] AER (2013), p. 170.

[251] AER (2013), p. 165.

[252] AER (2013), p. 175.

Regulator	Position
ERA	The ERA's 2015 rail WACC decision considered that the market-wide utilisation rate should be determined on the basis of the weighted average of the utilisation rate for all investors, reflecting that different investors will have different utilisation rates depending on their ability to use imputation credits. In this context, they considered that dividend drop off studies may not be an appropriate methodology because: • These studies only estimate theta around two trading days (the cum-dividend and ex-dividend days), which may only reflect the utilisation rates of investors active on those days, rather than for the whole market across a year. • There are *"significant econometric challenges"* in seeking to estimate theta from these studies, citing similar issues to those identified by the AER above.[253] Consequently, the ERA placed limited weight on evidence from dividend drop off studies and implied market valuation estimates more broadly. The ERA has followed a similar rationale in its subsequent cost of capital decisions.
QCA	In its 2016 decision for the Dalrymple Bay Coal Terminal, the QCA considered dividend drop off studies alongside other sources of evidence. Less emphasis was given to these studies on the basis that *"the utilisation rate should not be defined as a market value concept"* (i.e. reflecting the value of a single marginal investor that sets asset prices), but should rather reflect *"the weighted average of the utilisation rates of individual investors"*.[254] The QCA's decision on Aurizon Network's 2017 draft access undertaking similarly refers to the *"conceptual and measurement difficulties"* associated with dividend drop off studies.[255]

Sources: See Appendix A.

Accordingly, we do not consider a theta estimate from a single dividend drop off study can be considered a well accepted approach to determining gamma for a benchmark efficient entity.

5.2. REGULATORY EVIDENCE

In the table below, we summarise the approaches to estimating gamma that have been adopted by Australian regulators over the review period.

Table 5.4: Regulatory precedent - Gamma

Entity	Methodology	Distribution Rate (F)	Utilisation Rate (θ)	Gamma
2017-18 TCS				
AER (2016)[256]	Utilisation approach • F – Primary reliance on ATO statistics, some regard to financial accounts • θ – Significant reliance on equity ownership, some reliance on ATO statistics, less reliance on implied market value	0.7 – 0.75	0.38 – 0.68	0.4
ACCC (2015)	Utilisation approach • F – Telstra's historic payout ratio • θ – Followed earlier AER equity ownership estimate	0.95	0.45 – 0.68	0.45
ERA (2015)	Utilisation approach • F – ATO statistics • θ – Most weight on equity ownership, less weight on ATO statistics, least weight on implied market value	0.7 – 0.8	0.35 – 0.69	0.4

[253] ERA (2015), p.180.

[254] QCA (2016), p. 109.

[255] QCA (2018), p. 173.

[256] See *Attachment 4 – Value of imputation credits*, p. 32-36.

Entity	Methodology	Distribution Rate (F)	Utilisation Rate (θ)	Gamma
ESCOSA (2015)	Regulatory precedent[257]	-	-	0.5
IPART (2013)	Utilisation approach • F – ATO statistics • θ – Implied market value	0.7	0.35	0.25
OTTER (2015)	Adopted the same value as the preceding regulatory period, approach not available	-	-	0.5
QCA (2016b)	Utilisation approach • F – Financial accounts • θ – Equity ownership, with limited consideration of ATO statistics and implied market value	0.84	0.56	0.47
2018-19 TCS				
AER (2017)	Utilisation approach • F – Primary reliance on ATO statistics, some regard to financial accounts • θ – Significant reliance on equity ownership, some reliance on ATO statistics, less reliance on implied market value	0.7 – 0.75	0.38 – 0.68	0.4
ACCC (2017)	Draws on AER and QCA precedent (both use the utilisation approach)	-	-	0.4
ERA (2017)	Utilisation approach, follows ERA (2015)	-	-	0.4
ESCOSA (2015)	Regulatory precedent	-	-	0.5
IPART (2018)	Utilisation approach • F – ATO statistics • θ – Implied market value	0.7	0.35	0.25
OTTER (2015)	Adopted the same value as the preceding regulatory period, approach not available.	-	-	0.5
QCA (2016b)	Utilisation approach • F – Financial accounts • θ – Equity ownership, with limited consideration of ATO statistics and implied market value	0.84	0.56	0.47
2019-20 TCS				
AER (2018)	Utilisation approach • F – Financial accounts • θ – Equity ownership	0.9	0.65	0.585
ACCC (2017)	AER and QCA precedent (both use the utilisation approach)	-	-	0.4
ERA (2018)	Utilisation approach • F – Financial accounts • θ – Equity ownership	0.9	0.6	0.5
ESCOSA (2015)	Regulatory precedent	-	-	0.5
IPART (2018)	Utilisation approach • F – ATO statistics • θ – Implied market value	0.7	0.35	0.25

[257] ESCOSA's 2015 gamma estimate dates back to a 2012 decision on the rate of return for SA Water. ESCOSA considered a range of evidence based on the utilisation approach. However, ESCOSA ultimately decided that given the uncertainties around appropriate estimates it was more appropriate to adopt a value consistent with other water pricing determinations in Australia. Reviewing a range of contemporaneous determinations of gamma by IPART, ESC, ICRC, QCA ERA and AER, ESCOSA found that these regulators had consistently adopted a gamma value of 0.50, or a range incorporating 0.50. On this basis, ESCOSA concluded that *"a value of 0.50 for imputation credits is currently the most appropriate value given a lack of consensus within the academic literature and the limitations of empirical estimates of gamma"*. The decision did not specify underlying values for the distribution and utilisation rates. ESCOSA (2012), *Advice on a regulatory rate of return for SA Water*, Final Advice, February, p. 49.

Entity	Methodology	Distribution Rate (F)	Utilisation Rate (θ)	Gamma
ICRC (2018)	AER precedent prior to AER (2018)	-	-	0.4
OTTER (2018)	AER precedent prior to AER (2018)	-	-	0.4
QCA (2018)	Utilisation approach • F – Financial accounts • θ – Equity ownership.	0.88	0.55	0.484
2020-21 TCS				
AER (2018)	Utilisation approach • F – Financial accounts • θ – Equity ownership	0.9	0.65	0.585
ACCC (2019)	Follows AER (2018)	0.9	0.65	0.585
ERA (2019)	Utilisation approach • F – Financial accounts • θ – Equity ownership	0.9	0.6	0.5
ESCOSA (2020)	Regulatory precedent[258]	-	-	0.5
IPART (2018)	Utilisation approach • F – ATO statistics • θ – Implied market value	0.7	0.35	0.25
ICRC (2018)	AER precedent prior to AER (2018)	-	-	0.4
OTTER (2018)	AER precedent prior to AER (2018)	-	-	0.4
QCA (2020)	Utilisation approach • F – Financial accounts • θ – Equity ownership.	0.88	0.55	0.484

Note. The Industry Panel's 2015 Substituted Price Direction is not included in this table as a value for gamma does not appear to have been specified as part of that decision.

5.3. Assessment

We consider that the Port's overall approach to estimating gamma is not well accepted. Parts of the Port's approach are well accepted in terms of methodology and implementation:

- The utilisation approach based on an equity ownership methodology for calculating theta is consistent with well accepted approaches.
- However, a utilisation approach that estimates theta using implied market value studies is not well accepted. While some Australian regulators have considered this evidence as a cross-check, only IPART places substantial weight on this methodology. Accordingly, the Port's reliance on market valuation estimates in the 2017-18, 2018-19 and 2019-20 TCS is not well accepted.
- The zero gamma approach is not well accepted by financial practitioners or academics for the purpose of calculating a revenue requirement for a benchmark efficient entity.
- Combining a utilisation approach estimate with a zero gamma estimate is not well accepted by regulators or financial practitioners. While regulators have considered financial practitioners' views, no regulator has placed weight on these views in estimating a gamma to set revenues/ prices.

[258] In its 2020 decision for SA Water, ESCOSA accepted SA Water's proposal to use a value of 0.50 for gamma. See ESCOSA (2020), p. 179. We have not identified more detailed analysis by either SA Water or ESCOSA, and therefore assume the value is maintained from ESCOSA's 2015 determination, based on their 2012 review of regulatory precedent on gamma.

Overall, we consider that the Port's equity-ownership based gamma estimates are consistent with a well accepted approach and fall within the bounds of the precedent noted above. These are reproduced in the table below. We have reflected these values in our estimation of the MRP in Section 3.3.

Table 5.5: The Port's equity ownership estimates of gamma

	2017-18 TCS	2018-19 TCS	2019-20 TCS	2020-21 TCS
Gamma (equity ownership)	0.45	0.45	0.50	0.50
Distribution rate	0.7	0.7	0.7	0.8
Utilisation rate (implied)	0.643	0.643	0.714	0.625

Note. In the 2017-18 TCS, the Port assumed the same gamma value for the 2016-17 and 2017-18 years. The utilisation rate (theta) is derived from the assumed gamma value and the distribution rate stated by the Port.

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Appendix B RELATIVE RISK ASSESSMENT

We have undertaken a relative risk assessment to explore if there is compelling evidence that the systematic risk of our comparator sample differs from the Port. Both Synergies and Incenta have undertaken something similar, which they refer to as first principles analysis. A relative risk assessment is a mainly qualitative analysis applied to determine whether the comparator sample, and by extension the estimated range for the asset beta, offers a reasonable approximation of the systematic risk faced by the Port.

We have undertaken the relative risk assessment with reference to **Sample B**. Section 3.4.4 discusses the difference between the samples. The assessment is structured around the following factors:

- Regulatory framework.
- Demand risk – this covers the nature of the product, customer mix, pricing structure, market power, and contract length.
- Growth opportunities.
- Operating leverage.

The aim of the relative risk assessment is to assess whether the Port should be considered different from the average of the sample. This assessment is relative, if a factor is on average present among comparators we consider the comparator sample to be representative of the Port on that factor. This assessment will never be completely precise as it is impossible to successfully define and assess all the factors underlying beta. The table below provides a summary of our assessment.

Table B.1: Comparison between the Port's systematic risk and the systematic risk of the comparator sample

Factor	Port of Melbourne	Comparators	Comparator's systematic risk relative to the Port's
Regulatory framework	• Revenue cap regulation but effectively price capped in the medium term through the operation of the TAL.	• Varied regulatory frameworks. • Evidence of regulatory price controls for some comparators.	■
Demand risk	• Container volumes a key driver of revenues. • Some market power but a prospect of a second port in the medium term.	• Similar level of container volume risk. • Greater product diversification but direction of impact unclear. • Geographical diversification which may reduce beta. • Level of direct competition may be higher.	■
Growth opportunities	• Mature company. • Expanding port capacity through capital projects following increasing demand.	• Substantial acquisition activity by some comparators. • Product diversification may allow greater growth options.	▲
Operating leverage	• Landlord port with high operating leverage.	• Proxy measure indicates a similar level of operating leverage.	■

▼ = Lower ▲ = Higher ◀▶ = Different ■ = Similar

B.1. Regulatory framework

The Port is subject to economic regulation and a revenue cap is applied. Synergies highlights general practice of Australian regulators to assume regulation has a dampening effect on beta, this is because regulatory arrangements can increase revenue stability. The Port is also subject to a price cap through the operation of the tariff adjustment limit (TAL). The Port can only raise prices by the lower of the annual percentage change in CPI (the TAL) or the tariffs implied by the aggregate revenue requirement (the revenue cap). However, the regulatory framework allows deprecation to be delayed if revenues are constrained by the TAL. This means that building block costs can be deferred, partially protecting the value of investment in the port, but such a deferral may not be value neutral.

Synergies suggests that assessment that the operation of the TAL means the regulatory framework is unlikely to have the same dampening effect on beta as a pure revenue cap. We consider that the deferral of deprecation is likely to make the framework similar to other regulated companies.

In terms of beta the appropriate comparison is not to other regulated Australian infrastructure companies but to the Port's comparator set. The exact operation of the regulatory frameworks of comparators is complicated and hard to assess precisely. However, for both Hong Kong and Malaysian comparators (6 of 9 comparators) there is evidence prices cannot be set completely independently of regulatory authorities. In the past rates at ports in China have been subject to reductions by China's National Development and Reform Commission (NDRC). In November 2017, the NDRC ordered reductions of between 11% and 21% at several ports which included ports operated by two of our comparators.[259] Malaysian rates are also regulated and set by various port authorities.[260] We do not consider the regulatory framework to be a significant distinguishing factor for the Port.

B.2. Demand risk

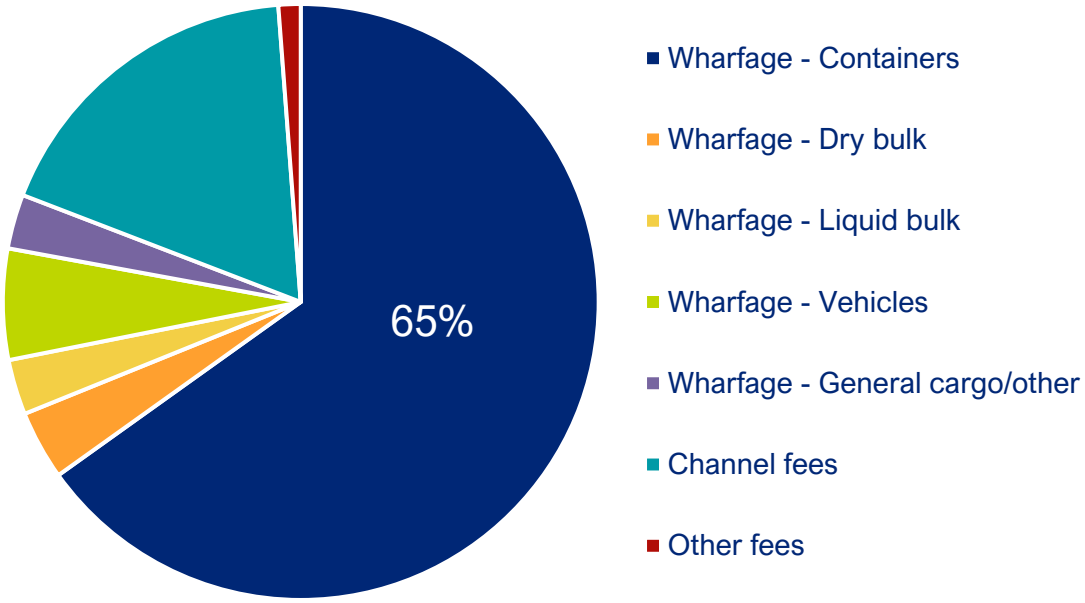
Companies offering products and services with higher income elasticity of demand are expected to have higher asset betas. This is because demand will be more sensitive to fluctuations in economic conditions. Several factors feed into this which include the nature of the product or service being sold, the mix of customers, pricing structure, the extent of market power and length of contracts.

Our starting point is the nature of the products and services being provided by the ports in the comparator set compared to the Port of Melbourne. If they are similar this provides some evidence that asset betas would be similar. While the Port earns revenue from several sources the prescribed services segment being considered here is narrower. The figure below shows the breakdown of the Port's prescribed services revenues for 2019. The vast majority comes from wharfage fees specifically for containers with a smaller amount for channel access. A key driver of revenue for the Port is container volumes.

[259] Moodys (2017), Moodys: Announced cut in container handling tariff is credit negative for Shanghai International Port.

[260] Port Klang Authority source.

Figure B.1: The Port's revenue from prescribed services (2019)



Source: PoM's 2020-21 regulatory model

All 9 of our comparators, like the Port, have substantial container operations. We were able to use financial accounts to ascertain the approximate proportion of revenue from container operations for 7 of our 9 comparators. The remaining two have substantial container operations but we were unable to determine their exact size. Segmental financial accounts are not prepared on the same basis as the Port's regulatory model and the comparison is not exact. Nonetheless, we consider this sufficient evidence to conclude the comparator set is comparable to the Port on this measure.

Table B.2: Approximate proportion of container operations of comparators

Comparator	Percentage of revenue from container operations
COSCO Shipping Ports Ltd	Segmental accounts state 100% from terminals and related businesses. No breakdown for containers provided.
China Merchants Port Holdings Co Ltd	Segmental accounts state 93% from port operations. No breakdown for containers provided.
MMC Corporation Bhd	65% from ports and logistics (assumed to be almost entirely from containers)
Piraeus Port Authority SA	61%
Hamburger Hafen und Logistik AG	58%
Dalian Port PDA Co Ltd	40%
Westports Holdings Bhd	86%
Qingdao Port International Co Ltd	19%
Port of Tauranga Ltd	60%
Average	56% of revenue from container operations

Source: Financial accounts.

Synergies and Incenta highlight several further issues which may impact systematic demand risk. While their discussion is with reference to their comparator set these issues are also present in our comparator set:

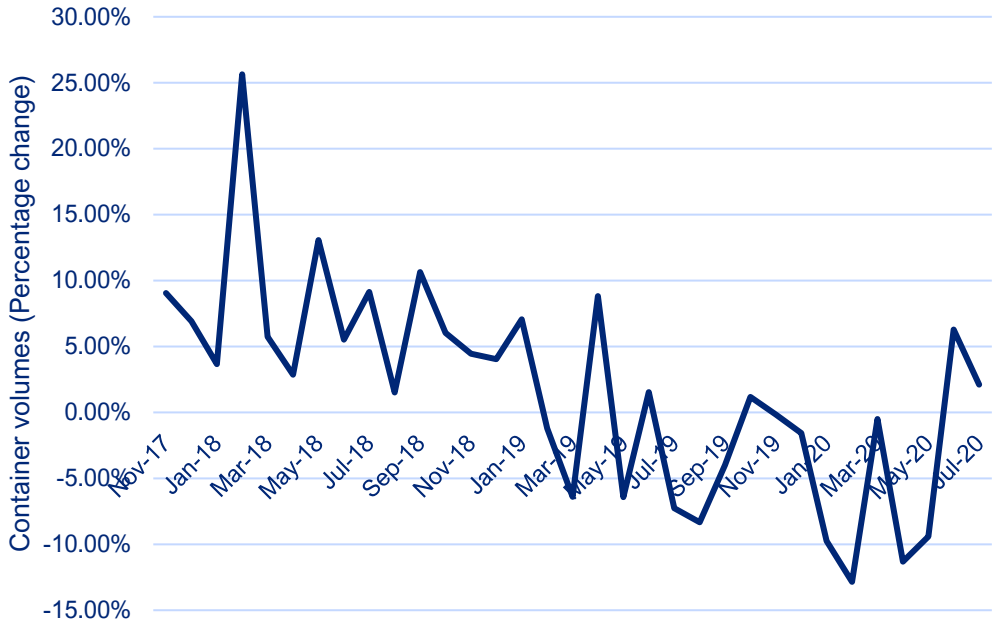
- Some comparators have diversified operations including providing other port related services such as logistics or receiving rental income while others provide services outside the ports sector. For example,

Qingdao Port made 11% of its revenue from financial services in 2019.[261] Diversified operations will have variable impacts on beta depending on the sector.

- Some comparators have geographically diverse operations, both China Merchants Port Holdings and COSCO Shipping Ports have substantial operations outside their home markets. Geographically diverse operations should reduce the beta estimate as it is estimated with reference to the home market (local/domestic CAPM).
- Synergies highlights the prospect of a second port in Melbourne may reduce the Port's market power. Assessing the relative market power of the Port compared to comparators is difficult. None the less, there is evidence some comparators face more direct competition than the Port. For example, Piraeus Port Authority, MMC Corporation and Westports Holdings all face intraport competition. This occurs where there is more than one container operator within the same port area.

The Port states they are highly exposed to movements in the Australian economy, especially when compared to other Australian regulated infrastructure such as water and energy networks.[262] They highlight a significant reduction in trade volumes and revenue since the onset of the COVID-19 crisis. The figure below shows the percentage change in the Port's container volumes from the same month the year prior. We observe reduced container volumes in the January to May period. However, container volumes in June 2020 and July 2020 were higher than in June 2019 and July 2019.

Figure B.2: The Port's monthly container volumes (percentage change year prior)



Source: PoM monthly trade reports

Containers are not an identical product and different types of containers may contribute to different levels of systematic risk. For example, Incenta argues that Port of Tauranga has a lower asset beta because it is more focused on exports and rejected Westports Holdings as a comparator as it is mainly a transhipment port. This may mean the Port is more or less exposed to systematic demand risk than comparators.

To assess this relationship, we collected annual data on container volumes for our comparators and the Port and data on real GDP for the markets' comparators were listed in and Australia for the Port. We aimed to collect data for

[261] To add Qingdao accounts here.

[262] PoM (2020), *Tariff Compliance Statement*, General Statement.

the last ten years (2009 to 2019) as this is the same period over which we estimate beta. However, due to data availability issues we were unable to collect ten years of data for all our comparators. We estimated two regressions and found that:

- On average a 1% increase in real GDP leads to a 1.09% increase in container volumes for our comparators with a 95% confidence interval of 0.90% to 1.29%.[263]
- On average a 1% increase in real GDP leads to a 1.05% increase in container volumes for the Port with a 95% confidence interval of 0.76% to 1.33%.

The results above suggest that there is no difference in the relationship between changes in real GDP and changes in container volumes between the Port and our comparators. We also ran a pooled regression with a dummy variable for the Port and find this to be insignificant. On this limited evidence the Port's exposure to systematic container volume risk is no different than comparators.

B.3. GROWTH OPPORTUNITIES

Growth opportunities (or 'options') refer to the real options that companies have to increase their revenue streams from providing alternative or additional products. If there is a positive economic shock the value of companies with material growth options should increase more strongly than those without with investors placing value on these growth options. Such companies can therefore be expected to have a higher asset beta.

We find some evidence companies in the comparator set have greater growth opportunities than the Port. However, the impact on beta is hard to assess. The evidence includes:

- Some comparators have undertaken acquisition activity in the last ten years, sometimes substantial. For example, COSCO Shipping Ports expanded through acquisitions the number of berths it operated from 106 in 2009 to 199 in 2019. [264] Other examples include Hamburger Hafen und Logistik acquiring an Estonian terminal operator in 2018.[265]
- As discussed in the demand risk sub-section above, some comparators have diversified operations offering products which are not strictly port operations. This suggests these firms have the opportunity to take advantage of such options if they arise. We understand the prescribed services part of the Port would not be able to do this.

B.4. OPERATING LEVERAGE

Operating leverage presents the ratio of fixed costs to variable costs. The higher proportion of fixed costs, the higher the operating leverage. A company with higher proportion of variable costs will be more able to change these costs as economic conditions change than a company with higher operating leverage. As a result, volatility in profits, and by extension asset beta, would be relatively lower.

Consistent reporting of costs as fixed or variable is generally not available. As a result, assessments of operating leverage typically rely on proxy measures. One such proxy measure employed by Incenta is to consider the extent to which operating income changes in response to changes in sales. We followed the same approach as Incenta to estimate operating leverage using this proxy measure for annual periods 2009 to 2019 for our comparators. Our estimate using this measure of operating leverage was 0.95 (this is compared to 0.96 for Incenta's comparators).

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[263] The relationship we estimate for our comparators seems to be about average for the period. For example, Hamburger Hafen und Logistik report an estimate for the GDP multiplier for global container volumes to be 1.2 between 2012 and 2018, see: https://hhla.de/fileadmin/download/investoren/praesentationen/HHLA_Investor-presentation-2020-04.pdf

[264] COSCO Pacific Limited – Annual Report 2010 and COSCO Annual Report 2019.

[265] Offshore Energy (2018), HHLA Acquires Estonia's Biggest Terminal Operator.

We were unable to estimate a value for the Port but Incenta finds a value of 0.88 and concludes that 0.96 is sufficiently close. We also conclude that the operating leverage of our comparator sample is sufficiently close to the Port's operating leverage.

Figure 5.1: Estimation of proxy operating leverage measure

$$Degree\ of\ Operating\ Leverage = \frac{\%\Delta EBITDA}{\%\Delta Revenues}$$

$$\ln EBITDA = \gamma + \beta \ln Revenues + \mu$$

Appendix C COMPARATOR SELECTION

The table below provides a comparison for our comparator samples A and B with Synergies' and Incenta's comparator samples with a brief explanation for the difference.

Company	Synergies (port sample)	Incenta	CEPA Sample A	CEPA Sample B	Explanation for difference
Qube Holdings	✓		✓		Incenta removes as main activities are "*stevedoring, logistics and intermodal*."
Port of Tauranga	✓	✓	✓	✓	
Hamburger Hafen und Logistik	✓		✓	✓	Incenta removes as "*logistics*"
China Merchants Port Holding Company	✓	✓	✓	✓	
COSCO Shipping Ports	✓	✓	✓	✓	
Dalian Port	✓	✓	✓	✓	
Hutchison Port Holdings Trust	✓	✓			CEPA liquidity filter (bid-ask) fail.
Adani Ports		✓			CEPA/Synergies country filter fail.
Gujarat Pipavav Port		✓			CEPA/Synergies country filter fail.
Rizhao Port Co Ltd		✓			CEPA/Synergies country filter fail.
Luka Koper		✓			CEPA/Synergies country filter fail.
Tianjin Port Development Holdings		✓			Synergies "Sale of materials accounts for majority of revenue. CEPA liquidity filter (bid-ask) fail.

Company	Synergies (port sample)	Incenta	CEPA Sample A	CEPA Sample B	Explanation for difference
Xiamen International Port		✓			Synergies "trading business of merchandise accounted for 61.5% of revenue in FY2016" CEPA liquidity filter (bid-ask) fail.
Yingkou Port Liability Co Ltd		✓			CEPA/Synergies country filter fail.
Societe d'Expoitation des Ports		✓			CEPA/Synergies country filter fail.
Jiangsu Lianyungang Port Co Ltd		✓			CEPA/Synergies country filter fail.
Shanghai International Port Group Co Ltd		✓			CEPA/Synergies country filter fail.
Ningbo Zhoushan Port Co Ltd		✓			CEPA/Synergies country filter fail.
Qingdao Port International Co Ltd		✓	✓	✓	Synergies finds "missing observations".
Beibuwan Port Co Ltd		✓			CEPA/Synergies country filter fail.
Qinhuangdao Port			✓		Synergies finds "some observations missing" Incenta "almost no container trade"
Toyo Wharf & Warehouse Co			✓		Synergies "Port and harbour operations only 23% of revenue" Incenta does not assess this company.
MMC Corp Bhd			✓	✓	Synergies does not assess this company. This company would fail Synergies country filter. Incenta free float filter fail.

Company	Synergies (port sample)	Incenta	CEPA Sample A	CEPA Sample B	Explanation for difference
Namyong Terminal PLC			✓		Synergies country filter fail. Incenta does not assess this company. Namyong Terminal PCL is a roll on roll off terminal operator. It has no container trade.
Piraeus Port Authority			✓	✓	Synergies country filter fail. Incenta recent "*privatisation*"
Westports Holdings Bhd			✓	✓	Synergies finds insufficient observations. Incenta "mainly transhipment port"
Westshore Terminals			✓		Synergies "single commodity" Incenta "coal terminal no containers".

Appendix D ASSET BETA ESTIMATES

The table below sets out our asset beta estimates for the companies contained in the samples shown in Section 3.4. Where a blank appears in the tables below there was an insufficient time period for an estimate.

D.1. CEPA SAMPLE A, 5-YEAR

Company Name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
COSCO SHIPPING Ports Ltd	0.51	0.53	0.49	0.44	0.46	0.50	0.51	0.52	0.60	0.66	0.65	0.75	0.86	0.81	0.94
MMC Corp Bhd	0.61	0.61	0.68	0.49	0.52	0.64	0.46	0.49	0.66	0.44	0.44	0.51	0.45	0.44	0.46
Qinhuangdao Port Co Ltd	0.49	0.48	0.40	0.46	0.47	0.38									
Port of Tauranga Ltd	0.57	0.62	0.56	0.43	0.42	0.44	0.51	0.47	0.45	0.53	0.51	0.55	0.52	0.46	0.47
Toyo Wharf & Warehouse Co Ltd	0.54	0.52	0.48	0.57	0.56	0.51	0.68	0.67	0.77	0.63	0.64	0.67	0.57	0.59	0.58
Piraeus Port Authority SA	0.58	0.52	0.48	0.69	0.63	0.74	0.66	0.62	0.59	0.61	0.58	0.64	0.59	0.56	0.65
Hamburger Hafen und Logistik AG	0.80	0.76	0.83	0.67	0.61	0.55	0.58	0.54	0.57	0.56	0.55	0.65	0.59	0.60	0.61
Westports Holdings Bhd	0.34	0.49	0.24	0.44	0.52	0.04									
Namyong Terminal PCL	0.94	0.87	1.01	0.69	0.52	0.39									
China Merchants Port Holdings Co Ltd	0.77	0.80	0.81	0.75	0.82	0.85	0.82	0.86	0.84	0.85	0.87	0.84	0.87	0.90	0.86
Liaoning Port Co Ltd	0.71	0.73	0.84	0.83	0.87	0.87	0.75	0.83	0.90	0.72	0.81	0.83	0.70	0.82	0.83
Qube Holdings Ltd	1.05	0.99	1.11	0.97	0.90	1.22	0.90	0.87	1.21	0.81	0.81	1.04	0.76	0.77	0.96

Company Name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
Westshore Terminals Investment Corp	0.74	0.65	0.92	1.38	1.23	1.61	1.31	1.16	1.79	1.28	1.08	1.50	1.04	0.90	1.30
Qingdao Port International Co Ltd	1.02	1.04	1.70												
Average (Sample A, 5-year)	**0.69**	**0.69**	**0.75**	**0.68**	**0.66**	**0.67**	**0.72**	**0.70**	**0.84**	**0.71**	**0.69**	**0.80**	**0.70**	**0.69**	**0.76**

D.2. CEPA SAMPLE A, 10-YEAR

Company name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
COSCO SHIPPING Ports Ltd	0.76	0.74	0.78	0.84	0.84	0.81	1.03	1.07	0.95	1.02	1.08	0.93	1.03	1.09	0.94
MMC Corp Bhd	0.51	0.51	0.48	0.45	0.48	0.48	0.43	0.46	0.44	0.46	0.48	0.46	0.51	0.53	0.55
Qinhuangdao Port Co Ltd															
Port of Tauranga Ltd	0.56	0.58	0.57	0.49	0.47	0.52	0.46	0.48	0.46	0.45	0.50	0.48	0.44	0.51	0.50
Toyo Wharf & Warehouse Co Ltd	0.54	0.54	0.51	0.50	0.51	0.45	0.46	0.47	0.39	0.45	0.46	0.38	0.44	0.46	0.38
Piraeus Port Authority SA	0.57	0.53	0.59	0.58	0.56	0.57	0.61	0.58	0.59	0.64	0.61	0.62	0.66	0.63	0.62
Hamburger Hafen und Logistik AG	0.72	0.72	0.80	0.67	0.70	0.86	0.79	0.79	0.94						
Westports Holdings Bhd															
Namyong Terminal PCL															

Company name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
China Merchants Port Holdings Co Ltd	0.84	0.86	0.83	0.90	0.92	0.83	1.03	1.03	0.89	1.08	1.08	0.93	1.12	1.12	0.96
Liaoning Port Co Ltd	0.66	0.73	0.74	0.67	0.73	0.69	0.88	0.86	0.81	0.86	0.84	0.81			
Qube Holdings Ltd	0.81	0.83	1.02	0.79	0.75	0.90	0.74	0.69	1.04	0.75	0.71	1.03			
Westshore Terminals Investment Corp	0.75	0.68	0.90	1.07	0.96	1.14	1.10	0.99	1.24	1.11	1.00	1.19	1.11	0.99	1.23
Qingdao Port International Co Ltd															
Average (Sample A, 10-year)	**0.67**	**0.67**	**0.72**	**0.70**	**0.69**	**0.72**	**0.75**	**0.74**	**0.77**	**0.76**	**0.75**	**0.76**	**0.76**	**0.76**	**0.74**

D.3. CEPA SAMPLE B, 5-YEAR

Company name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
COSCO SHIPPING Ports Ltd	0.51	0.53	0.49	0.44	0.46	0.50	0.51	0.52	0.60	0.66	0.65	0.75	0.86	0.81	0.94
China Merchants Port Holdings Co Ltd	0.77	0.80	0.81	0.75	0.82	0.85	0.82	0.86	0.84	0.85	0.87	0.84	0.87	0.90	0.86
MMC Corp Bhd	0.61	0.61	0.68	0.49	0.52	0.64	0.46	0.49	0.66	0.44	0.44	0.51	0.45	0.44	0.46
Piraeus Port Authority SA	0.58	0.52	0.48	0.69	0.63	0.74	0.66	0.62	0.59	0.61	0.58	0.64	0.59	0.56	0.65
Hamburger Hafen und Logistik AG	0.80	0.76	0.83	0.67	0.61	0.55	0.58	0.54	0.57	0.56	0.55	0.65	0.59	0.60	0.61
Liaoning Port Co Ltd	0.71	0.73	0.84	0.83	0.87	0.87	0.75	0.83	0.90	0.72	0.81	0.83	0.70	0.82	0.83
Westports Holdings Bhd	0.34	0.49	0.24	0.44	0.52	0.04									
Qingdao Port International Co Ltd	1.02	1.04	1.70												

Company name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
Port of Tauranga Ltd	0.57	0.62	0.56	0.43	0.42	0.44	0.51	0.47	0.45	0.53	0.51	0.55	0.52	0.46	0.47
Average (Sample B, 5-year)	**0.66**	**0.68**	**0.74**	**0.59**	**0.61**	**0.58**	**0.61**	**0.62**	**0.66**	**0.62**	**0.63**	**0.68**	**0.65**	**0.66**	**0.69**

D.4. CEPA SAMPLE B, 10-YEAR

Company name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
COSCO SHIPPING Ports Ltd	0.76	0.74	0.78	0.84	0.84	0.81	1.03	1.07	0.95	1.02	1.08	0.93	1.03	1.09	0.94
China Merchants Port Holdings Co Ltd	0.84	0.86	0.83	0.90	0.92	0.83	1.03	1.03	0.89	1.08	1.08	0.93	1.12	1.12	0.96
MMC Corp Bhd	0.51	0.51	0.48	0.45	0.48	0.48	0.43	0.46	0.44	0.46	0.48	0.46	0.51	0.53	0.55
Piraeus Port Authority SA	0.57	0.53	0.59	0.58	0.56	0.57	0.61	0.58	0.59	0.64	0.61	0.62	0.66	0.63	0.62
Hamburger Hafen und Logistik AG	0.72	0.72	0.80	0.67	0.70	0.86	0.79	0.79	0.94						
Liaoning Port Co Ltd	0.66	0.73	0.74	0.67	0.73	0.69	0.88	0.86	0.81	0.86	0.84	0.81			
Westports Holdings Bhd															
Qingdao Port International Co Ltd															
Port of Tauranga Ltd	0.56	0.58	0.57	0.49	0.47	0.52	0.46	0.48	0.46	0.45	0.50	0.48	0.44	0.51	0.50
Average (Sample B, 10-year)	0.66	0.67	0.68	0.66	0.67	0.68	0.74	0.75	0.72	0.75	0.77	0.70	0.75	0.78	0.71

D.5. CEPA Sample C, 5-year

Company name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
Logistec Corp	-0.21	0.68	0.81	0.59	0.64	0.49	0.46	0.40	0.34	0.48	0.55	0.35	0.84	0.70	0.48
Eurokai GmbH & Co KGaA	0.62	0.58	0.71	0.32	0.37	0.51	0.25	0.31	0.50	0.16	0.24	0.35	0.35	0.42	0.69
Bremer Lagerhaus-Gesellschaft AG	0.19	0.20	0.00	0.07	0.08	0.02	0.15	0.10	0.05	0.12	0.05	0.09	0.08	0.03	0.23
China Container Terminal Corp	0.25	0.25	0.31	0.30	0.34	0.35	0.38	0.43	0.60	0.57	0.62	1.02	0.75	0.85	1.18
Bintulu Port Holdings Bhd	0.14	0.44	0.41	0.10	0.06	0.14	-0.14	0.01	0.03	-0.07	0.05	0.06	0.04	0.03	0.04
COSCO SHIPPING Ports Ltd	0.51	0.53	0.49	0.44	0.46	0.50	0.51	0.52	0.60	0.66	0.65	0.75	0.86	0.81	0.94
China Merchants Port Holdings Co Ltd	0.77	0.80	0.81	0.75	0.82	0.85	0.82	0.86	0.84	0.85	0.87	0.84	0.87	0.90	0.86
MMC Corp Bhd	0.61	0.61	0.68	0.49	0.52	0.64	0.46	0.49	0.66	0.44	0.44	0.51	0.45	0.44	0.46
Marsden Maritime Holdings Ltd	0.04	0.31	0.63	0.14	0.18	0.36	0.34	0.33	0.43	0.15	0.26	0.43	0.21	0.35	0.51
South Port New Zealand Ltd	0.22	0.18	0.41	0.05	0.00	0.08	-0.02	-0.08	0.27	0.35	-0.05	0.29	0.44	-0.06	0.00
Taiwan Allied Container Terminal Corp	-0.07	0.04	0.12	-0.01	0.07	0.15	0.15	0.21	0.13	0.20	0.23	0.23	0.27	0.18	0.13
Toyo Wharf & Warehouse Co Ltd	0.54	0.52	0.48	0.57	0.56	0.51	0.68	0.67	0.77	0.63	0.64	0.67	0.57	0.59	0.58
Thessaloniki Port Authority SA	0.55	0.50	0.54	0.60	0.49	0.77	0.50	0.46	0.64	0.50	0.48	0.67	0.55	0.55	0.68
Piraeus Port Authority SA	0.58	0.52	0.48	0.69	0.63	0.74	0.66	0.62	0.59	0.61	0.58	0.64	0.59	0.56	0.65

Company name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
Xiamen International Port Co Ltd	0.53	0.57	0.78	0.66	0.75	0.93	0.90	0.97	1.23	1.07	1.17	1.40	1.06	1.18	1.36
Tianjin Port Development Holdings Ltd	0.56	0.60	0.80	0.56	0.59	0.72	0.55	0.59	0.71	0.60	0.64	0.74	0.69	0.70	0.82
Qube Holdings Ltd	1.05	0.99	1.11	0.97	0.90	1.22	0.90	0.87	1.21	0.81	0.81	1.04	0.76	0.77	0.96
Hamburger Hafen und Logistik AG	0.80	0.76	0.83	0.67	0.61	0.55	0.58	0.54	0.57	0.56	0.55	0.65			
Global Ports Investments PLC	0.29	0.28	0.53	0.35	0.27	0.52	0.41	0.31	0.57	0.52	0.39	0.78			
Mercantile Ports and Logistics Ltd	0.33	0.21	0.81	0.65	0.28	0.96	2.16	1.03	3.97						
Hutchison Port Holdings Trust	0.36	0.34	0.35												
Liaoning Port Co Ltd	0.71	0.73	0.84	0.83	0.87	0.87	0.75	0.83	0.90	0.72	0.81	0.83	0.70	0.82	0.83
Westshore Terminals Investment Corp	0.74	0.65	0.92	1.38	1.23	1.61	1.31	1.16	1.79	1.28	1.08		1.04	0.90	
Westports Holdings Bhd	0.34	0.49	0.24	0.44	0.52	0.04									
Begistics PCL	1.53	1.61	2.41	1.60	1.58	2.50	1.91	1.72	2.29	1.65	1.41	1.53	1.12	1.04	1.20
Qinhuangdao Port Co Ltd	0.49	0.48	0.40	0.46	0.47	0.38									
Qingdao Port International Co Ltd	1.02	1.04	1.70												
Namyong Terminal PCL	0.94	0.87	1.01	0.69	0.52	0.39									
Port of Tauranga Ltd	0.57	0.62	0.56	0.43	0.42	0.44	0.51	0.47	0.45	0.53	0.51	0.55	0.52	0.46	0.47
Average (Sample C, 5-year)	**0.57**	**0.57**	**0.70**	**0.57**	**0.55**	**0.64**	**0.70**	**0.60**	**0.84**	**0.61**	**0.59**	**0.65**	**0.61**	**0.61**	**0.65**

D.6. CEPA SAMPLE C, 10-YEAR

Company name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
Logistec Corp	0.62	0.79	0.66	0.65	0.74	0.42	0.62	0.60	0.41	0.62	0.62	0.34	0.94	0.72	0.39
Eurokai GmbH & Co KGaA	0.52	0.53	0.79	0.32	0.42	0.57	0.40	0.46	0.70	0.46	0.50	0.74	0.49	0.52	0.71
Bremer Lagerhaus-Gesellschaft AG	0.15	0.15	0.18	0.12	0.09	0.08	0.14	0.13	0.12	0.13	0.11	0.12	0.10	0.09	0.14
China Container Terminal Corp	0.46	0.49	0.67	0.59	0.64	0.70	0.65	0.71	0.68	0.70	0.73	0.73	0.81	0.84	0.85
Bintulu Port Holdings Bhd	0.19	0.27	0.28	0.28	0.18	0.16	0.24	0.18	0.17	0.32	0.30	0.24	0.30	0.29	0.30
COSCO SHIPPING Ports Ltd	0.76	0.74	0.78	0.84	0.84	0.81	1.03	1.07	0.95	1.02	1.08	0.93	1.03	1.09	0.94
China Merchants Port Holdings Co Ltd	0.84	0.86	0.83	0.90	0.92	0.83	1.03	1.03	0.89	1.08	1.08	0.93	1.12	1.12	0.96
MMC Corp Bhd	0.51	0.51	0.48	0.45	0.48	0.48	0.43	0.46	0.44	0.46	0.48	0.46	0.51	0.53	0.55
Marsden Maritime Holdings Ltd	0.16	0.35	0.59	0.14	0.22	0.37	0.31	0.32	0.25	0.30	0.32	0.27	0.31	0.32	0.26
South Port New Zealand Ltd	0.30	0.18	0.37	0.27	0.20	0.28	0.01	0.18	0.30	0.30	0.39	0.37	0.29	0.45	0.31
Taiwan Allied Container Terminal Corp	0.29	0.24	0.17	0.35	0.32	0.18	0.41	0.39	0.29	0.38	0.37	0.28	0.40	0.39	0.35
Toyo Wharf & Warehouse Co Ltd	0.54	0.54	0.51	0.50	0.51	0.45	0.46	0.47	0.39	0.45	0.46	0.38	0.44	0.46	0.38
Thessaloniki Port Authority SA	0.60	0.59	0.69	0.61	0.62	0.77	0.69	0.69	0.85	0.74	0.73	0.85	0.77	0.77	0.88
Piraeus Port Authority SA	0.57	0.53	0.59	0.58	0.56	0.57	0.61	0.58	0.59	0.64	0.61	0.62	0.66	0.63	0.62

Company name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
Xiamen International Port Co Ltd	0.62	0.69	0.80	0.70	0.83	1.02	0.91	1.02	1.28	0.97	1.05	1.29	1.03	1.11	1.38
Tianjin Port Development Holdings Ltd	0.60	0.64	0.78	0.63	0.63	0.74	0.67	0.62	0.82	0.73	0.69	0.91			
Qube Holdings Ltd	0.81	0.83	1.02	0.79	0.75	0.90	0.74	0.69	1.04	0.75	0.71	1.03			
Hamburger Hafen und Logistik AG	0.72	0.72	0.80	0.67	0.70	0.86	0.79	0.79	0.94						
Global Ports Investments PLC															
Mercantile Ports and Logistics Ltd															
Hutchison Port Holdings Trust															
Liaoning Port Co Ltd	0.66	0.73	0.74	0.67	0.73	0.69	0.88	0.86	0.81	0.86	0.84	0.81			
Westshore Terminals Investment Corp	0.75	0.68	0.92	1.07	0.96	1.14	1.10	0.99	1.24	1.11	1.00	1.19	1.11	0.99	1.23
Westports Holdings Bhd															
Begistics PCL	1.26	1.16	1.49	0.98	0.88	0.99	0.75	0.72	0.70	0.68	0.67	0.70	0.64	0.65	0.69
Qinhuangdao Port Co Ltd															
Qingdao Port International Co Ltd															
Namyong Terminal PCL															
Port of Tauranga Ltd	0.56	0.58	0.57	0.49	0.47	0.52	0.46	0.48	0.46	0.45	0.50	0.48	0.44	0.51	0.50
Average (Sample C, 10-year)	**0.57**	**0.58**	**0.66**	**0.57**	**0.58**	**0.61**	**0.61**	**0.61**	**0.65**	**0.63**	**0.63**	**0.65**	**0.63**	**0.64**	**0.64**

D.7. CEPA SAMPLE D, 5- YEAR

Company name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
Logistec Corp	-0.21	0.68	0.81	0.59	0.64	0.49	0.46	0.40	0.34	0.48	0.55	0.35	0.84	0.70	0.48
Eurokai GmbH & Co KGaA	0.62	0.58	0.71	0.32	0.37	0.51	0.25	0.31	0.50	0.16	0.24	0.35	0.35	0.42	0.69
China Container Terminal Corp	0.25	0.25	0.31	0.30	0.34	0.35	0.38	0.43	0.60	0.57	0.62	1.02	0.75	0.85	1.18
COSCO SHIPPING Ports Ltd	0.51	0.53	0.49	0.44	0.46	0.50	0.51	0.52	0.60	0.66	0.65	0.75	0.86	0.81	0.94
China Merchants Port Holdings Co Ltd	0.77	0.80	0.81	0.75	0.82	0.85	0.82	0.86	0.84	0.85	0.87	0.84	0.87	0.90	0.86
MMC Corp Bhd	0.61	0.61	0.68	0.49	0.52	0.64	0.46	0.49	0.66	0.44	0.44	0.51	0.45	0.44	0.46
Taiwan Allied Container Terminal Corp	-0.07	0.04	0.12	-0.01	0.07	0.15	0.15	0.21	0.13	0.20	0.23	0.23	0.27	0.18	0.13
Thessaloniki Port Authority SA	0.55	0.50	0.54	0.60	0.49	0.77	0.50	0.46	0.64	0.50	0.48	0.67	0.55	0.55	0.68
Piraeus Port Authority SA	0.58	0.52	0.48	0.69	0.63	0.74	0.66	0.62	0.59	0.61	0.58	0.64	0.59	0.56	0.65
Xiamen International Port Co Ltd	0.53	0.57	0.78	0.66	0.75	0.93	0.90	0.97	1.23	1.07	1.17	1.40	1.06	1.18	1.36
Tianjin Port Development Holdings Ltd	0.56	0.60	0.80	0.56	0.59	0.72	0.55	0.59	0.71	0.60	0.64	0.74	0.69	0.70	0.82
Hamburger Hafen und Logistik AG	0.80	0.76	0.83	0.67	0.61	0.55	0.58	0.54	0.57	0.56	0.55	0.65	0.59	0.60	0.61
Global Ports Investments PLC	0.29	0.28	0.53	0.35	0.27	0.52	0.41	0.31	0.57	0.52	0.39	0.78			
Mercantile Ports and Logistics Ltd	0.33	0.21	0.81	0.65	0.28	0.96	2.16	1.03							

Company name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
Hutchison Port Holdings Trust	0.36	0.34	0.35												
Liaoning Port Co Ltd	0.71	0.73	0.84	0.83	0.87	0.87	0.75	0.83	0.90	0.72	0.81	0.83	0.70	0.82	0.83
Westports Holdings Bhd	0.34	0.49	0.24	0.44	0.52	0.04									
Begistics PCL	1.53	1.61	2.41	1.60	1.58	2.50	1.91	1.72	2.29	1.65	1.41	1.53	1.12	1.04	1.20
China Infrastructure & Logistics Group Ltd	0.36	0.60	1.27	0.30	0.53	1.09	0.10	0.36	0.75	-0.01	0.27	0.40	0.01	0.14	0.38
Qingdao Port International Co Ltd	1.02	1.04	1.70												
Port of Tauranga Ltd	0.57	0.62	0.56	0.43	0.42	0.44	0.51	0.47	0.45	0.53	0.51	0.55	0.52	0.46	0.47
Average (Sample D, 5-year)	**0.59**	**0.59**	**0.77**	**0.59**	**0.57**	**0.72**	**0.67**	**0.62**	**0.73**	**0.63**	**0.61**	**0.72**	**0.64**	**0.65**	**0.73**

D.8. CEPA Sample D, 10-year

Company name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
Logistec Corp	0.62	0.79	0.66	0.65	0.74	0.42	0.62	0.60	0.41	0.62	0.62	0.34	0.94	0.72	0.39
Eurokai GmbH & Co KGaA	0.52	0.53	0.79	0.32	0.42	0.57	0.40	0.46	0.70	0.46	0.50	0.74	0.49	0.52	0.71
China Container Terminal Corp	0.46	0.49	0.67	0.59	0.64	0.70	0.65	0.71	0.68	0.70	0.73	0.73	0.81	0.84	0.85
COSCO SHIPPING Ports Ltd	0.76	0.74	0.78	0.84	0.84	0.81	1.03	1.07	0.95	1.02	1.08	0.93	1.03	1.09	0.94
China Merchants Port Holdings Co Ltd	0.84	0.86	0.83	0.90	0.92	0.83	1.03	1.03	0.89	1.08	1.08	0.93	1.12	1.12	0.96
MMC Corp Bhd	0.51	0.51	0.48	0.45	0.48	0.48	0.43	0.46	0.44	0.46	0.48	0.46	0.51	0.53	0.55
Taiwan Allied Container Terminal Corp	0.29	0.24	0.17	0.35	0.32	0.18	0.41	0.39	0.29	0.38	0.37	0.28	0.40	0.39	0.35
Thessaloniki Port Authority SA	0.60	0.59	0.69	0.61	0.62	0.77	0.69	0.69	0.85	0.74	0.73	0.85	0.77	0.77	0.88
Piraeus Port Authority SA	0.57	0.53	0.59	0.58	0.56	0.57	0.61	0.58	0.59	0.64	0.61	0.62	0.66	0.63	0.62
Xiamen International Port Co Ltd	0.62	0.69	0.80	0.70	0.83	1.02	0.91	1.02	1.28	0.97	1.05	1.29	1.03	1.11	1.38
Tianjin Port Development Holdings Ltd	0.60	0.64	0.78	0.63	0.63	0.74	0.67	0.62	0.82	0.73	0.69	0.91			
Hamburger Hafen und Logistik AG	0.72	0.72	0.80	0.67	0.70	0.86	0.79	0.79	0.94						
Global Ports Investments PLC															
Mercantile Ports and Logistics Ltd															
Hutchison Port Holdings Trust															
Liaoning Port Co Ltd	0.66	0.73	0.74	0.67	0.73	0.69	0.88	0.86	0.81	0.86	0.84	0.81			

Company name	2020 Weekly	2020 Weekly AD	2020 Monthly	2019 Weekly	2019 Weekly AD	2019 Monthly	2018 Weekly	2018 Weekly AD	2018 Monthly	2017 Weekly	2017 Weekly AD	2017 Monthly	2016 Weekly	2016 Weekly AD	2016 Monthly
Westports Holdings Bhd															
Begistics PCL	1.26	1.16	1.49	0.98	0.88	0.99	0.75	0.72	0.70	0.68	0.67	0.70	0.64	0.65	0.69
China Infrastructure & Logistics Group Ltd	0.09	0.26	0.58	0.35	0.46	1.05	0.36	0.38	0.91	0.32	0.34	0.73	0.33	0.33	0.73
Qingdao Port International Co Ltd															
Port of Tauranga Ltd	0.56	0.58	0.57	0.49	0.47	0.52	0.46	0.48	0.46	0.45	0.50	0.48	0.44	0.51	0.50
Average (Sample D, 10-year)	**0.61**	**0.63**	**0.71**	**0.61**	**0.64**	**0.70**	**0.67**	**0.68**	**0.73**	**0.67**	**0.69**	**0.72**	**0.71**	**0.71**	**0.73**

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