Synergies
ECONOMIC CONSULTING

Determining a WACC estimate for Port of Melbourne

A report prepared in context of the Pricing Order for the 2021-22 Tariff Compliance Statement

May 2021

Synergies Economic Consulting Pty Ltd
www.synergies.com.au

Disclaimer

Synergies Economic Consulting (Synergies) has prepared this report exclusively for the use of the party or parties specified in the report (the client) for the purposes specified in the report (Purpose). The report must not be used by any person other than the client or a person authorised by the client or for any purpose other than the Purpose for which it was prepared.

The report is supplied in good faith and reflects the knowledge, expertise and experience of the consultants involved at the time of providing the report.

The matters dealt with in this report are limited to those requested by the client and those matters considered by Synergies to be relevant for the Purpose.

The information, data, opinions, evaluations, assessments and analysis referred to in, or relied upon in the preparation of, this report have been obtained from and are based on sources believed by us to be reliable and up to date, but no responsibility will be accepted for any error of fact or opinion.

To the extent permitted by law, the opinions, recommendations, assessments and conclusions contained in this report are expressed without any warranties of any kind, express or implied.

Synergies does not accept liability for any loss or damage including without limitation, compensatory, direct, indirect or consequential damages and claims of third parties, that may be caused directly or indirectly through the use of, reliance upon or interpretation of, the contents of the report.

Snapshot

The table below provides a short summary of the reasons for the difference between the weighted average cost of capital estimate Synergies has calculated for the 2021-22 Tariff Compliance Statement (TCS) compared to the estimate calculated for the 2020-21 TCS.

Chapter	Element	2020-21 TCS	2021-22 TCS
	WACC estimate	8.93%	8.23%
3.1	**Risk-free rate**	0.90% 20-day average of the 10-year Australian Government bond yield to 31 March 2020	1.70% No change to approach. Updated to reflect the 20-day period to 31 March 2021
3.4	**Market risk premium**	Point estimate of 7.57% MRP based on a 70% weighting to the Ibbotson MRP, a 15% weighting to the Wright MRP, and a 15% weighting to Dividend Discount Models (DDMs) used by IPART, the ERA and the QCA.	Point estimate of 6.54% MRP is now based on an 85% weighting to the Ibbotson MRP, and a 15% weighting to Dividend Discount Models (DDMs) used by IPART, the ERA and the QCA.
4	**Beta**	Point estimate of at least 0.70 from a range of at least 0.70 to at least 0.75 Comparator set consisting of 13 entities. We applied a US$200 million market capitalisation filter to the comparator set.	Point estimate of 0.70 No change to the comparator set.
5	**Capital Structure**	30% Reflected the midpoint (rounded to the nearest 5%) of the updated median gearing ratio for the 9 investment-grade listed benchmark efficient entities (20%) and the average acquisition gearing of Australian port privatisations (42%) and is consistent with the average gearing of our comparator set.	30% No change to approach. Reflects the midpoint (rounded to the nearest 5%) of the updated median gearing ratio for the 9 investment-grade listed benchmark efficient entities (19%) and the average acquisition gearing of Australian port privatisations (42%) and is consistent with the average gearing of our comparator set.
6	**Return on debt**	5.04% 70% weighting to the 2017-18 'on-the-day' cost of 5.45%, 10% weighting to the 2018-19 'on-the-day' cost of 4.58%, 10% weighting to the 2019-20 'on-the-day' cost of 4.21%, and 10% weighting to the 2020-21 'on-the-day' cost of 3.42%. Weightings will continue to be adjusted 10% each year towards a 10-year trailing average approach.	4.80% 60% weighting to the 2017-18 'on-the-day' cost of 5.45%, 10% weighting to the 2018-19 'on-the-day' cost of 4.58%, 10% weighting to the 2019-20 'on-the-day' cost of 4.21%, 10% weighting to the 2020-21 'on-the-day' cost of 3.42%, and 10% weighting to the 2021-22 'on-the-day' cost of 3.12%. Weightings will continue to be adjusted 10% each year towards a 10-year trailing average approach.
6.3	**Notional credit rating**	BBB	No change
6.5	**Debt raising costs**	0.10% PwC (2013), p.6	0.10% No change
6.6	**Debt risk premium**	4.04% Based on the trailing average return on debt of 5.04%, a risk-free rate of 0.90%, and debt raising costs of 0.10%	3.00% Based on the trailing average return on debt of 4.80%, a risk-free rate of 1.70%, and debt raising costs of 0.10%
7	**Gamma**	0.33 Two-thirds weighting to the equity ownership approach (0.50), and a one-	0.50 Full weighting to the equity ownership approach (0.50)

Chapter	Element	2020-21 TCS	2021-22 TCS
		third weighting to the financial practitioner approach (zero) Market valuation studies (0.25), such as those used by IPART, are used as a cross-check, along with gamma estimates from academic literature (zero).	Market valuation studies (0.25), such as those used by IPART, continue to be used as a cross-check, along with gamma estimates from financial practitioner approaches and academic literature (zero).
8	**SL CAPM**	10.60%	9.69% No change to SL CAPM methodology

Contents

Figures and Tables

Executive Summary

The purpose of this report is to provide an estimate of the return on capital for the Port of Melbourne (PoM) for its 2021-22 Tariff Compliance Statement (TCS) under the regulatory framework established by the *Port Management Act (Vic) 1995* and Pricing Order.

The Pricing Order confers important discretions on the Port Licence Holder in relation to the cost of capital. In forming our views on a compliant cost of capital, we have had the benefit of the ESC's Interim Commentary on past TCS submissions[1] and the publication of the ESC's Statement of Regulatory Approach.[2] This has led to significant refinements in our approach over time. We respond to this commentary throughout the report.

Whilst we maintain the interpretation of "well accepted" and the characterisation of the Benchmark Efficient Entity from previous submissions (particularly the report accompanying the 2020-21 TCS), in this TCS we note the following changes to approach from previous TCS submissions in that we:

- no longer incorporate the Wright approach for the assessment of the MRP;
- for the Ibbotson approach, average the NERA and Brailsford approaches for estimating the MRP, rather than placing sole reliance on the NERA approach;
- no longer incorporate the Black CAPM or Fama French approaches to inform the cost of equity;
- adopt a gamma value of 0.50 in line with the upper end of the ESC's indicated range.

In light of these changes it is anticipated that the assessment of PoM's WACC will be less contentious than in previous years. Accordingly, we have attempted to significantly reduce the length of this submission. In doing so, where we maintain a position expressed in a previous TCS, we constructively incorporate the material adduced to support that approach from our previous reports (particularly the report accompanying the 2020-21 TCS).

---

1 ESC (2020). Interim commentary – Port of Melbourne tariff compliance statement 2020-21, 16 December; ESC (2019). Interim commentary – Port of Melbourne tariff compliance statement 2019-20, together with an accompanying report prepared by Frontier Economics; ESC (2018). Interim commentary – Port of Melbourne tariff compliance statement 2018-19; ESC (2018), Interim commentary – Port of Melbourne tariff compliance statement 2017-18.

2 ESC (2020). Statement of Regulatory Approach – version 2.0, which revised the interpretation expressed in the earlier Statement of Regulatory Approach (ESC (2017), Statement of Regulatory Approach).

Total market return

Given the inherent volatility in the risk-free rate over time, it is informative to evaluate the expected value of the total market return (TMR) outcome, which is measured as the risk-free rate plus the market risk premium (MRP).

Consistent with previous WACC estimates for PoM, the risk-free rate continues to be based on a 20-day average of the 10-year Commonwealth Government bond yield. As at 31 March 2021, the resulting estimate is 1.70%.

The MRP is a function of the difference between the expected equity market return and the risk-free rate of return. It is an inherently forward-looking parameter, which is not observable and is difficult to estimate. In the 2020-21 interim commentary, the ESC identified the following concerns with our approach to the MRP:

- that the Wright approach is not well accepted;
- the data source used for the stock accumulation index (with the ESC recommending an average of the Brailsford, Handley, and Maheswaran (BHM) and NERA adjustments);
- whether our dividend discount models (DDMs) have been implemented in the same manner as the regulators that adopt them.

In the 2021-22 TCS submission, we have relied upon the following well accepted methodologies:

- the Ibbotson approach (using an average of BHM and NERA data); and
- DDMs (with the data for the IPART models now sourced from Refinitiv (Thomson Reuters) consistent with IPART's practice).

We provide evidence that all of these approaches are used by economic regulators in Australia and overseas. For the 2021-22 MRP estimate of 6.54%, we have placed 85% weighting on the Ibbotson MRP (6.48%), and 15% weighting on DDMs (6.90%). The resulting TMR (risk free rate plus market risk premium) is 8.24%.

Beta

In the 2020-21 interim commentary, the ESC identified the following concerns with our approach to the estimation of beta:

- we should revisit our use of developing or emerging economies to find relevant comparators;

- the ESC has preliminary concerns with successive changes in our approach to market capitalisation filtering;
- our estimation of beta having regard to monthly returns in conjunction with weekly returns may lead to an overstatement of beta.

An asset beta of 0.70 has been estimated based on a comparator set of 13 companies, consisting of 7 Marine Ports and Services firms and 6 Railroads (the same listed firms that informed our gearing assessment). Moreover, we do not include any firms from developing or emerging countries in our comparator set, and we demonstrate that our reliance on both weekly and monthly returns is underpinned by substantial regulatory and financial practitioner precedent.

Commentary from the ESC and Frontier Economics raised concerns about reliance on railroads for the BEE's comparator set, particularly in regard to the assertion that the Class I railroads are subject to greater competitive pressure than the BEE. However, in Attachment A, we present evidence of increasing haul lengths, increasing revenue margins, and dominant market shares for the largest Class I railroads in each state. All of these factors either contribute to, or are a result of, limited competitive pressures faced by Class I railroads.

Finally, the practice of applying quantitative filters to comparator set to address issues of data quality is common among regulators and financial practitioners, and can be achieved by applying a market capitalisation filter or through other forms of statistical filtering. Given the ESC's reservations about the use of statistical filtering (which we nevertheless continue to consider appropriate), we have adopted a market capitalisation filter of US$200 million, which has substantial precedent among regulators.

Given the gearing estimate of 30%, this asset beta range translates into an estimated equity beta 1.0.

Capital Structure

As discussed in Chapter 5, we have retained a gearing assumption of 30% for the BEE.

Cost of debt

As discussed in Chapter 6, the cost of debt continues to be based on a trailing average approach, which currently results in a cost of debt estimate of 4.80%.

Gamma

In the 2020-21 interim commentary, the ESC identified the following concerns with our approach to gamma:

- that it may not be logical to combine two approaches with different conceptions of the value of gamma (namely the equity ownership approach and the financial practitioner approach);
- that the financial practitioner approach is not well accepted.

As discussed in Chapter 7, our gamma estimate for 2021-22 is 0.50 based on the equity ownership approach used by various Australian regulators. The equity ownership approach estimate of 0.50 reflects recent regulatory decisions.

Synergies' WACC estimate

Our pre-tax nominal WACC point estimate for the BEE for PoM under the Pricing Order is 8.23%. This value is derived from well accepted approaches in accordance with the Pricing Order and the objectives of the Port Management Act.

Table 1 WACC estimate for PoM

Parameter	2017-18 TCS	2018-19 TCS	2019-20 TCS	2020-21 TCS	2021-22 TCS
Risk-free rate	2.81%	2.74%	1.96%	0.90%	1.70%
Capital structure	30%	30%	30%	30%	30%
Gamma	0.25	0.25	0.25	0.33	0.50
Corporate tax rate	30%	30%	30%	30%	30%
CAPM Parameters					
Ibbotson MRP	6.53%	6.56%	6.48%	6.42%	6.48%
Wright MRP	9.01%	8.86%	9.54%	10.74%	-
Dividend Discount Models (DDMs)	-	-	8.56%	9.75%	6.90%
Ibbotson MRP weighting	*50%*	*50%*	*50%*	70%	*85%*
Wright MRP weighting	*50%*	*50%*	*25%*	15%	*0%*
DDMs weighting	*0%*	*0%*	*25%*	15%	*15%*
Weighted MRP	7.77%	7.71%	7.77%	7.57%	6.54%
Asset beta	0.70	0.70	0.70	0.70	0.70
Equity beta	1.00	1.00	1.00	1.00	1.00
SL CAPM	13.66%	13.48%	12.55%	10.60%	9.69%
Debt beta	0.00	0.00	0.00	0.00	0.00
Debt risk premium	2.54%	2.53%	3.18%	4.04%	3.00%
Debt raising costs	0.10%	0.10%	0.10%	0.10%	0.10%
Return on debt (pre-tax)	5.45%	5.37%	5.24%	5.04%	4.80%
Pre-tax nominal WACC	**11.54%**	**11.52%**	**10.46%**	**8.93%**	**8.23%**

Benchmarking the WACC for the BEE

We have demonstrated that each WACC parameter has been estimated using well-accepted approaches, consistent with the first step of the ESC's compliance assessment test. The second step in the ESC's compliance test assesses whether the WACC is commensurate with the return required by a BEE with a similar degree of risk as that which applies to PoM in respect of providing Prescribed Services (as per clause 4.1.1(a) of the Pricing Order).

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

- those relating to the intrinsic characteristics of the entities and their commercial and regulatory environments; and

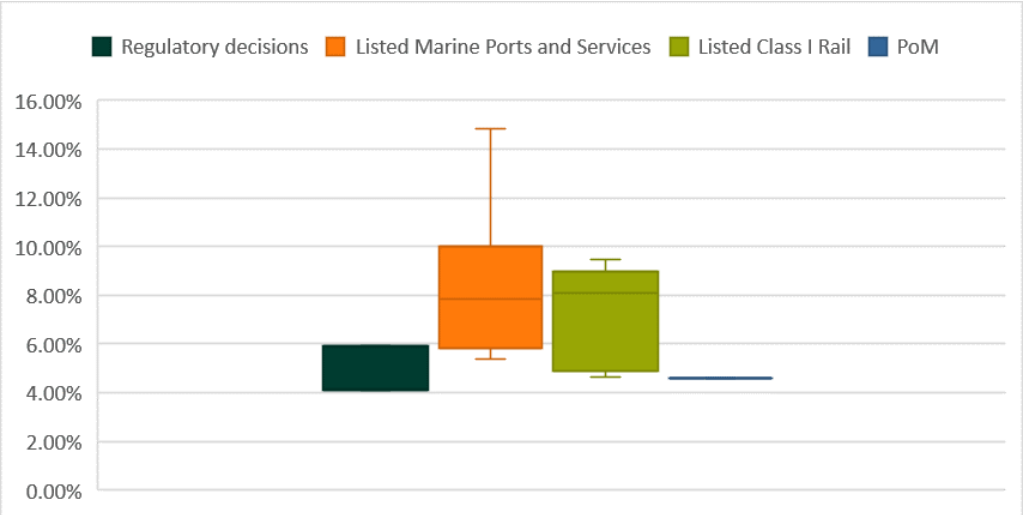
- those relating to the WACC assessment itself, arising from differences in methods for quantifying the cost of debt and the impact of tax across the comparator set.

We have benchmarked our WACC estimate for the BEE against WACCs generated for all of the listed firms in the beta comparator set, as well as against relevant regulatory comparators (namely the NSW Rail Access Undertaking, Arc Infrastructure, and Pilbara Railways). These listed and regulatory comparators face risks comparable to those borne by the BEE in its provision of Prescribed Services. In presenting benchmarked relevant WACC estimates, we believe the following are most relevant:

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

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

Post-tax unlevered cost of equity margins

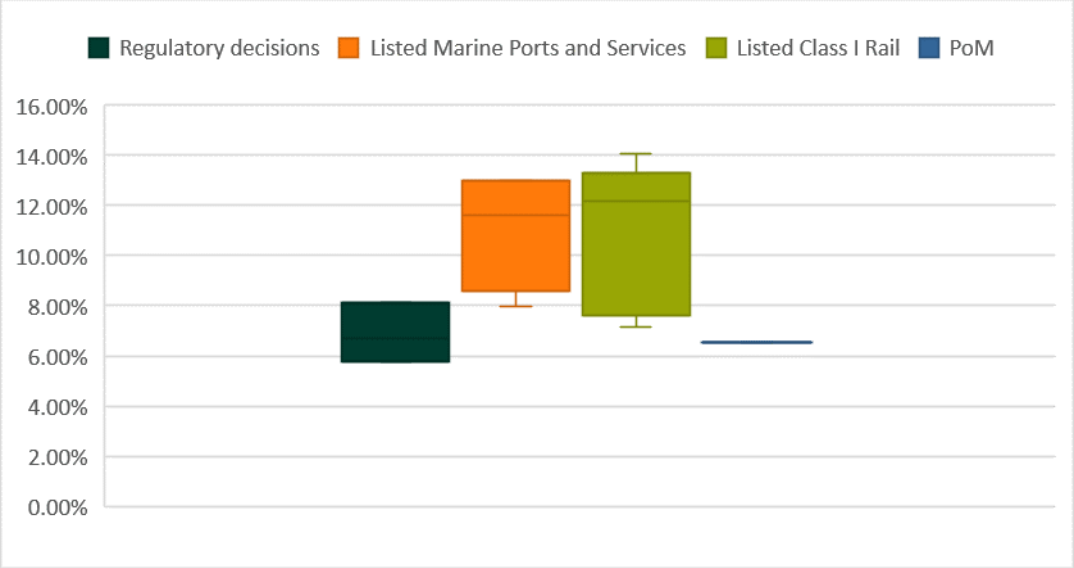


Data source: Synergies calculations, various regulatory decisions, Bloomberg

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

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

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



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

1 Introduction

This report estimates the return on capital for the Port of Melbourne (PoM) for its 2021-22 Tariff Compliance Statement (TCS) in respect of the Prescribed Services under the regulatory framework established by the *Port Management Act (Vic) 1995* and Pricing Order.

This report is structured as follows:

- Chapter 2 – interpretation and response to ESC commentary
- Chapter 3 – estimates the return on the market as a whole
- Chapter 4 – estimates beta for the BEE
- Chapter 5 – assumed capital structure
- Chapter 6 – estimates the return on debt
- Chapter 7 – estimates the value of gamma
- Chapter 8 – proposes a WACC estimate for the BEE
- Attachment A – contains a review of the market power possessed by US Class I railways
- Attachment B – presents beta diagnostics
- Attachment C – provides additional detail on the benchmarking analysis conducted in Chapter 8.

2 Interpretation and response to ESC commentary

Chapter overview
This chapter sets out our response to the ESC's commentary. In so doing, we acknowledge significant changes in the approach to estimating the WACC for the Port Licence Holder

2.1 Overview of the regulatory framework

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

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

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

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

2.2 One or a combination of well accepted approaches

The issue of what constitutes a well accepted approach has been contentious in previous TCS submissions. It is not our intention to reiterate the positions of the parties here, although for clarity, we adhere to the interpretation expressed in Appendix N to PoM's TCS submission last year on this matter.[3]

[3] Port of Melbourne (2020), 2020 - 2021 Tariff Compliance Statement, General Statement, May, Appendix N, Chapter 3

Our views have been influenced by the statutory objectives set out in the PMA and the Pricing Order, particularly around ensuring the efficient use of and investment in the provision of Prescribed Services. Efficient investment in the provision of Prescribed Services can only occur where the rate of return is sufficient to attract investment, having regard to alternative opportunities open to investors (noting that the long term interests of users will not be protected if timely investment is not undertaken at the Port).

In this respect we give particular regard to the workably competitive market within which infrastructure is financed, being global debt and equity markets. It is therefore essential that regard is not confined to Australian regulatory decisions on relevant parameters to inform the cost of capital. For example, if regulators in other jurisdictions allow systematically higher rates of return than Australian regulators, then by definition one cannot be satisfied that the PMA's objectives are satisfied in relation to promoting efficient investment in infrastructure if consideration is limited to the outcomes of Australian regulatory processes, irrespective of the compatibility of the underlying objectives of those regulatory regimes with the Pricing Order and the PMA.

Similarly, our interpretation of well accepted approaches is not limited to acceptance by economic regulators as particular approaches could be well accepted in relevant spheres outside of economic regulatory applications. The overarching matters that are relevant to assessing the well accepted-ness of an approach are those expressed in the objectives of the PMA. This in turn requires that appropriate weight should be placed on approaches such as those used by finance practitioners engaged in deriving a return on capital.[4]

2.3 Benchmark Efficient Entity

In compliance with the Pricing Order, we have identified a benchmark efficient entity (BEE) for PoM that provides 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.

The ESC has previously expressed its view that, for the purposes of defining the BEE, the Prescribed Services are provided by a port in Australia. However, in practice, there are very limited listed companies in Australia that have similar risks to this assumed BEE and no listed ports which could inform this assessment. Consequently, it has been necessary for us to follow a well accepted alternative for such situations used by economic regulators (as well as finance practitioners and academics) and form our sample of comparable Australian listed entities (none of which are ports) with

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

international listed entities with comparable risks. An element of judgement is required in this task.

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

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

2.4 Responding to ESC commentary

The Pricing Order confers important discretions on the Port Licence Holder in relation to the cost of capital. In forming our views on a compliant cost of capital, we have had the benefit of the ESC's Interim Commentary on past TCS submissions[5] and the publication of the ESC's Statements of Regulatory Approach.[6] This has led to significant refinements in our approach over time. We respond to this commentary throughout the report. In this TCS we note the following changes to approach from previous TCS submissions in that we:

- no longer incorporate the Wright approach for the assessment of the MRP;
- for the Ibbotson approach, average the NERA and Brailsford approaches for estimating the MRP, rather than placing sole reliance on the NERA approach;
- no longer incorporate the Black CAPM or Fama French approaches to inform the cost of equity;
- adopt a gamma value of 0.50 in line with the upper end of the ESC's indicated range.

In light of these changes it is anticipated that the assessment of PoM's WACC will be less contentious than in previous years. Accordingly, we have attempted to significantly reduce the length of this submission. In doing so, where PoM maintains a position

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

[6] ESC (2020) Statement of Regulatory Approach – version 2.0; ESC (2017), Statement of Regulatory Approach.

expressed in a previous TCS, we constructively incorporate the material adduced to support that approach from our previous reports (particularly the report accompanying the 2020-21 TCS).

3 Total market return

Chapter overview		
2021-22 submission	**2020-21 submission**	**Comments**
8.24%	8.47%	This chapter sets out our approach to estimating the total market return (calculated as the sum of the risk-free rate and the market risk premium (MRP)). The point estimate of 8.24% is based on a risk-free rate of 1.70% and an MRP of 6.54%. The MRP is based on an 85% weighting to the Ibbotson MRP, and a 15% weighting to dividend discount models (DDMs) used by Australian regulators.

Given the inherent volatility in the risk-free rate over time, it is informative to evaluate the expected value of the total market return (TMR) outcome (measured as the risk-free rate plus the MRP).

In this chapter we begin by briefly outlining the TMR approaches adopted by regulators before quantifying the risk-free rate and market risk premium we have estimated for PoM, which are in turn combined into estimates of the TMR. Finally, we apply a range of cross checks.

3.1 TMR approaches

This section begins with a brief overview of regulatory approaches to the risk-free rate and market risk premium (including changes since the 2020-21 report), before combining these into estimates of TMRs.

3.1.1 Regulatory approach to the risk-free rate

Following the QCA draft decision for Queensland Rail released in April 2019 (and reaffirmed in the final decision), all Australian regulators assume a 10-year risk-free rate in their transport determinations.[7]

In regard to averaging periods, the most common regulatory practice is to average the rate over a short horizon, which typically ranges from between ten and forty days, noting that over such a short horizon the choice of averaging period is likely to be of little consequence. Relevantly, IPART and OTTER are two Australian regulators that take into consideration longer-term averages, which they do in conjunction with short-term estimates.[8]

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

[8] OTTER (2018). 2018 water and sewerage price determination investigation, p.166. OTTER determines the risk-free rate as follows. First, it calculates a 40-day average of 10-year Commonwealth Government Securities. Second, it calculates the daily average of the last one, two, three, four, five, six, seven, eight, and nine years of yields on 10-year government securities. Then, it calculates an average based on the 40-day average and each of the various annual historical averages. Finally, it determines the risk-free rate as the midpoint of this average (of averages) and the 40-day average. As at 31 March 2021, this approach results in a risk-free rate of 2.02%.

Updated risk-free rate for PoM

We have updated our risk-free rate estimate for PoM based on 10-year Commonwealth Government bond yields and a 20-day averaging period to 31 March 2021. As the quoted rates are semi-annual, we have converted them to annual effective rates.[9] The resulting estimate is 1.70%.

3.1.2 Regulatory decisions on the MRP

Table 2 summarises the most recent MRP estimates derived by Australian economic regulators, which range from a low of 5.9% to a high of 7.2%.

Table 2 Most recent MRP estimates applied by Australian regulators

Regulator	Date	Sector	MRP (per cent)	Summary of approach
IPART	February 2021	Biannual WACC update	7.2% based on the February 2021 range of 6.0% - 8.4%. Increases to 7.75% once account is taken of uplift to risk-free rate	Based on long-run historical excess returns, and forward looking evidence, giving a 2/3 weight to DDM results and 1/3 weight to economic market indicators
QCA	May 2020	Water	7.0%	Increased from 6.5% due to higher Cornell DDM and Wright MRP estimates. Continues to apply a weighted average of Ibbotson (25%), Cornell DDM (25%), Surveys (20%), Siegel (15%) and Wright (15%)
ERA	May 2019	Rail	5.9%	Applies Ibbotson and DDM estimation results, more weight on historical approach
ACCC	December 2019	Postal Services	6.1%	Increased from 6.0%, citing AER precedent. Considers historical estimates, surveys, and previous regulatory decisions with most weight put on historical estimates.
ESCOSA	March 2020	Water	6%	Applies Ibbotson based on the longest time series available (being 1833 – present). Uses surveys as a cross check.
ESC	July 2016	Water	6%	In its June 2016 Melbourne Water decision, the ESC applied an MRP of 6%, which was originally contained in a Guidance Paper. The reasoning behind this was not provided. It reflects a preference for relying on historical excess returns to estimate the MRP
AER	December 2018	Electricity and Gas	6.1%	MRP set using the Ibbotson method with regard had to DDM and surveys
OTTER	May 2018	Water	6.5%	Based on AER 2013 guidelines and judgement based on evidence from historic excess returns, survey evidence, DDM
ICRC	May 2018	Water	6.5%	Previously adopted the MRP used in the AER's 2013 Rate of Return Guidelines In its April 2021 WACC review, ICRC affirmed that it would use a benchmarking approach to

[9] Annual effective rate = (1+ semi-annual rate/2)^2 -1

Regulator	Date	Sector	MRP (per cent)	Summary of approach
				determine the MRP and consider forward-looking estimates derived from DGMs. ICRC stated that its benchmarking approach will result in an approach that is similar to the QCA's when determining the MRP, noting that its approach of balancing forward looking estimates with historic estimates is consistent with established regulatory practice.

Source: Synergies based on Australian regulatory determinations

Attachment B in the 2020-21 report provides more details on Australian regulators' estimation of the MRP.

3.2 Ibbotson MRP

3.2.1 The approach

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

In the 2020-21 report, we demonstrated that the Ibbotson MRP is well accepted by Australian regulators, and in the December 2020 interim commentary, the ESC reiterated its "initial view" that the Ibbotson approach is well accepted.[10]

3.2.2 NERA adjustment

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

[10] ESC (2020). Interim commentary – Port of Melbourne tariff compliance statement 2020-21, 16 December, p.13.

ESC 2020 interim commentary

While the ESC retained its view that the Ibbotson approach is well accepted, it did identify preliminary issues with specific elements of PoM's approach. In particular, the ESC observed that:[11]

> Other preliminary issues include that the original estimates of the stock accumulation index used to estimate the market risk premium applied unweighted average dividend yields on dividend paying stocks (rather than value-weighted dividend yields) and excluded non-dividend paying shares. As a result, estimates of the accumulation index and resultant market risk premium may be affected by an upward bias.

In identifying the BHM and NERA approaches as the main sources of adjusted data for dealing with issue, the ESC noted that in the 2020-21 MRP estimate for PoM, we used only the NERA approach as the BHM adjusted dataset is likely to overstate the potential downward adjustment to the MRP. The ESC's initial view was that this exclusive reliance on the NERA approach led to a higher MRP, which may not be justified if affected by bias. Consequently, the ESC recommended that PoM consider using an average of the Brailsford and NERA adjusted datasets to estimate the MRP, in order to reduce the impact of any bias.[12]

Recognising that both approaches are used by Australian regulators, and mindful of the ESC's commentary, we have supplemented our preferred NERA approach by averaging it with the Brailsford approach, as detailed in Section 3.2.3. The difference in the Ibbotson MRP between full weighting on the NERA approach and an average of the Brailsford and NERA approaches is 12 basis points.

3.2.3 Ibbotson MRP estimate

Ibbotson MRP estimates for various averaging periods used by Australian regulators are shown in Table 3 for both arithmetic and geometric averaging.[13] Note that all of these estimates assume a theta of 0.625 consistent with our gamma assumption of 0.50.

[11] ESC (2020). Interim commentary – Port of Melbourne tariff compliance statement 2020-21, 16 December, p.13.

[12] ESC (2020), p.14.

[13] In the 2020-21 report, we demonstrated that arithmetic returns were well accepted. Since last year's report was finalised, regulatory precedent on this issue is unchanged, with the exception of ICRC, which stated in its April 2021 WACC review that it would continue to give preference to arithmetic averages over geometric averages when observing historical estimates of excess returns.

Table 3 Ibbotson arithmetic and geometric MRP estimates

	Arithmetic (Brailsford)	Arithmetic (NERA)	Geometric (Brailsford)	Geometric (NERA)
1883-2020	6.36%	6.69%	5.03%	5.36%
1937-2020	6.10%	6.07%	4.32%	4.29%
1958-2020	6.60%	6.62%	4.38%	4.40%
1980-2020	6.57%	6.60%	4.49%	4.52%
1988-2020	6.22%	6.23%	4.76%	4.77%
Average	**6.37%**	**6.44%**	**4.59%**	**4.67%**
Median	**6.36%**	**6.60%**	**4.49%**	**4.52%**
Average of Brailsford and NERA medians	**6.48%**		**4.50%**	

Note: The averaging periods are the same as those presented by the AER, ERA and ACCC in their decisions. All estimates assume a theta of 0.625, consistent with a gamma of 0.50 and a distribution rate of 0.80.

Source: Synergies' historical MRP model

Having regard to the estimates in Table 3, we believe an appropriate Ibbotson estimate at the present time is 6.48%. This is based on the average (or midpoint) of the median for the arithmetic Brailsford (6.36%) and the median of the arithmetic NERA (6.60%) across the various time periods used by Australian regulators. This recognises the range of results across averaging periods, while not weighting any averaging period more highly than another.

3.3 Dividend discount models (DDMs)

3.3.1 The approach

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

In the 2020-21 report, we demonstrated that the DDMs are well accepted by Australian regulators. We noted that three Australian economic regulators (IPART, the QCA and the ERA) assign DDMs a weighting of at least 20% (either implicitly or explicitly). Moreover, there is implicit acceptance of DDMs by ESCOSA, OTTER and ICRC.[14]

[14] Refer Table 19 in Section 6.8.2 of our 2020-21 WACC report. In a further development since the finalisation of last year's report, ICRC affirmed that it would use a benchmarking approach to determine the MRP and consider forward-looking estimates derived from DDMs. ICRC stated that its benchmarking approach will result in an approach that

3.3.2 ESC commentary on DDMs

While the ESC did not comment on whether or not DDMs are well accepted in the 2020-21 interim commentary, the ESC raised "some initial concerns" with our implementation of DDMs.[15] Specifically, the ESC stated that it was not clear that we had implemented our DDMs in the same manner as IPART and the ERA. However, the interim commentary did not make reference to any specific technical concerns with our implementation of the various approaches.

We have implemented the QCA, ERA and IPART regulatory DDMs using information about the various methodologies contained in publications from each regulator. We subsequently engaged with the relevant regulators to clarify elements of their approach that were not fully apparent based on publicly available information.[16]

One modification from last year's DDM analysis relates to the data that we have used in the IPART DDMs. Previously, all of our DDMs (i.e. QCA, ERA, IPART) were based on Bloomberg data. However, while the QCA and ERA both use Bloomberg data in their own estimates, IPART uses Refinitiv (Thomson Reuters) data.

Both Bloomberg and Refinitiv are highly reputable and globally recognised sources of financial data, and we consider that both are fit for purpose when calculating DDM MRPs. Nevertheless, our objective is to bring our DDM methodologies into as close alignment as possible with Australian regulatory precedent. For this reason, our IPART DDM estimates are now based on Refinitiv data. In doing so, we seek to address the ESC's concerns that our implementation of DDMs may differ from the Australian regulators that use them.[17]

3.3.3 DDM estimates

We apply equal weighting to each Australian regulator that uses DDMs in determining the overall DDM estimate (i.e. a weighting of one-third on the average of IPART's three publicly available DDM estimates, a weighting of one-third on the ERA's two stage DDM, and a weighting of one-third to the QCA's Cornell DDM).

---

is similar to the QCA's when determining the MRP, noting that its approach of balancing forward looking estimates with historic estimates is consistent with established regulatory practice. ICRC has not yet identified any specific DDM methodology or methodologies that it will employ nor the weightings that it will adopt for future determinations. Refer: ICRC (2021). Review of methodologies for the weighted average cost of capital – Final Report, April, p.20.

15 ESC (2020). Interim commentary – Port of Melbourne tariff compliance statement 2020-21, 16 December, p.13.

16 In the case of the QCA, we noted that our model had been refined based on discussions with QCA staff.

17 Further information about our DDM methodologies were presented in Attachment B of the 2020-21 report.

Table 4 presents the results of these approaches. In Attachment B of the 2020-21 report, we provided details on how these models are derived, and we also outline the values for key parameters (e.g. long-run growth rates) that are used by the various regulators in their respective models.

Table 4 Forward looking MRP estimates based on DDM

Methodology	Estimate	Weighting
Damodaran (2013)	8.03%	
Bank of England (2002)	7.35%	
Bank of England (2010)	8.08%	
Average of IPART models	7.82%	33.33%
ERA two-stage DDM	7.44%	33.33%
QCA Cornell DDM	5.44%	33.33%
Weighted Average MRP	**6.90%**	

Note: All MRP estimates are based on a gamma of 0.50. The QCA Cornell DDM estimate is based on the approach described in the 2014 Cost of capital: market parameters report and on subsequent discussion with QCA staff.

Source: Synergies' analysis, Bloomberg data for the ERA and QCA models, Refintiv (Thomson Reuters) data for the IPART models

For comparison, IPART's estimate of the Damodaran (2013) MRP as at 31 January 2021 was 9.06%, its Bank of England (2002) MRP was 8.58% and its Bank of England (2010) MRP was 8.76% (noting that IPART assumes a gamma of 0.25 in these estimates). At the time of writing, the QCA and ERA have not released any MRP estimates using data for 2021.

3.4 Conclusion on the TMR

We have taken into account comments made by the ESC in the Interim Commentary, including in relation to the Wright approach, which no longer contributes to the estimation of the MRP, and the averaging of the Brailsford and NERA approaches for the Ibbotson MRP.

Accordingly, for the 2021-22 TCS, we have adopted an 85% weighting on the Ibbotson MRP, and a 15% weighting on dividend discount models (DDMs). We consider that this weighting scheme contributes to a return that is commensurate with that required by a BEE providing services with a similar degree of risk to the Prescribed Services, because it combines sources of historical and forward-looking information in line with their application by practitioners and regulators. The greater weight assigned to the Ibbotson MRP reflects its widespread use by domestic regulators, as well as financial practitioners (although in the latter case, the risk-free rate is frequently increased in response to prevailing market conditions).

Although we maintain our view that PoM's degree of reliance on specific MRP approaches is not constrained by regulatory precedent, we note that our weighting on DDMs is consistent with Australian regulatory precedent, and the proposed weighting is also substantiated by extensive overseas reliance on the approach. In regard to DDMs, three Australian regulators place at least 20% weight on DDMs, and DDMs are routinely applied overseas where they are given material weight.[18]

Our MRP and TMR estimates for the 2021-22 TCS are displayed in Table 5.

Table 5 MRP and TMR estimates for the 2021-22 TCS

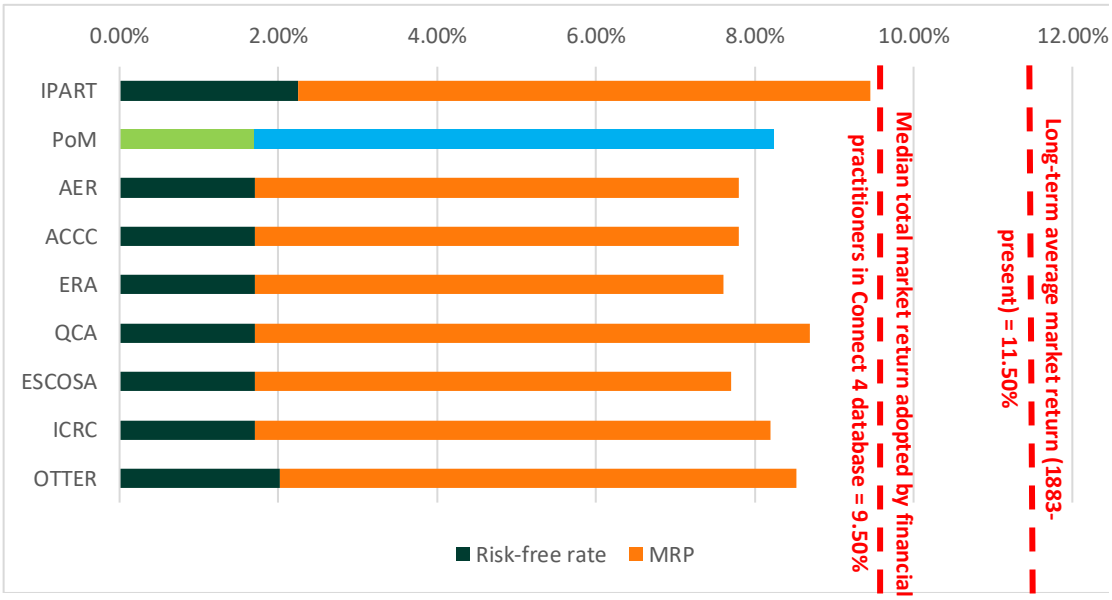
Methodology	Estimate	Weighting (Lower range)
Ibbotson MRP	6.48%	85%
Dividend Discount Models (DDMs)	6.90%	15%
Weighted Average MRP		**6.54%**
Risk-free rate		1.70%
Total market return		**8.24%**

3.4.1 Regulatory estimates of TMRs

Figure 1 shows the range for the TMR currently applied by Australian regulators. This effectively shows how these regulatory bodies would assess the return on equity for a firm with an equity beta of 1 given the same current 10-year risk-free as applies for PoM, which we calculate to be 1.70%. This ensures that we are making comparisons at the same point in time.

[18] Refer Section 6.8.2 of our 2020-21 WACC report, as well as NERA Economic Consulting (2020) Review of Regulators' Approaches to Determination of the Market Risk Premium (report at Appendix R of PoM's 2020-21 TCS submission).

Figure 1 Market returns applied by Australian regulators



Note: As noted in footnote 8, OTTER also has regard to longer-run averages of the risk-free rate. As at 31 March 2021, this approach results in a risk-free rate of 2.02%.

Data source: Various regulatory decisions

The TMR ranges between a minimum of 7.60% for the ERA, and a maximum of 9.45% for IPART. This compares to a TMR of 8.24% for PoM. As such, the TMR estimate for PoM sits firmly in the middle of the regulatory range.

3.5 Total market return cross-checks

To verify the appropriateness of our TMR estimate, we have performed a number of cross-checks based on data and publications referenced throughout the chapter.

3.5.1 Total market return from Connect 4 database

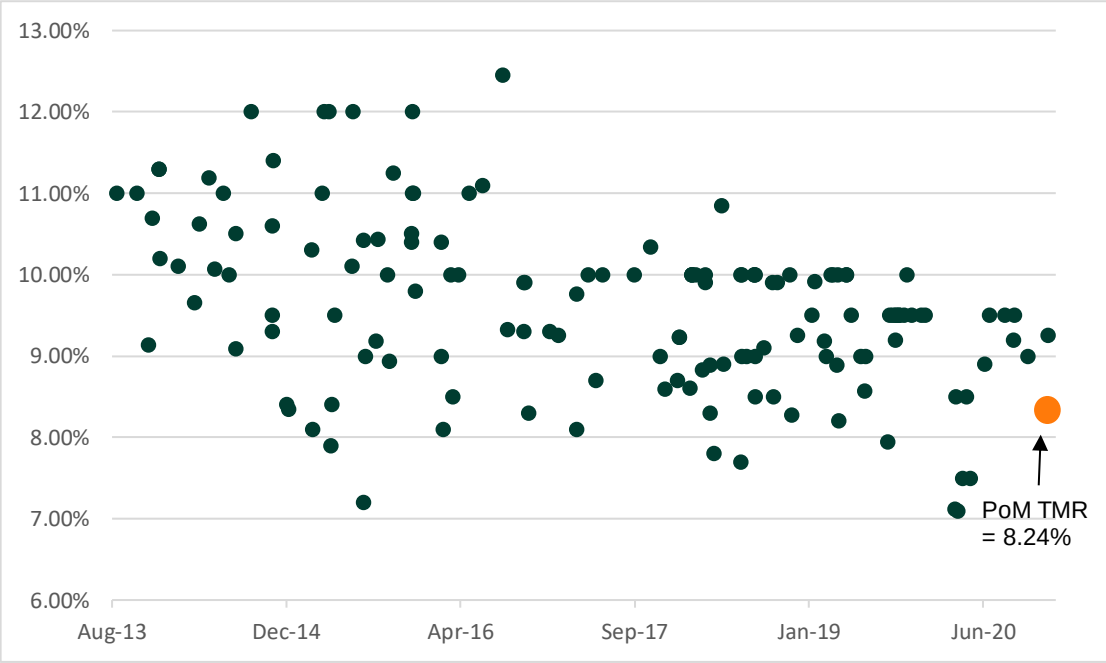
Total market returns applied by financial practitioners are likely to provide the strongest indication of outcomes in a workably competitive market. Updating the methodology employed in last year's report, we have used data on independent expert reports extracted from the Connect 4 database to generate estimates of the post-tax TMR, which is equivalent to the post-tax return on equity for an entity with an equity beta of 1.0.[19]

The median post-tax TMR across the sample period is 9.50% (with an average of 9.58%), as shown in Figure 2. This compares to the post-tax TMR of 8.24% that we currently

[19] Specifically, for the Australian sample, Synergies has investigated all 481 independent expert reports relating specifically to acquisitions, takeovers, divestments, demergers and merger schemes from 1 January 2013 to 31 December 2020.[19] Of these 512 reports, only 245 (48%) made explicit reference to the use of a WACC or discount rate, and of these only 192 (38%) provide a detailed description of their WACC methodology.

estimate for PoM as at 31 March 2021.[20] We do observe a modest decline in the TMR since 2017, with estimates used by independent experts clustering between 8% and 10%. Nevertheless, our TMR of 8.24% is clearly towards the lower end of this range. The majority of TMR estimates are situated above the estimated TMR for PoM (shown with an orange data point).

Figure 2 Post-tax TMRs implied by independent expert reports



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

Data source: Connect 4, Synergies calculations

3.5.2 MRP and TMR surveys

In the 2020-21 report we introduced two surveys, the KPMG Valuation Practices survey, and the annual Fernandez et al. survey. These surveys are frequently cited by Australian regulators, and in the case of the QCA, they contribute to the "Surveys and independent experts" approach, which is assigned a 20% weighting in the overall MRP estimate.

Total market returns reported by the participants in these surveys are summarised in Table 6.[21]

[20] 8.24% = risk-free rate (1.70%) + MRP (6.54%)

[21] At the time of writing, no KPMG Valuation Practices survey has been published for 2020, nor has there been a 2021 update to the Fernandez et al. survey. Consequently, the cross-check estimates are unchanged from last year's report. A comprehensive overview of these surveys is presented in the 2020-21 report.

Table 6 Total market return estimates from financial practitioner surveys

Survey	Estimate
KPMG (2019)	8.8%
Fernandez et al. (2019) average	9.2%
Fernandez et al. (2019) median	8.7%
Fernandez et al. (2020) average	10.3%
Fernandez et al. (2020) median	9.0%

Note: KPMG respondents were asked to provide estimates as at 30 June 2019. The Fernandez et al. (2019) survey asks respondents to report the parameter they used in 2019. Thus, no specific point in time is specified as in the KPMG survey. However, Fernandez et al. (2019) report that they initially sent out emails to survey participants in February 2019, and responses were collated by 22 March 2019. Similarly, the 2020 survey asks participants to report the parameters they used in 2020, again with no specific point in time specified, but responses were collated by 23 March 2020.

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

The TMRs in these surveys range between 8.7% and 10.3%. Consequently, our proposed TMR for PoM of 8.24% sits below this range. This implies that the estimated return on equity for PoM will be a conservative estimate for a firm with an equity beta of 1.0.

3.5.3 IPART TMR

As discussed in Section 3.1.2, IPART's TMR is informed by the midpoint of long-term and short-term risk-free rate averaging. For this reason, IPART's recent estimates are a useful cross-check on the TMR for PoM, which is informed exclusively by a short-term (20-day) average of the risk-free rate.

IPART's most recent biannual update (which used data to 31 January 2021) adopted a midpoint risk-free rate of 2.25% and a midpoint MRP of 7.2%, for a TMR of 9.45% (see Section 3.1.2). These estimates are shown in Table 7.

Table 7 Recent IPART TMR estimates

Date	Risk-free rate	MRP	Total market return (TMR)
31 January 2021	2.25%	7.20%	9.45%

Source: IPART biannual update (February 2021)

IPART's most recent TMR estimate significantly exceeds the proposed TMR for PoM of 8.24%.[22]

3.5.4 Wright MRP

Our final cross-check is the Wright MRP. Despite no longer have regard to it when setting our point estimate MRP for the BEE, it is nevertheless a relevant cross-check on

[22] In contrast, the lowest MRP (TMR) currently determined by an Australian regulator is 5.9% (7.6%, based on the risk free rate as at 31 March, 2021) by the ERA.

the overall TMR outcome. This is particularly relevant given European regulators' reliance on the Wright approach to inform the MRP given that the workably competitive global finance market in which PoM must attract investment is impacted by these regulatory decisions.

Using arithmetic averaging, the average of the Brailsford and NERA medians is 11.61%, well above our TMR estimate for PoM of 8.24%.

Table 8 Wright arithmetic and geometric TMR estimates

Period	Arithmetic (Brailsford)	Arithmetic (NERA)	Geometric (Brailsford)	Geometric (NERA)
1883-2020	11.33%	11.67%	9.92%	10.25%
1937-2020	10.09%	10.07%	8.33%	8.30%
1958-2020	11.56%	11.58%	9.46%	9.48%
1980-2020	12.45%	12.49%	10.57%	10.61%
1988-2020	11.82%	11.84%	10.41%	10.43%
Average	11.45%	11.53%	9.74%	9.81%
Median	11.56%	11.67%	9.92%	10.25%
Average of Brailsford and NERA medians	**11.61%**		**10.09%**	

Note: The averaging periods are the same as those presented by the AER, ERA and ACCC in their decisions. All estimates assume a theta of 0.625, consistent with a gamma of 0.50 and a distribution rate of 0.80.

Source: Synergies' historical MRP model

4 Estimating beta for the BEE

Chapter overview		
2021-22 submission	**2020-21 submission**	**Comments**
Asset beta: 0.70 **Equity beta: 1.00**	Asset beta: 0.70-0.75 Equity beta: 1.00-1.07	Our point estimates of PoM's asset and equity betas are unchanged from last year's submission. The average and median of the comparator set, across both 5 and 10-year timeframes, reinforces that an asset beta value of 0.7 represents a conservative assessment. An asset beta of 0.70 corresponds to an equity beta of 1.00 assuming gearing of 30%.

This chapter outlines our response to the ESC's interim commentary on issues relating to beta. The 2020 interim commentary identified the following concerns with PoM's approach to beta estimation:

- The use of non-port sector comparators, such as railroads;
- The frequency of beta measurements (e.g weekly and/or monthly);
- Reliance on comparator firms from developing or emerging economies; and
- Changes in our reliance on filtering approaches, such as the reimposition of a market capitalisation filter.

We consider each of these issues in turn before concluding with updated beta estimates for the BEE comparator set, along with two cross-checks.

4.1 Use of non-port sector comparators

The necessity of relying on comparators from outside the BEE's sector is heavily dependent on the BEE that is being evaluated. For example, in the utilities sector, there are numerous listed domestic and international comparators that bear close resemblance to regulated utilities in Australia. The situation faced by a container port BEE is very different. For this reason, there is limited value in drawing parallels between the degree of reliance on comparators from other sectors in determinations for utilities, and those in the transport sector. Because there is no regulatory precedent for a port BEE handling predominantly containers amongst a range of trades, we can look to other examples of transport regulatory precedent, such as rail, where regulators are faced with a limited selection of comparators.

In the interim commentary, the ESC claimed that "Australian regulators do not place substantial reliance on comparators from industries outside the regulated entity's sector", instead limiting other industries to cross-checks.[23] Table 25 in Section 7.2.2 of our

[23] ESC (2020). Interim commentary – Port of Melbourne tariff compliance statement 2020-21, 16 December, p.14.

2020-21 report comprehensively summarised the approaches that regulators have adopted when identifying relevant comparator industries. Drawing on those insights, Table 9 responds to the ESC's findings in Table 1.9 of the 2020 interim commentary. We have identified several areas of disagreement with the ESC's interpretation of regulatory precedent.

Table 9 Use of comparators outside BEE sector

Regulator	ESC claim on use of comparators outside the BEE's sector (Table 1.9 of 2020 interim commentary)	Synergies finding based on review of regulatory precedent
AER (gas and electricity)	Does not use comparators outside sector	Agree – the AER relies on 9 Australian energy comparators, 6 of which are now delisted
ERA (rail)	Uses comparators outside sector	Agree – Port of Tauranga is used as a comparator for rail networks (as were Toll and Asciano prior to their delisting) In the 2018 rail WACC review, the sample for Arc Infrastructure, the sample contained 11 firms (7 Class I railways, Aurizon Network, Port of Tauranga, as well as Toll and Asciano based on historical data prior to delisting). The ERA also relied on 5 tollroads for the Public Transport Authority
IPART (rail)	Does not use comparators outside sector	**Disagree** – decision for NSW Rail Access Undertaking explicitly used 21 coal mining firms and 40 electricity generation firms (in addition to 74 rail transport firms), reflecting the risk exposure of the rail network. These businesses clearly do not operate in the rail sector.
QCA (rail and ports)	Does not use comparators outside sector	**Disagree** – the QCA has frequently compared the rail and port entities that it regulates (e.g., Queensland Rail, Aurizon and DBCT) to energy and water utilities, as well as toll roads, which are clearly outside the sector in which the BEE operates. For example, the beta analysis for the 2020 Queensland Rail access undertaking used 72 regulated energy and water businesses, and 7 tollroads.
ACCC (postal services)	Does not use comparators outside sector	Agree – in its most recent determination for Australia Post the ACCC used 8 postal companies, as well as 5 logistics companies as proxies for Australia Post's transport and logistics operations In previous determinations for ARTC, the ACCC has relied solely on Class I railroads.

Source: Synergies analysis of regulatory precedent

Consequently, there is clear precedent for Australian regulators informing their view of a BEE's systematic risk exposure using firms sourced from a sector that is closely related to the business or BEE being analysed. This is especially pertinent in transport sectors such as rail and ports, where comparator sets for the specific sector of interest are limited. Having regard to transport determinations (which we consider of most relevance to the

BEE), all regulators use at least as many comparators as we have adopted for the BEE's comparator set.[24]

Importantly, there is substantial regulatory precedent for the comparability of railroads and ports. This is evident in:

- the ERA's use of port comparators for Arc Infrastructure[25]
- the parallels that the QCA has drawn between Aurizon Network and DBCT in the context of setting DBCT Management's beta[26]
- the parallels drawn by the ACCC between the ARTC's Hunter Valley rail network and PNO (an export coal terminal and port) in considering an appropriate asset beta for PNO[27].

4.1.1 Comparability of railroads

In the interim commentary, the ESC expressed the initial view that PoM should review its approach of including railways as direct comparators for the BEE.[28] The ESC recommended that care should be exercised with the weighting that is applied to this sector.[29] Although the ESC has not elaborated on its concerns about railroads in the 2020 interim commentary, we understand from past commentaries that the degree of competition faced by Class I railroads is one of the first principles risk factors that is assumed to most significantly differentiate railroads from the BEE. As detailed in Table 27 in Attachment A, in regard to all other first principles risk factors (e.g. cost structure, operating leverage, freight composition and contracting arrangements), Frontier Economics has previously advised the ESC that each of these risk factors either lower the systematic risk profile of Class I railroads relative to the BEE, or their impact was inconclusive.[30]

---

[24] The AER relies on only 9 comparators (6 of which are delisted), primarily because it restricts its analysis to Australian firms only. However, restricting the sample to Australian firms is not feasible for the BEE's comparator set, and we have demonstrated that reliance on international comparators is widespread in transport determinations.

[25] ERA (WA), Final Determination, 2018 and 2019 Weighted Average Cost of Capital For the Freight and Urban Networks, and the Pilbara Railways, 22 August 2019, p.55.

[26] QCA, November 2016, final decision, DBCT Management's 2015 draft access undertaking, pp. 102–103.

[27] ACCC, September 2018, final determination: statement of reasons, Access dispute between Glencore Coal Assets Pty Ltd and Port of Newcastle Operations Pty Ltd, p 159.

[28] ESC (2020). Interim commentary – Port of Melbourne tariff compliance statement 2020-21, 16 December, p.14.

[29] Because 6 of the 13 companies in the listed comparator set for the BEE are railroads, railroad betas are assigned slightly less than equal weighting in the determination of the overall asset beta estimate.

[30] Frontier Economics (2019). Issues in cost of capital estimation for the Port of Melbourne – Prepared for the Essential Services Commission, 12 December, pp.14-15. (Refer Attachment A for further discussion.)

To address concerns regarding the degree of competition faced by Class I railroads, Attachment A comprehensively analyses the market power of Class I railroads by reference to data on revenue margins, freight composition, average haul lengths by commodity (which indicate the extent of competition with other transportation modes), and the degree of competition between Class I railroads.

Our findings indicate that Class I railroads do not appear to be exposed to a significant degree of competition. The market power of Class I railroads is underpinned by increasing average haul lengths in virtually all commodities over the last two decades, in conjunction with a freight composition dominated by bulk freight, which faces less intense competition than intermodal freight. Moreover, our analysis of track ownership by state reveals significant parts of the US rail network where competition between Class I railroads is either limited or close to absent. Even where multiple railroads operate in a given state, the infrastructure may be situated in different parts of the state rather than parallel to each other.

On the basis of this evidence, we consider freight railroads (in particular, North American Class I railroads) a primary comparator set due to their freight-focussed business model, strong market position and below rail infrastructure services, and similar demand drivers to ports. Importantly, Class I railroads do not typically derive significant revenue from property leasing, making their scope of operation more comparable to the Prescribed Services.

4.2 Beta measurement frequency

In the interim commentary, the ESC argued that PoM's estimates of beta are sensitive to the return specification employed (e.g weekly or monthly).[31] According to the ESC's analysis, reliance on monthly returns produces a higher asset beta estimate in the ports sample whereas the adoption of weekly returns would reduce the estimated asset beta by 0.05. In light of the fact that three Australian regulators have regard exclusively to weekly returns (with two having regard to a combination of weekly and monthly returns), the ESC concluded that monthly returns "might still be considered," but PoM should consider revisiting its use of monthly data to estimate beta.[32] We note that while the ESC cites the practices of other regulators, it has not presented any technical basis for its concerns with the return specifications that we have adopted.

Having regard to the 2021 beta estimates presented in Section 4.5.2, we observe that the beta estimates for both the port and rail sectors, as well as the overall comparator set are

[31] ESC (2020). Interim commentary – Port of Melbourne tariff compliance statement 2020-21, 16 December, p.16.

[32] ESC (2020). Interim commentary – Port of Melbourne tariff compliance statement 2020-21, 16 December, p.17.

broadly similar over a 5-year and 10-year timeframes, regardless of which return interval is applied.

Nevertheless, we have undertaken a comprehensive review of regulatory precedent on the use of weekly and monthly returns for estimating beta. Further, we have also investigated approaches employed by financial practitioners along with insights from academic literature.

4.2.1 Regulatory precedent

The approaches of economic regulators in Australia and New Zealand are summarised in Table 10. These regulators were all cited by the ESC, with the exception of the New Zealand Commerce Commission (NZCC), which we have added for completeness. Table 10 highlights that there is no universally applied approach among Australian and New Zealand regulators. There is substantial regulatory precedent for the use of monthly returns, (albeit always in combination with weekly returns).

In particular, liquidity concerns arising from low trading frequency may support weight being given to monthly returns. In the next section, we note that the ACCC has given consideration to monthly returns on this basis, and we demonstrate that it may also be a relevant consideration in the context of the BEE.

Table 10 Return intervals used by Australian and New Zealand economic regulators

Regulator (sector)	Weekly or monthly returns?
AER (electricity and gas)	Weekly
ERA (rail, electricity and gas)	Weekly
IPART (water, freight rail, public transport)	Weekly
QCA (water, rail, ports)	Weekly and monthly
ACCC (postal services)	Weekly and monthly
NZCC (airports, electricity, gas)	Weekly and monthly

Note: Regulators not mentioned here (e.g. OTTER, ICRC) do not usually set beta by reference to an explicit comparator set, instead tending to rely on the precedent of other regulators

Source: ESC interim commentary, various regulatory decisions

We have also interrogated a sample of representative independent expert reports to ascertain the approaches that are used by frequent expert report authors. Table 11 shows the range of return intervals (e.g weekly, monthly, daily) used by independent experts. It demonstrates that a range of approaches are used by independent experts, but the most common involve monthly return intervals or a combination of weekly and monthly (consistent with our current approach). In the sample of reports that we have interrogated, BDO is the only independent report author that has placed sole reliance on weekly returns (and, in one report, daily returns).

Table 11 Return intervals used in independent expert reports

Return interval	Independent experts using the approach
Weekly and monthly returns	Grant Samuel, Grant Thornton, Deloitte, KPMG, EY
Monthly only	Grant Thornton, EY, Lonergan Edwards
Weekly only	BDO
Daily only	BDO

Note: Some independent experts (e.g. BDO) appear in more than one category because their approach differs across reports. Note that we have used indicative reports from the Connect 4 database to identify the approaches generally taken by each expert, and there may still be certain cases where an independent expert departs from the approach listed in the table.
Source: Synergies interrogation of Connect 4 database

Therefore, on the basis of our review, we maintain that our approach of having regard to both weekly and monthly returns is underpinned by substantial regulatory and financial practitioner precedent.

4.2.2 Liquidity of port comparators relative to home markets

This section outlines our findings on liquidity and turnover for the firms in PoM's comparator set. One of the overarching factors in the choice of weekly or monthly returns among financial practitioners, academics and certain regulators is the impact of liquidity. For example, Professor Aswath Damodaran notes that:[33]

> Using shorter return intervals increases the number of observations in the regression, for any given time period, but **it does come with a cost**. Assets do not trade on a continuous basis, and when there is non-trading on the asset, the beta estimated can be affected. In particular, non-trading on an asset during a return period can reduce the measured correlation with the market index, and consequently the beta estimate.

Similarly, in the Australian regulatory setting, the ACCC has adopted monthly rather than weekly returns for three comparators that it deemed were potentially susceptible to liquidity concerns.[34]

Therefore, it is important to ascertain the extent to which the firms in the BEE's comparator set may have low turnover relative to the rest of the market. If a firm has a low turnover relative to other firms in the market with similar market capitalisations, this could suggest that weekly betas may understate systematic risk relative to monthly betas, or at the very least that both return intervals should be considered.

[33] Damodaran, A. (1999). Estimating risk parameters, p.10.

[34] ACCC (2019). Decision on Australian Postal Corporation 2019 price notification, December. In the decision, the ACCC adopted monthly instead of weekly returns for the small cap logistics companies CTI, K&S and Chalmers, noting that these firms suffer from nonsynchronous trading problems. Consequently, the ACCC concluded that weekly data did not necessarily improve the beta estimates for these firms.

We have constructed market capitalisation and turnover rankings for each of the firms in the comparator set for the BEE. The market capitalisation ranking is based on the given comparator's relevant home market (e.g. Australia for Qube, New Zealand for Port of Tauranga). Turnover was calculated as the five-day average of daily value traded, and values were calculated in USD for comparison purposes.

As shown in Table 12, our analysis reveals that the turnover ranking is typically lower than the market capitalisation ranking for the firms in the BEE's comparator set. This suggests that these companies have a relatively lower turnover (and therefore less liquidity) compared to similar-sized business in other sectors. This phenomenon is observed across both the port and rail sectors, but it is more pronounced for ports.

For example, Qube is the 78th largest firm in the Australian market, but it is only the 138th highest by turnover. Likewise, Port of Tauranga is the 13th largest firm in the New Zealand market, but only 34th highest by turnover. Although the market capitalisation and turnover rankings for Hamburger Hafen und Logistik are similar, the rankings for the Hong Kong and Singaporean firms show a reasonably wide gap between market capitalisation and turnover.

The results are more mixed for US railroads. CSX has similar market capitalisation and turnover rankings, while Kansas City Southern is the only comparator whose turnover ranking exceeds its market capitalisation ranking. On the other hand, Norfolk Southern and Union Pacific have significantly lower turnover rankings than market capitalisation rankings. The Canadian railways remain in the top 10 for the Canadian market in terms of both market capitalisation and turnover, even though the turnover rankings are slightly lower.

We also investigated turnover rankings in percentage terms (i.e. average daily value traded as a proportion of market capitalisation). However, we emphasise that these results should be interpreted with caution. Using Qube Holdings as an example, it has the 78th highest market capitalisation in the Australian market, and the 138th highest turnover in absolute dollar terms. In percentage terms though (i.e. when turnover is measured as proportion of market capitalisation instead of in dollars), its turnover is ranked only 1,030th. By way of comparison, BHP's turnover is ranked only 1,228th when turnover is measured as a percentage of market capitalisation, even though it has the highest average daily turnover in absolute dollar terms and the largest market capitalisation in the Australian market (at the time of writing). Consequently, a low ranking in percentage terms may not in and of its own be a cause for liquidity concerns.

Table 12 Liquidity of beta comparators

Comparator firm	Ranking by market capitalisation	Ranking by turnover (absolute USD terms)	Ranking by turnover (percentage terms)
PORT COMPARATORS (7 firms)			
Qube Holdings	78th	138th	1,030th
Port of Tauranga	13th	34th	113th
Hamburger Hafen und Logistik	196th	203rd	435th
China Merchants Ports Holding Company	162nd	256th	913th
COSCO Shipping Ports	265th	315th	736th
Liaoning Port Co Ltd (formerly Dalian Port)	178th	225th	727th
Hutchison Port Holdings Trust	48th	74th	182nd
RAILROAD COMPARATORS (6 firms)			
CSX Corporation	128th	144th	1,296th
Kansas City Southern	394th	216th	390th
Norfolk Southern Corporation	127th	285th	2,261st
Union Pacific Corporation	63rd	120th	2,174th
Canadian National Railway Company	4th	7th	890th
Canadian Pacific Railway	8th	10th	732nd

Note: Given the large number of stocks listed in the United States, for analysis purposes the rankings for CSX, Kansas City Southern, Norfolk Southern and Union Pacific are based on US-listed firms with a market capitalisation of at least USD 1 billion. Dalian Port was renamed Liaoning Port Co Ltd in January 2021.

Source: Refinitiv (Thomson Reuters), Synergies analysis

In summary, given that liquidity is considered by academics and some regulators as one of the primary factors determining the choice of return interval, the findings above demonstrate the importance of having regard to both monthly and weekly returns when estimating the asset beta for the BEE.[35]

4.3 Reliance on international comparators

In the 2020 interim commentary, the ESC acknowledged the support of Australian regulators for the inclusion of international comparators, even though limits may be placed on the countries from which comparators can be sourced.[36]

The ESC claimed that we have used international comparators drawn from emerging and developing countries. In particular, the ESC was concerned that the use of comparators from emerging countries, most notably China, would warrant further investigation.[37] Synergies has not at any point used comparators from China. We have

[35] For academic precedent, refer: Damodaran, A. (1999). Estimating risk parameters; Gregory, A., Hua, S. & Tharyan, R. (2018). In search of beta, British Accounting Review, 50(4), pp.425-441. For regulatory precedent, refer: ACCC (2019). Decision on Australian Postal Corporation 2019 price notification, December (see previous footnote).

[36] ESC (2020). Interim commentary – Port of Melbourne tariff compliance statement 2020-21, 16 December, p.15.

[37] ESC (2020). Interim commentary – Port of Melbourne tariff compliance statement 2020-21, 16 December, p.15.

used comparators from Hong Kong, which, as we detail below, is supported by Australian regulatory precedent. Moreover, our use of the FTSE Developed classification filters out comparators from countries that would generally be considered emerging or developing.

The issue for the selection of beta comparators from countries other than Australia revolves around the extent to which regulators consider an international sample necessary (due to a dearth of domestic comparators) and relevant (given the similarity of international comparators to the BEE), and if considered necessary and relevant, which countries (or jurisdictions) comparators are generally drawn from.

As summarised in Table 26 of our 2020-21 report, there is substantial precedent for the practice of using an international sample among Australian regulators. Regulators accept international comparators due to a lack of (or limited) relevant comparators in Australia. There appears to be no presumption by regulators that the systematic risks of international comparators are not comparable to the relevant BEE in each case, although this is likely to be influenced by the comparability of the economies from which comparators are selected.

The ESC also posited that a small set of comparators may not necessarily justify expanding the comparator set to international firms for the sole purpose of increasing sample size. However, the ESC's statement does not appear to be consistent with Australian regulatory precedent. For instance, the ERA noted that:[38]

> For rail there was a lack of comparable Australian companies. As a consequence, and consistent with its 2015 rail WACC approach, the ERA relied on overseas railway network operators in order to form the benchmark samples to estimate equity beta for the Public Transport Authority, Arc Infrastructure and Pilbara Railways.

This quote emphasises that the overarching objective of adopting a comparator set drawn from countries other than Australia is to achieve comparability with a BEE providing services with a similar degree of risk; it is not solely driven by a need to increase sample size. Based on our review of regulatory decisions, Australian regulators have previously relied upon transport comparators from Australia, New Zealand, the US, Canada, the UK, France, Italy and Spain in the face of limited relevant domestic comparators.[39]

---

[38] ERA (WA), Final Determination, 2018 and 2019 Weighted Average Cost of Capital For the Freight and Urban Networks, and the Pilbara Railways, 22 August 2019, p.55.

[39] IPART, in its recent consultation paper on "Estimating equity beta", relied on a sample of 35 water utilities for the entities it regulates. These comparators were sourced from countries such as Hong Kong, the Philippines, Malaysia, Thailand, Vietnam and Chile. Many of these countries have appeared in PoM's comparator set previously.

4.3.1 Reliance on Hong Kong for listed comparators

Three of the seven firms in the BEE's ports comparator set are listed in Hong Kong. As mentioned above, the ESC has recommended that we revisit the use of comparators from emerging and developing countries, particularly China. However, we have not included international comparators from emerging and developing economies, nor have we ever included companies listed in China. Although we use firms listed in Hong Kong that have operations in China, Hong Kong is classified as a developed country according to the FTSE country classifications, which is a globally recognised classification system.[40]

With respect to regulatory precedent, we have identified two recent examples of Australian regulators sourcing comparators from Hong Kong for their comparator set, including those with operations in China. A recent example comes from the QCA for Gladstone Area Water Board's 2020 price monitoring review. While it excluded 4 firms from Hong Kong on the basis that their operations were predominantly in China, it did retain China Water Affairs Group as its country of risk on Bloomberg was listed as Hong Kong.[41] Meanwhile, for its review of equity beta for water utilities, IPART included Guangdong Investment, a Hong Kong-listed firm, even though it reports having significant water supply operations in Shenzhen and Dongguan, China.[42]

In summary, while listed comparators from Hong Kong have not been extensively relied upon by Australian regulators in recent determinations, we consider that the examples cited above validate PoM's reliance on port comparators from Hong Kong. Notwithstanding the reasons for including firms from Hong Kong in the comparator sample, we note that an asset beta estimate of 0.70 is robust to the inclusion or exclusion of these companies.

Conclusion on use of international comparators

There is a trade-off between the size of the comparator sample and the extent of filtering that is undertaken to refine it. Here, however, there is not a sufficient number of Australian based listed entities to inform a beta assessment of PoM. There is no realistic option but to draw on international comparators, for which there is substantial regulatory precedent in addition to support from finance spheres.

---

40 Refer Section 7.3.2 of our 2020-21 report.

41 QCA (2020). Gladstone Area Water Board price monitoring 2020–25 Part A: Overview, May. See also: CEPA (2019). Advice on an appropriate asset beta, capital structure, credit rating, and debt risk premium for GAWB's 2020- 2025 pricing period, 19 December.

42 IPART (2019). Estimating equity beta, 1 April, p.7.

We have minimised the risk of incorporating less comparable international comparators by filtering on the basis of the quality of the relevant capital market where such entities are listed through the use of the FTSE Developed country classification.[43] This is consistent with regulatory practice. In its 2019 interim commentary, the ESC acknowledged that we have addressed some of its concerns from the previous 2018 interim commentary. In particular, the ESC observed that "the port is now seeking comparators drawn from developed economies similar to Australia."[44]

4.4 Filtering approaches

4.4.1 Use of a size filter

The guiding principle for the adoption of any quantitative filter is the avoidance of bias in beta estimation. Robust filtering ensures that the firms in the comparator set reflect a degree of systematic risk exposure commensurate with the BEE, because they are less likely to be prone to bias brought about by infrequent trading or other idiosyncratic factors that mask their underlying systematic risk exposure.

In the interim commentary, the ESC claimed that PoM has changed its approach to filtering each year since 2017.[45] This led the ESC to raise preliminary concerns that PoM has been adopting inconsistent approaches over time, which could be perceived as an indication that the approach may not be underpinned by sound principles. We have sought to be responsive to the issues while retaining an approach that appropriately accounts for the threats to unbiased beta estimation described above. In particular, we have taken the opportunity to address the ESC's concerns on compliance through the publication of its interim commentaries, and we consider that the approaches we have adopted have substantial precedent among regulators and financial practitioners.

The changes to our approach over time are summarised in Table 13.

Table 13 Changes to the filtering methodology over time

TCS submission	Filtering methodology
2017-18	US$100 million market cap filter, statistical significance filtering (t-statistic and R^2)
2018-19	No market cap filter, statistical significance filtering (t-statistic and R^2)
2019-20	**No change to 2018-19 approach** (i.e. no market cap filter, statistical significance filtering (t-statistic and R^2)

[43] Refer Section 7.3.2 of our 2020-21 report.

[44] ESC (2019). Interim commentary – Port of Melbourne tariff compliance statement 2019-20, 16 December, p.24.

[45] ESC (2020). Interim commentary – Port of Melbourne tariff compliance statement 2020-21, 16 December, p.18. We note that we adopted the same approach to filtering in both the 2018-19 and 2019-20 submissions.

2020-21	US$200 million market cap filter, no statistical significance filtering
2021-22	**No change to 2020-21 approach** (i.e. US$200 million market cap filter, no statistical significance filtering)

Source: Synergies analysis

Up until 2019-20, PoM applied a statistical significance filter based on t-statistics and R^2 values. As the ESC noted in its 2020 interim commentary, the ESC has previously raised initial concerns about this practice. In an attempt to address this feedback, while maintaining that the practice is well accepted amongst practitioners and regulators, we recognised that the filtering on the basis of statistical significance was contentious with the ESC, and we removed it from our methodology. In place of the statistical significance filter, we reimposed a market capitalisation filter. Market capitalisation filters target a similar objective with respect to removing firms whose beta estimates may misrepresent the true underlying systematic risk exposure of the business, even though the firm may operate in a sector that is relevant to the BEE on a first principles basis.

Moreover, we note that the ESC's own position on filtering approaches, as expressed in its annual interim commentaries, has also evolved over time. When the ESC first recommended that we remove the market capitalisation filter in its 2017 interim commentary, it had not yet raised concerns about our use of statistical significance filtering. Reliance on statistical significance filtering should not be considered in isolation of other filtering approaches such as market capitalisation thresholds. If statistical significance is not to be used as a threshold criterion,[46] we have demonstrated that the use of market capitalisation filters in its place is an approach with significant support among Australian regulators.

Consequently, changes in our filtering approaches over time have been informed by improvements and refinements to our approach in response to the ESC's concerns. This responsiveness to past ESC commentaries should not be interpreted as an inconsistency, and it does not indicate that the current approach is not underpinned by sound principles.

Moreover, the ESC has also previously acknowledged that applying a size filter when compiling a sample of comparators may be reasonable to avoid bias in beta estimation.[47] Regulatory precedent on this issue is summarised in Table 28 of our 2020-21 report, which demonstrated that applying a market capitalisation threshold for comparators is a well accepted approach amongst Australian regulators. In many instances, Australian

[46] In applying this approach, we maintain that statistical significance is a factor that legitimately goes to the weight placed on a comparator.

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

economic regulators have implicitly adopted a market capitalisation filter by virtue of the selection of their beta comparators. Comparators used by Australian regulators have market capitalisations in excess of $US500 million at the time of the relevant determination.

Finally, we note that neither regulators nor regulated businesses ossify their approaches over time – the ERA's most recent changes to the assessment of WACC reduced the returns of affected businesses by up to 200 basis points. Seen in this light, our approach to size filtering, which has involved a movement in response to the ESC commentary, followed by the return to PoM's original approach (albeit with a higher threshold) now reflects the principled application of an approach that is supported by Australian regulatory precedent.

In summary, we remain of the view that it would be very unlikely that a small firm with a market capitalisation of less than US$200 million could reasonably inform the systematic risk of the BEE, given the fact that the fact capital intensity of the BEE is a crucial attribute for the provision of Prescribed Services.[48]

4.5 Beta estimation

4.5.1 Approach to estimating asset betas

Betas have been estimated based on five years and ten years of monthly and weekly returns, regressed against the relevant domestic share market index using Ordinary Least Squares. We eliminated any firms with a market capitalisation of less than US$200 million as well as any companies from countries that are not FTSE Developed.

The resulting equity betas were de-levered to produce an asset beta using the Brealey-Myers approach as follows:

$$\beta_e = \beta_a * \left(1 + D/E\right)$$

Where

βe = equity beta

βa = asset beta

D = proportion of debt within the assumed capital structure

E = proportion of equity within the assumed capital structure

[48] The application of a size filter results on all comparators being reliable estimators from a statistical perspective.

4.5.2 Beta estimates

The average gearing levels for each business were calculated using annual data over the five-year period (using the ratio of long-term debt to market value of equity). The resulting asset betas are shown in Table 14.

Table 14 BEE comparator set beta estimates for the 2021-22 TCS

Comparator firm	5-year monthly asset beta	5-year weekly asset beta	10-year monthly asset beta	10-year weekly asset beta
PORT COMPARATORS (7 firms)				
Qube Holdings	1.05	1.01	0.99	0.90
Port of Tauranga	0.62	0.68	0.58	0.64
Hamburger Hafen und Logistik	1.04	0.91	0.81	0.74
China Merchants Ports Holding Company	0.71	0.68	0.68	0.70
COSCO Shipping Ports	0.46	0.51	0.61	0.58
Liaoning Port Co Ltd (formerly Dalian Port)	0.41	0.42	0.67	0.61
Hutchison Port Holdings Trust	0.51	0.48	0.43	0.43
Ports average asset beta	**0.69**	**0.67**	**0.68**	**0.66**
Ports median asset beta	**0.62**	**0.68**	**0.67**	**0.64**
RAILROAD COMPARATORS (6 firms)				
CSX Corporation	0.91	0.82	0.97	0.92
Kansas City Southern	0.87	0.83	0.90	0.98
Norfolk Southern Corporation	1.04	0.89	1.05	0.91
Union Pacific Corporation	0.97	0.92	0.92	0.92
Canadian National Railway Company	0.55	0.67	0.54	0.69
Canadian Pacific Railway	0.59	0.73	0.73	0.83
Railroads average asset beta	**0.83**	**0.81**	**0.85**	**0.88**
Railroads median asset beta	**0.89**	**0.82**	**0.91**	**0.91**
OVERALL AVERAGE ASSET BETA	**0.75**	**0.70**	**0.76**	**0.76**
OVERALL MEDIAN ASSET BETA	**0.71**	**0.68**	**0.73**	**0.74**

Note: Asset beta estimates are as at March 2021. Firms with a market capitalisation of less than US$200 million have been removed from the comparator set.

Source: Refinitiv (Thomson Reuters), Synergies analysis

Over 5 years, the average (median) asset beta for the full sample is 0.75 (0.71) using monthly estimates, while using weekly estimates, the average (median) is 0.70 (0.68). Over 10 years for monthly data, the average asset beta is 0.76 while the median is 0.73; using weekly data, the average (median) is 0.76 (0.74). Therefore, the updated empirical evidence across 5-year and 10-year windows remains consistent with an asset beta of at least 0.70.

4.5.3 First principles assessment

In our view, reliance on average or median asset beta measures of this comparator set is conservative, at least for the port comparators, when account is taken of a first principles assessment (refer Attachment D in our 2020-21 report), a summary of which is contained in Table 15 (over page).

Table 15 First principles analysis of the characteristics of PoM and comparator industries

Risk factor	Port of Melbourne	Marine ports and services	Class 1 railroads	Impact on PoM's systematic risk relative to comparators
Nature of the product/ nature of the customer	Predominantly import-oriented, and majority of trade handled is containerised (80% of revenue FY18), which is driven by factors that have a direct correlation with GDP.	Similar market exposure to container freight trade, albeit with limitations due to issues of comparability with the BEE: Port comparators earn revenue from wider range of services (e.g. property leasing that is significantly less affected by movements in economic activity) Stevedores have similar market exposure, although typically operate in multiple jurisdictions	Freight-focussed business model, Handle relatively more bulk freight than containerised (intermodal) freight than PoM.	Class I railroads exhibit the most similar systematic risk exposure to the BEE
Pricing structure/ contracting environment	PoM's charges are predominantly traffic-based without long-term contracts. This provides less revenue certainty in the event of economy downturns/upturns.	Stevedores – contracts with shipping lines of 1-3 years duration Ports – traffic based with no contracts; long term property leases	Contracts are of varying durations	Increases the BEE's systematic risk exposure relative to Class I railroads
Market power (competition environment)	Subject to some competition from other ports, although the degree of contestability differs both by cargo type and by destination.	Terminal operators experience a more intense competitive environment than landlord ports Ports – similar to BEE	Overall Class I railroads face a degree of competition (just as PoM or the BEE is exposed to competition from other Australian ports). However, they do not appear to be exposed to a significant degree of competition, which can be attributed to the high degree of market concentration and customer captivity.	Ports – similar market power to BEE Class I railroads exhibit market power but are in a more competitive environment than BEE Stevedores are in a more competitive environment than BEE
Form of regulation	Regulated (price cap form regulation, which is not cost based and has a long re-set period). Regulatory framework does not provide PoM with a stable revenue stream and does not provide any meaningful protection against volume and cost risks.	Not regulated	Class 1 railroads are subject to very limited regulatory intervention.	BEE does not gain benefit of stability afforded by regulation. Similar systematic risk exposure relative to Class I railroads

Growth options	PoM, is likely to undertake a number of capital projects to maintain / upgrade existing assets as well as expand the Port's capacity to service Victoria's increasing freight demand.	Growth options vary depending on locations	Growth options vary depending on locations	Not determinative
Operating leverage	PoM has a relatively high fixed cost base due to the inherently capital intense nature of the business. Additionally, PoM is subject to fixed fees which are unrelated to actual port services or costs. As fixed costs, these obligations add to PoM's operating leverage. Prescribed Services do not include property revenue that reduces operating leverage	Terminal operators generally have lower operating leverage (lower fixed capital costs and higher variable costs within their total cost base) than a landlord port, such as PoM	Railroad operations of rolling stock have a higher proportion of operating costs to fixed costs compared to below rail (track only) operations. This reduces railroad operating leverage relative to the BEE, because the BEE will have a lower proportion of incremental or avoidable cost associated with increased or reduced activity and consequently the BEE's earnings will be relatively more affected by activity levels.	BEE's systematic risk exposure higher than all comparators

4.6 Asset beta cross-checks

We have considered three cross-checks in order to evaluate the robustness of the beta estimate emerging from our comparator set for the BEE:

- industry beta estimates from Professor Aswath Damodaran; and
- beta estimates for transport business from independent expert reports.

4.6.1 Industry beta estimates from Professor Aswath Damodaran

For our first cross-check on the beta estimates resulting from the comparator set, we have investigated industry beta estimates from Professor Aswath Damodaran, a globally recognised Professor of Finance at the Stern School of Business at New York University.[49] Professor Damodaran publishes industry beta estimates for 96 sectors. The industry beta estimates most relevant to the BEE are the Transportation sector and the Railroads sector.[50] Damodaran's estimates, as at January 2021, are shown in Table 16.

Table 16 Damodaran industry beta estimates

Industry	Number of firms	Asset beta estimate
Transportation	284	0.77
Transportation (Railroads)	53	0.62

Note: Industry betas are available for the US, Europe, Japan, Emerging Markets, or Global. Because there are no specific beta estimates available for Australia or Asia-Pacific, we have relied on the global estimates. A full list of the companies used to generate the beta estimate can be found here: http://www.stern.nyu.edu/~adamodar/pc/datasets/indname.xls. Professor Damodaran does not publish sub-industry beta estimates for Transportation (ports).

Source: Professor Aswath Damodaran

Damodaran's estimate of 0.77 for the transportation sector aligns closely with our five- and ten-year estimates from the BEE's comparator set and affirm the robustness of our beta estimate for the BEE.

4.6.2 Transport beta estimates from independent expert reports

In the 2020-21 report, we presented asset beta estimates from independent expert reports for the transport sector. As there have been no further reports of this nature since finalising the 2020-21 WACC report for PoM, Table 17 replicates the independent expert report cross-checks from last year. Further discussion of these estimates can be found in the 2020-21 report.

[49] Professor Aswath Damodaran also proposed the Damodaran (2013) DDM model used by IPART to calculate the MRP.

[50] Damodaran, A. (2020). Levered and unlevered betas by industry - global. Available from: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datacurrent.html#discrate [Accessed 7 April 2020].

Table 17 Grant Samuel transport beta estimates

Company	Business Division	Equity beta	Gearing	Implied asset beta
Asciano	Pacific National (PN)	0.9-1.0	15%-25%	0.675-0.85
	Patrick Terminals & Logistics (T&L)	1.0-1.1	15%-25%	0.75-0.935
	Patrick Bulk & Automotive Services (BAPS)	1.0-1.1	10%-20%	0.80-0.99
Toll	Assumed equity beta	1.0-1.1	20%-25%	0.75-0.88
	Toll's actual equity beta	1.5+ (as reported by Grant Samuel)	20%-25%	1.125-1.20+

Note: The implied asset beta has been derived using the Brealey-Myers formula
Source: Grant Samuel

This data reaffirms that our asset beta range estimate of between 0.70 for the BEE is likely to be conservative. The contribution of these estimates compared to the Damodaran estimates is that they relate directly to entities who, until recently, operated in specifically in the Australian transport sector.

4.7 Conclusion: asset beta for PoM

In conclusion:

- we have used a well accepted approach to form a comparator set from which to estimate an asset beta for the BEE
- we have used a well accepted approach to estimate the asset beta for the BEE
- the empirical evidence supports an asset beta estimate of at least 0.7
- the first principles analysis suggests that:
  - PoM's systematic risk is at least as high as the average of the Marine Ports and Services members of the comparator set.
  - the systematic risk profile of the BEE shares many similarities with Class I railroads;
- an asset beta of at least 0.7 is consistent with the most recent regulatory review of a similar freight business in Australia, Arc Infrastructure, which on a first principles basis, could be expected to have lower systematic risk than PoM.[51]
- an asset beta of at least 0.7 is also consistent with our two cross checks.

Overall, we consider that an asset beta value of 0.7 represents a conservative assessment.

[51] ERA (2019). 2018 and 2019 weighted average cost of capital for the freight and urban rail networks, and the Pilbara Railways, 22 August.

5 Capital structure

Chapter overview
We have retained our assumed capital structure for PoM of 30% gearing from the 2020-21 submission. This remains within the range of transport regulatory decisions, and evidence from listed comparators indicates no material movement in gearing levels.

5.1 Regulatory precedent

Although the ESC's 2019 and 2020 interim commentaries did not provide any specific guidance on gearing, the 2018 interim commentary reiterated the ESC's earlier commentary that the majority of regulatory transport decisions in Australia have assumed benchmark gearing levels between 50% and 60%. Based on this, the ESC noted that regulators have tended to use lower asset betas in combination with higher gearing levels than that assumed by Synergies for the BEE.[52]

As discussed in our 2020-21 report, debt levels assumed by Australian regulators range between 20% and 60% in transport decisions for rail and port entities. There have been no changes to regulatory precedent on capital structure since that time.

Regulated transport businesses with higher gearing levels are normally subject to revenue cap regulation and have some form of contractual protection to confer relative cash flow stability. Regulatory precedent supports lower levels of gearing for entities with less cash flow stability, including a gearing of 20% for the Pilbara railways, and a gearing of 25% for Arc Infrastructure. Our proposed gearing ratio of 30% is consistent with this range .

5.2 Empirical evidence

In determining an appropriate gearing ratio for PoM, we have analysed empirical evidence from relevant comparator firms, being the entities that we have also used to estimate beta for the return on equity calculation (refer Chapter 4). Additionally, we have also examined the gearing levels of privatised Australian ports.

Gearing ratios and the latest available credit ratings for the entities comprising our comparator set that are rated by ratings agencies as being investment grade or better are contained in Table 18.

[52] ESC (2018). Interim commentary – Port of Melbourne tariff compliance statement 2018-19, pp. 61–62.

Table 18 Companies in our sample with investment grade ratings (9 entities)

Company	Country	OECD	Sector	Moody's Credit Rating	S&P Credit Rating	Gearing
China Merchants Port Holding Company	Hong Kong	No	Marine Ports and Services	Baa1	BBB	37%
Port of Tauranga	New Zealand	Yes	Marine Ports and Services	-	A-	4%
Hutchinson Port Holdings Trust	Singapore	No	Marine Ports and Services	Baa1	A-	61%
Canadian National Railway Company	Canada	Yes	Railroads	A2	A	12%
Canadian Pacific Railway	Canada	Yes	Railroads	-	BBB+	18%
CSX Corporation	US	Yes	Railroads	Baa1	BBB+	22%
Kansas City Southern	US	Yes	Railroads	Baa2	BBB	19%
Norfolk Southern Corporation	US	Yes	Railroads	Baa1	BBB+	20%
Union Pacific Corporation	US	Yes	Railroads	Baa1	A-	15%

Source: Moody's

Amongst companies in our sample with an investment grade rating, the median gearing level is 19% and the average gearing level is 23%. Average and median gearing by industry sector for the sample with an investment grade rating is summarised in Table 19.

Table 19 Gearing averages and ranges by sector for investment grade entities (9 entities)

	Overall Average	Overall Median	Overall Minimum	Overall Maximum
Full Sample	23%	19%	4%	57%
	Sector Average	**Sector Median**	**Sector Minimum**	**Sector Maximum**
Marine Ports and Services	34%	37%	4%	61%
Railroads	17%	18%	12%	22%

Source: Bloomberg

5.2.1 Privatised Australian ports

In the 2020-21, we presented acquisition gearing ratios for Australian ports, which avereage 42%. There have been no further port privatisations since that time.

5.3 Assessment

Debt levels assumed by Australian regulators for regulated transport entities range from 20% for the Pilbara railways up to 60% for Dalrymple Bay Coal Terminal (DBCT).

Amongst companies in our sample with an investment grade rating, the median gearing level is 19% and the average gearing level is 23%. The average acquisition gearing from Australian port privatisations (other than Flinders Ports) is just in excess of 40%.

Our proposed gearing ratio of 30% for the BEE sits comfortably within these ranges.

5.4 Conclusion

The very nature of a gearing range is that a reasonable value may fall anywhere within a range.

Considering relevant market evidence, we maintain our view that a gearing range of between 20% and 40% is appropriate for the efficient benchmark port entity. The considerations that inform this view are as follows:

- The range set by gearing levels for our comparator sample with investment grade ratings and privatised Australian ports on acquisition is between 20% and 42%.
- Despite the ESC's previous observation that the majority of transport regulatory decisions assign gearing ratios between 50% and 60%, the more relevant regulatory precedent relates to Arc Infrastructure and Pilbara railways which have gearing levels of 25% and 20% respectively.
- This range is consistent with the point estimate recommended by Incenta from its mechanistic averaging across the comparator set it determined.[53]

We have retained a gearing level of 30% for the BEE, which represents the mid-point of the gearing ratios for the investment-grade listed companies of 20% and the gearing ratios for the privatised ports of 42% (after rounding to the nearest 5%).

Both the range and the point estimate for a BEE may change over time in response to several factors.

[53] Incenta (2020). Estimating the Port of Melbourne's equity beta, p.7.

6 Estimating the return on debt

Chapter overview		
2021-22 submission	**2020-21 submission**	**Comments**
Risk-free rate: 1.70%	Risk-free rate: 0.90%	The risk-free rate has again been calculated as a 20-day average on 10-year Australian Government bond yields, an approach frequently adopted by economic regulators.
DRP: 3.00% **Debt raising costs: 0.10%** **Return on debt: 4.80%**	DRP: 4.04% Debt raising costs: 0.10% Return on debt: 5.04%	The return on debt continues to be calculated using a trailing average methodology. For the 2020-21 estimate, a 60% weighting is placed on the initial 2017 on-the-day estimate, a 10% weighting on the 2018 on-the day estimate, a 10% weighting on the 2019 on-the-day estimate, a 10% weighting on the 2020 on-the-day estimate, and a 10% weighting on the 2021 on-the-day estimate. Each year, 10% of the weighting on the 2017 on-the-day estimate will be refreshed with the prevailing on-the day estimate for the given year. As we have documented in our previous WACC reports, there is substantial regulatory precedent and support for the trailing average methodology Our position on debt raising costs is unchanged.

6.1 Introduction

The return on debt calculation can be expressed as follows:

$$R_d = R_f + DRP + DRC$$

Where:

Rf = risk-free rate

DRP = debt risk premium

DRC = debt raising costs

6.1.1 Implications of ESC commentary for return on debt

Recent ESC interim commentaries have not examined PoM's approach to the return on debt in detail. In regard to the trailing average methodology, the ESC's expectation in the 2018 interim commentary was that, "having now adopted such an approach, the port would not revert to the on-the-day approach."[54] Our approach for the 2020-21 WACC estimate is a continuation of the trailing average adopted since 2018.

6.2 Risk-free rate

As noted in Chapter 3, we have applied an updated estimate of the risk-free rate based on a twenty-day average of the ten-year Commonwealth Government bond yield as at 31 March 2021.

The resulting estimate is 1.70 per cent (annual effective).

[54] ESC (2018). Interim commentary – Port of Melbourne tariff compliance statement 2018-19, p.13.

6.3 Notional credit rating assumption

A common starting point for the notional credit rating assumption is BBB, or minimum investment grade. The most common notional credit rating assumption applied to regulated entities in Australia is either BBB or BBB+.

It is noted that in practice, this distinction often has no practical consequence given most regulators have estimated the BBB/BBB+ DRP from the broader BBB corporate bond categories reported by third-party data sources such as the RBA and Bloomberg, which reflect a combination of BBB-, BBB+ and BBB bonds.[55]

It is also appropriate that the credit rating assumption used for the DRP should be consistent with the gearing assumption.

In Australian regulatory practice, the adoption of an investment grade credit rating for an efficient benchmark entity is well accepted.

6.4 Term to maturity

Consistent with our risk-free rate calculation for the return on equity, we have assumed a ten-year term to maturity for BBB bonds, the longest available tenor (with appropriate liquidity) in an Australian context.

6.5 Debt raising costs

10 basis points per annum (bppa) or 0.10% has been added to our return on debt estimate to account for debt raising costs. As discussed in our previous WACC reports, recent regulatory decisions reinforce an allowance around this level.

6.6 Cost of debt estimates

Our methodology for calculating the 2021 on-the-day estimate used in the trailing average calculation is unchanged from last year's report.

Assuming a risk-free rate of 1.70% and debt raising costs of 10 bppa gives an on-the-day cost of debt estimate for the benchmark efficient port entity of 3.12%. Table 20 sets out this calculation.

[55] The exception to this is the ERA, which employs its own bespoke in-house approach to estimate the DRP. The ERA's methodology explicitly identifies a selected portfolio of bonds with specific credit ratings (e.g. BBB+, BBB or BBB-).

Table 20 2021 on-the-day cost of debt calculation

Averaging period	RBA	Bloomberg	Average
BBB DRP based on 20 days to 31 March 2021	1.33%	1.30%	1.32%
Risk-free rate based on 20 days to 31 March 2021	1.70%	1.70%	1.70%
Debt raising costs	0.10%	0.10%	0.10%
2021 on-the-day cost of debt	**3.13%**	**3.10%**	**3.12%**

Source: RBA, Bloomberg, Synergies calculations

This 2021 on-the-debt estimate is then used as an input in the trailing average calculation, as displayed in Table 21.

Table 21 Trailing average cost of debt calculation

Time period	Estimate	Weighting
2017 on-the-day cost of debt	5.45%	60%
2018 on-the-day cost of debt	4.58%	10%
2019 on-the-day cost of debt	4.21%	10%
2020 on-the-day cost of debt	3.42%	10%
2021 on-the-day cost of debt	3.12%	10%
Cost of debt	**4.80%**	

Note: Assuming a risk-free rate of 1.70% and debt raising costs of 0.10%, this implies a DRP of 3.00%
Source: RBA, Bloomberg, Synergies calculations

Given a risk-free rate of 1.70%, and debt raising costs of 10 bppa, a cost of debt of 4.80% implies a DRP of 3.00%, which is lower than the 2020 DRP estimate of 4.04%, owing mainly to the higher risk-free rate.

7 Gamma

Chapter overview		
2021-22 submission	**2020-21 submission**	**Comments**
0.50	0.33	Our gamma estimate for 2021-22 is based on the equity ownership approach. The equity ownership approach estimate of 0.50 reflects recent regulatory decisions and falls at the upper end of the range specified by the ESC in its commentary.

7.1 Background

This chapter outlines our methodology for determining gamma. We begin by responding to ESC commentary before considering the approaches to gamma that exist among regulators. We then set out our approach to gamma, before conducting a series of cross-checks that reinforce the appropriateness of our estimate.

7.2 ESC commentary on gamma

In the 2020-21 WACC report, we adopted a gamma of 0.33, based on a two-thirds weighting to the equity ownership approach, and a one-third weighting to the financial practitioner approach of adopting a zero gamma. Subsequently, the ESC's preliminary view in the interim commentary was that these two approaches are underpinned by two different conceptions of the view of gamma.[56] The ESC formed the initial view that it may not be sensible or logical to combine such different approaches.

Aside from this, the ESC also noted that it was not clear that the financial practitioner approach was well accepted in the context of the Pricing Order, and that a utilisation approach that relies on well accepted estimates of the distribution rate and utilisation rate may be the better approach.

We respectfully disagree about the incompatibility between the equity ownership and financial practitioner approaches in the context of applying "one or a combination of well accepted approaches." It is not clear to us that the Pricing Order requires for two or more approaches to have similar logical conceptions in order for them to be combined or that a well accepted combination of approaches is required if the underlying approaches themselves are well accepted. In our view, it is precisely because of the different information that can be obtained from multiple approaches that the Pricing Order allows for the possibility of implementing "one or a combination of well accepted approaches." That being said, we have again reviewed regulatory positions on the utilisation and distribution rates, which has led us to adopt an approach that is consistent

[56] ESC (2020). Interim commentary – Port of Melbourne tariff compliance statement 2020-21, 16 December, p.18.

with current Australian regulatory precedent, and that falls within the ESC's specified gamma range.

7.3 Distribution and utilisation rates

Gamma is the product of two inputs:

- the proportion of tax paid that has been distributed to shareholders as franking credits (the distribution rate); and
- the value an investor places on $1 of franking credits, referred to as the value of distributed franking credits (often referred to as theta or the utilisation rate).

Gamma must take a value between zero and one depending on the assumptions made in regards to the distribution rate and theta.

7.3.1 Australian regulatory precedent

This section discusses the approaches that Australian economic regulators have adopted when determining a value for gamma.

Australian regulatory precedent has been a highly contested area with ongoing disagreement over the value of imputation credits in the hands of investors. Consequently, there are several approaches that have been applied in Australian regulatory practice. This is reflected in the range of gamma values from 0.25 to 0.585 that are currently adopted by Australian regulators.

Table 22 provides an overview of the gamma, distribution rate and utilisation rate approaches and positions that are currently adopted by Australian regulators.

Table 22 Gamma positions adopted by Australian regulators

Regulator	Distribution rate	Utilisation rate / theta	Gamma	Justification provided by regulator
IPART	0.70	0.35	0.25	Arrived at under a specific review of gamma concluded in 2012 and re-affirmed in its 2018 WACC methodology review. In 2018, IPART considered that there was insufficient evidence to adopt a different value of gamma at this time. It maintained its view that dividend drop-off studies are currently the best method to estimate the market value of gamma. IPART's view on the equity ownership method was that the main assumption of the method (that domestic investors take full advantage of imputation credits while foreign investors are unable to take any advantage of them) provided a point of reference, but was imprecise, and may tend to overestimate the use of imputation credits. Further, IPART noted that domestic ownership ratios fluctuate considerably over time, and are quite different for listed equities as compared to all (listed and non-listed) equities. In the case of ATO taxation statistics, IPART observed that while this method also has its limitations, it tends to produce gamma estimates that are lower than those from the equity ownership method, because it does not make such imprecise assumptions about the behaviour of investors. No direct reference to the distribution rate in the 2018 methodology review. However, IPART notes that it has adopted 0.25 since 2012, after ACompT adopted 0.70 for the distribution rate. For theta, IPART directly cites Cannavan and Gray (2017), which reports a theta of 0.35; this indirectly confirms the distribution rate of 0.70.
AER	0.90	0.65	0.585	Final 2018 Rate of Return Instrument relied exclusively on equity ownership approach, in contrast to draft guidelines, which still placed "some reliance" on taxation statistics and "limited reliance" on dividend drop-off studies. The AER's distribution rate is now based exclusively on Dr Martin Lally's estimate of the distribution rate based on the top 50 ASX firms. Previously, the AER placed primary reliance on the cumulative payout ratio approach (based on ATO data), with some regard to Lally's approach. The AER in its decision for TransGrid (one of the last before the 2018 instrument came into effect), previously referred to the cumulative payout ratio approach as "widely accepted." It typically resulted in a distribution rate around 0.7.
ERA	0.90	0.60	0.50	To estimate the utilisation rate, the ERA relies on the equity ownership approach to determine the percentage of domestic investors in the Australian equity market. The utilisation rate is estimated for all Australian equity from the national accounts of the ABS. The ERA's view was that ATO data (i.e. taxation statistics) should not be applied to all aspects of the imputation system. The ERA considered that was confirmed by opinions expressed by the ATO. ERA also estimates the distribution rate based on the ASX top 50 (as per AER). Note that ERA rounds final gamma estimate from 0.54 to 0.50.
QCA	0.88	0.55	0.484	The QCA considers that the appropriate estimate of the utilisation rate should be based on the equity ownership of Australian listed companies (not all equity, as per AER and ERA). On the other hand, the QCA does not consider the taxation statistics approach to be reliable. The distribution rate is based on the Lally approach (although only the top 20 firms are used).
ACCC	0.90	0.65	0.585	The ACCC moved into alignment with the AER in the Australia Post decision.

Regulator	Distribution rate	Utilisation rate / theta	Gamma	Justification provided by regulator
ICRC	0.7 (implied)	0.6 (implied)	0.40	As per May 2018 final decision for Regulated Water and Sewerage Services Prices 2018-23. ICRC agreed with the AER and QCA approaches that prevailed as at the time of the decision (May 2018, prior to the latest AER Rate of Return instrument). Decision does not stipulate distribution / utilisation rates, but does rely predominantly on AER precedent (as of May 2018) Note that ICRC is currently undertaking a review of its WACC methodology, which is at the draft stage, but it has not determined a specific value for gamma. ICRC stated that "The Commission does not intend to consider the value of imputation credits as part of this Review because is not an input parameter for calculating the WACC. The Commission will take the interrelationship between gamma and the MRP into account in determining the values for the MRP and gamma in its next price investigation."
OTTER	0.7 (implied)	0.6 (implied)	0.40	As per the May 2018 final decision for the Water and Sewerage Price Determination Investigation. OTTER based this estimate on the AER's position at the time of the decision, determining that the current best estimate of gamma for a business operating in Australia (as at May 2018) was 0.4. No explicit reference to chosen distribution / utilisation rates, but cites AER research as "current best estimate" (as of May 2018)
ESC	0.82	0.6	0.50	In our 2020-21 WACC report, we reported 'implied' distribution and utilisation rates for the ESC of 0.8 and 0.6, respectively, whilst acknowledging that specific precedent was either dated or imprecise about the breakdown between the distribution and utilisation rates. In the interim commentary, the ESC has since clarified that its distribution rate is 0.82 and its theta is 0.6 (the product of these parameters is 0.492).
ESCOSA	0.7-1.0 (midpoint = 0.85)	0.25-0.81 (midpoint = 0.53)	0.50	In our 2020-21 WACC report, we reported the distribution and utilisation rates for ESCOSA as "not specified", based on the limited commentary in the 2020 SA Water draft decision that was available to us at the time of last year's report. Without citing any references directly, the ESC interim commentary reported wide ranges for the distribution and utilisation rates, which are shown here. For the purpose of calculating Australian regulatory averages and medians, we have applied the midpoint estimates.
ALL DECISIONS				
Average	0.82	0.57	0.47	
Median	0.85	0.60	0.50	
Midpoint	0.80	0.50	0.42	
ALL DECISIONS (EXCLUDING IPART)				
Average	0.83	0.60	0.49	
Median	0.87	0.60	0.50	
Midpoint	0.80	0.59	0.49	

Source: Various regulatory decisions, Synergies analysis

7.3.2 Conclusion on well accepted approaches

The majority of Australian regulators give primary weight to the equity ownership approach, although various approaches are used to estimate theta. IPART is the only Australian regulator to currently rely on dividend drop-off studies.

7.4 Our approach to gamma

As recommended by the ESC in its 2020-21 Interim Commentary, we have adopted a utilisation approach that relies on well accepted estimates of the distribution rate and utilisation rate.

Our estimate of gamma for the BEE is 0.50, based on a distribution rate of 0.8 and a utilisation rate (theta) of 0.625. In adopting this position, we note that:

- Our proposed distribution rate of 0.8 is within the range (equal to the midpoint) of Australian regulatory decisions that adopt the utilisation approach
- Our proposed utilisation rate of 0.625 is within the range (higher than the average, medians and midpoint) of Australian regulatory decisions that adopt the utilisation approach
- Our distribution rate of 0.8 and utilisation rate of 0.625 are very close to the ESC's own distribution rate of 0.82 and utilisation rate of 0.6
- Our overall gamma estimate of 0.50 is at the top of the ESC's range from its 2020-21 Interim Commentary (0.35 to 0.50).

7.5 Cross-checks

We employ three cross-checks to examine the appropriateness of our gamma estimate for the BEE:

- Dividend drop-off studies (the market approach currently used by IPART);
- Estimates of gamma from financial practitioners; and
- Estimates of gamma from peer-reviewed financial academic literature.

7.5.1 Dividend drop-off (market value) studies

IPART currently estimates a gamma of 0.25 based on dividend drop-off studies. This is materially below our proposed gamma estimate of 0.5. Holding all else constant, a higher gamma results in a lower pre-tax cost of equity for the BEE. This also demonstrates that

our estimate of gamma sits well within the current regulatory range of gamma values applied in Australia.

7.5.2 Financial practitioner evidence on gamma

As detailed in our 2020-21 WACC report, it is well accepted among financial practitioners that gamma should be zero. Therefore, our estimate of gamma for the BEE satisfies this cross-check.

7.5.3 Academic evidence on gamma

As detailed in the 2020-21 WACC report, it is well accepted in the academic literature that the gamma for a security should be zero where the marginal investor is foreign (as is likely to be the case in the Australian context). Therefore, our estimate of gamma for the BEE satisfies this cross-check.

8 Proposed WACC estimate for BEE

The purpose of this chapter is to present the values of the key components of our pre-tax nominal WACC estimate of 8.23% for the BEE.

We also demonstrate that this WACC estimate satisfies the three-stage assessment approach set out by the ESC to assess the compliance of PoM's WACC estimate with the Pricing Order.

8.1 Changes since 2020-21 TCS submission

The changes to our return on equity and debt estimates since the 2020-21 TCS report reflect changes in market-based parameter values (e.g. risk-free rate, MRP, DRP) as well as changes in the approach to the determination of certain parameters (e.g. MRP and gamma). Our asset beta and gearing value assumptions remain unchanged.

8.1.1 Return on equity calculation

The methodologies used to calculate our pre-tax return on equity estimate of 9.69% are discussed in Chapters 3 and 4 of our report. The underlying input parameter values are presented in Table 23.

Table 23 SL CAPM post-tax cost of equity

Parameter	Estimate
Risk-free rate	1.70%
Gearing	30%
Asset beta	0.7
Equity beta	1.0
MRP	6.54%
Post-tax SL CAPM cost of equity	8.24%

Source: Synergies analysis

Pre-tax return on equity

Given the Pricing Order requires that the WACC estimate be expressed in pre-tax nominal terms, the following formula grosses up the post-tax Re for the gamma-adjusted corporate tax to generate a pre-tax Re:

$$\text{Pre-tax Re} = \text{Post-tax Re} / (1 - t * (1 - \gamma))$$

Where

t = corporate tax rate = 0.3

γ = gamma = 0.50 (refer Chapter 7 of our report)

Substituting the parameter values into the above formula:

$$\text{Pre-tax Re} = 8.24\% / (1 - 0.3 * (1 - 0.50)) = 8.24\% / 0.85$$

Pre-tax SL CAPM Re = 9.69%

Therefore, our estimate of the pre-tax return on equity for the benchmark port entity based on the SL CAPM is 9.69%.

8.1.2 Return on debt calculation

The underlying components of our return on debt estimate of 4.80% are discussed in Chapter 6 of our report.

8.1.3 WACC estimate

The Pricing Order confers important discretions on the Port Licence Holder in relation to the cost of capital. In forming our views on a compliant cost of capital, we have had the benefit of the ESC's Interim Commentary on past TCS submissions[57] and the publication of the ESC's Statement of Regulatory Approach (which the ESC updated in April 2020 with refinements to its interpretation of well accepted approaches).[58] This has led to refinements in our approach over time.

Our pre-tax nominal WACC estimate of 8.23% and its underlying components are presented in Table 24. For the 2021-22 TCS, we have maintained an estimate for the asset beta of 0.70. We have adopted an MRP estimate of 6.54% by placing an 85% weighting on the Ibbotson MRP (6.48%), and a 15% weighting on DDMs (6.90%).

[57] ESC (2019), Interim commentary - Port of Melbourne tariff compliance statement 2019-20, ESC (2018), Interim commentary - Port of Melbourne tariff compliance statement 2018-19, ESC (2018), Interim commentary - Port of Melbourne tariff compliance statement 2017-18.

[58] ESC (2020) Statement of Regulatory Approach – version 2.0; ESC (2017), Statement of Regulatory Approach.

Table 24 WACC estimate for PoM

	2017-18 TCS	2018-19 TCS	2019-20 TCS	2020-21 TCS	2021-22 TCS
Risk-free rate	2.81%	2.74%	1.96%	0.90%	1.70%
Capital structure	30%	30%	30%	30%	30%
Gamma	0.25	0.25	0.25	0.33	0.50
Corporate tax rate	30%	30%	30%	30%	30%
CAPM Parameters					
Ibbotson MRP	6.53%	6.56%	6.48%	6.42%	6.48%
Wright MRP	9.01%	8.86%	9.54%	10.74%	-
Dividend Discount Models (DDMs)	-	-	8.56%	9.75%	6.90%
Ibbotson MRP weighting	*50%*	*50%*	*50%*	70%	*85%*
Wright MRP weighting	*50%*	*50%*	*25%*	15%	*0%*
DDMs weighting	*0%*	*0%*	*25%*	15%	*15%*
Weighted MRP	7.77%	7.71%	7.77%	7.57%	6.54%
Asset beta	0.70	0.70	0.70	0.70	0.70
Equity beta	1.00	1.00	1.00	1.00	1.00
SL CAPM	13.66%	13.48%	12.55%	10.60%	9.69%
Debt beta	0.00	0.00	0.00	0.00	0.00
Debt risk premium	2.54%	2.53%	3.18%	4.04%	3.00%
Debt raising costs	0.10%	0.10%	0.10%	0.10%	0.10%
Return on debt (pre-tax)	5.45%	5.37%	5.24%	5.04%	4.80%
Pre-tax nominal WACC	**11.54%**	**11.52%**	**10.46%**	**8.93%**	**8.23%**

8.2 Satisfying the ESC's compliance assessment framework

The ESC has established a compliance assessment framework for assessing how the proposed WACC estimate for the BEE satisfies the regulatory regime that involves the following steps:[59]

- use of well-accepted approaches in its development;
- determining the overall reasonableness of the proposed WACC estimate and whether it is likely to be commensurate with that required by the BEE; and
- assessing whether PoM's approach is consistent with the Pricing Order and the objectives of the regulatory regime. If any concerns arise regarding the proposed WACC estimate, a more detailed, focussed analysis of its basis will be undertaken.

[59] ESC (2020) Statement of Regulatory Approach – version 2.0, pp.22-23.

The following sections demonstrate that the proposed WACC estimate for the BEE satisfies the regulatory regime. We address the first two steps in turn.

8.3 Use of well accepted approaches

Throughout our report, we outline the reasons for our view that the approaches adopted in the determination of the WACC, and in the determination and estimation of the necessary parameters, are well accepted within the meaning of the Pricing Order. We provide evidence from economic regulators, finance practitioners and academics in support of the approaches that we have adopted.

In each chapter of our report, we set out how we have utilised well accepted approaches to determine a WACC that satisfies the Pricing Order (including clause 4.1.1(a)). Step 2 in the ESC's compliance assessment involves comparing the WACC derived for the BEE, an issue to which we now turn.[60]

8.4 Benchmarking the WACC for the BEE

The purpose of this section is to substantiate the consistency of our proposed overall WACC estimate with the returns required by the BEE with a similar degree of risk as that which applies to PoM in the provision of the Prescribed Services (as required by clause 4.1.1(a) of the Pricing Order). Firstly, we evaluate the WACC margins implied from the more comparable regulatory decisions identified by the ESC in its Interim Commentary, as well as the IPART NSW Rail Access Undertaking final decision.

Whilst the ESC has previously confined its assessments to regulatory decisions, we consider a broader assessment is necessary to ensure that the regulatory objectives are achieved. Accordingly, we have generated estimated WACC margins for our listed comparator set using data from Bloomberg on country-specific MRP values and risk-free rates, as well as firm-specific information regarding the return on debt. An overview of the methodology for the assessment of the cost of equity is located in Attachment C.

8.4.1 Complexities in benchmarking WACC

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

[60] ESC (2020). Statement of Regulatory Approach – version 2.0, p.23.

- those relating to the intrinsic characteristics of the entities and their commercial environments
- those relating to the WACC assessment itself.

We briefly explain these in turn.

Differences in the intrinsic characteristics of the entities and their commercial environments include:

- Inherent differences in the entities being benchmarked – the BEE in this instance has substantial exposure to the domestic market because of its import concentration, and very high operating leverage, due to, amongst other things, its capital intensity, the Prescribed Services not incorporating property based revenue, the Port Licence Fee and Cost Contribution Amount under the Port Concession Deed and a regulatory regime which provides very limited scope to adjust prices in response to changing circumstances (in contrast to, for example, a revenue cap environment). It is also subject to a Government endorsed plan for the creation of a second port
- Different regulatory regimes – the Pricing Order confers upon PoM important discretions about the approaches to be adopted for determining the WACC that are not reflected in any other Australian regulatory regime. This affects the comparison of WACC because a wider range of values can be compliant under the Pricing Order when compared to the more common deterministic regimes that apply to the comparator regulated entities.

These differences are captured in Table 25.

Table 25 Environmental benchmarking summary

Entity	Revenue model (where relevant, regulatory framework)	Systematic Risk Exposure	Other relevant factors	Comparability to PoM
PoM	Price-capped, full demand risk with variable tariffs Uncontracted revenue	Volumes linked to domestic economic cycles, high operating leverage exacerbated by large Government licensing fees Contestable trades Threat of 2nd port	Compliance not deterministic regime	N/A
Coal-related network entities (ports and rail)	Long-term take-or-pay contracts Revenue capped, very low demand risk	Relatively limited exposure to imports Generally single commodity exposure	Deterministic regulatory regime	Poor comparator due to regulated revenue cap and substantially different operating environment, means significantly lower systematic risk

Entity	Revenue model (where relevant, regulatory framework)	Systematic Risk Exposure	Other relevant factors	Comparability to PoM
ARTC Interstate Network	Ceiling revenue test, full demand risk Limited contractual protection	Volumes linked to economic cycles Limited road competition on major route (East-West), other routes contestable (North-South)	Negotiate arbitrate regime 2018 Voluntary Access Undertaking withdrawn following ACCC Draft Determination	Reasonable comparator noting the impact of a different regulatory regime
Arc infrastructure	Ceiling revenue test, full demand risk Long term contracts	Predominantly export focused, although some domestic traffic akin to ARTC Interstate Network	Negotiate arbitrate regime with potential deterministic outcomes (arbitration)	Reasonable comparator noting the impact of a different regulatory regime and relatively greater export exposure
NSW Rail Access Undertaking	Ceiling revenue test, full demand risk	Wide variety of traffic ranging from coal (not contestable) to grain to intermodal (more contestable).	Negotiate arbitrate regime with potential deterministic outcomes (arbitration)	Lower systematic risk comparator due to significant export orientation, noting the impact of a different regulatory regime
Pilbara rail networks	Take-or-pay model Ceiling revenue test, full demand risk	Relatively limited exposure to imports Generally single commodity exposure	Negotiate arbitrate regime with potential deterministic outcomes (arbitration)	Largely diversifiable single commodity risk with take or pay (rather than revenue cap) protection
Class I US railroads	Limited competitive switching Short term contracts	Volumes linked to economic cycles Lower operating leverage given variable costs Very light handed regulatory model	Intensity of competition between Class I Railroads is controversial	Comparable due to exposure to domestic freight activity, limited contractual protection and absence of regulated revenue cap protection
Marine and Ports	Concession agreements Typically non-regulated	Volumes linked to economic cycles Exposure to competition	Low operating leverage Exposure to shipping industry trends (e.g. growth in liner sizes)	Comparable due to exposure to freight activity, limited contractual protection and no regulated revenue cap protection Impact of low operating leverage significant for systematic risk Impact of international diversification lowers systematic risk in home market

Source: Synergies analysis

Differences relating to the WACC assessment itself include:

- Different cost of debt assumptions – different cost of debt assumptions materially affect the WACC and are therefore particularly important when comparing a WACC in the context of:

  - a regulated setting (such as PoM for current purposes) – where PoM adopts a trailing average and other entities comprised in the sample do not, even though, over time, an entity should be indifferent between a trailing average approach and an on-the-day approach
  - an unregulated setting – where debt margins are not available on a consistent basis for the entirety of the comparator set and we need to rely on an alternative (Bloomberg) that is unlikely to properly reflect the true cost of debt for the entity.

- Different tax regimes – post-tax comparisons abstract from consideration of differences in tax regimes and thereby highlight the underlying risk/return relationships of interest (the focus of 4.1.1(a)). This is particularly the case for international comparators. Moreover, in the context of domestic comparators, pre-tax comparisons reflect differences in the gamma, which is unrelated to the underlying risk/return relationship.

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

- Post-tax unlevered cost of equity margins – on the basis that:
  - They remove the distracting influence of the cost of debt and the various approaches that inform that estimate in different comparators. Moreover, once the approach to the cost of debt is accepted, the attribution of parameter values is more uncontroversial in most cases. As such, removing the cost of debt facilitates a more straightforward reference point that is most relevant to the workably competitive market of greatest relevance for the BEE
  - The relevant workably competitive market for the assessment of PoM's cost of equity is an international capital market. In such a market, a post-tax comparison is the most informative because international investors cannot access imputation credits.

- Pre-tax nominal WACC margins – whilst not necessarily the most representative, this presentation reflects the terms of the Pricing Order. Accordingly, the material is presented subject to the caveats expressed above. In order to address the cost of debt issue, we present pre-tax nominal WACC margins for the comparators adjusting for the BEE's trailing average cost of debt.

8.4.2 Post-tax cost of equity margins

In Attachment C, we disaggregate the pre-tax nominal WACC estimates for the entities listed in Table 26 into cost of equity and cost of debt margins.

Table 26 List of benchmarking comparators

Sector	Entity name
Listed Marine Ports and Services	Qube Holdings
	Port of Tauranga
	Hamburger Hafen und Logistik
	China Merchants Ports Holding Company
	COSCO Shipping Ports
	Dalian Port
	Hutchison Port Holdings Trust
Listed Railroads	CSX Corporation
	Kansas City Southern
	Norfolk Southern Corporation
	Union Pacific Corporation
	Canadian National Railway Company
	Canadian Pacific Railway
Regulatory comparators	Arc Infrastructure (ERA)
	Pilbara Railways (ERA)
	NSW Rail Access Undertaking (IPART)

Source: Synergies analysis

We find that median cost of equity margins for both listed Marine Ports and Services firms and Class I Railroads are higher (whether on a pre-tax or post-tax basis) than the cost of equity margin for PoM. Moreover, we also examined levered and unlevered cost of equity estimates, the latter removing the effect of gearing.

Results on a post-tax, unlevered cost of equity basis are displayed in Figure 3 using box and whisker plots, which display the data in quartiles.[61] The first box and whisker plot (dark green) shows the range of recent regulatory decisions.[62] The second box and whisker plot (orange) shows the range of post-tax unlevered cost of equity margins for listed Marine Ports and Services entities, while the third box and whisker plot presents post-tax unlevered cost of equity margins for listed Class I Railroads (light green). The fourth box and whisker plot (dark blue) presents PoM's post-tax unlevered cost of equity margin for the 2021-22 TCS submission.

In our view, post-tax unlevered cost of equity margins are the most representative benchmarking approach for current purposes. PoM's cost of equity margin estimate (4.58%) is situated towards the lower end of the ranges for the two listed comparator

[61] The "box" component illustrates the interquartile range (i.e. the middle 50% of values). The "whiskers" at each end of the box show the lowest 25% of values and the highest 25% of values, respectively.

[62] Specifically, the range is based on the 2020 Arc Infrastructure and Pilbara Railways determinations, as well as the 2019 IPART determination for the NSW rail access undertaking.

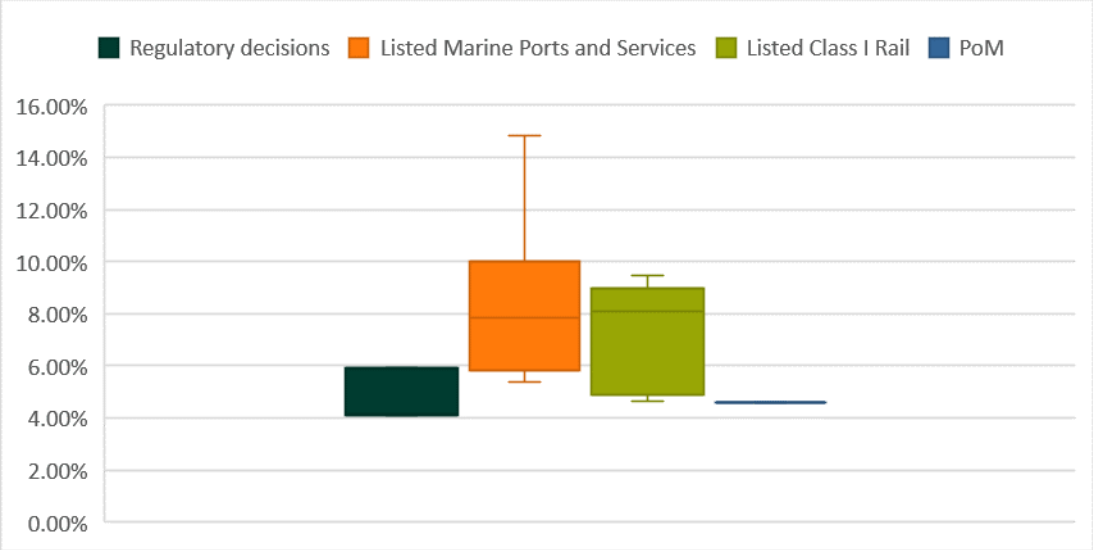
sectors, and approximately within the mid-range of relevant Australian regulatory transport decisions. The post-tax unlevered cost of equity margins for the regulatory transport decisions are as follows:[63]

- Arc Infrastructure = 4.13%
- Pilbara Railways = 5.90%
- IPART NSW Rail Access Undertaking = 4.10%

For the listed comparators, the post-tax unlevered cost of equity margins range between 4.62% and 9.45% for the Class I railroads, and between 5.38% and 14.81% for the Marine Ports and Services comparators.

Results on a post-tax levered basis are similar and are presented in Attachment C.

Figure 3 Post-tax unlevered cost of equity margins



Data source: Synergies calculations, various regulatory decisions, Bloomberg

8.4.3 Pre-tax nominal WACC margins

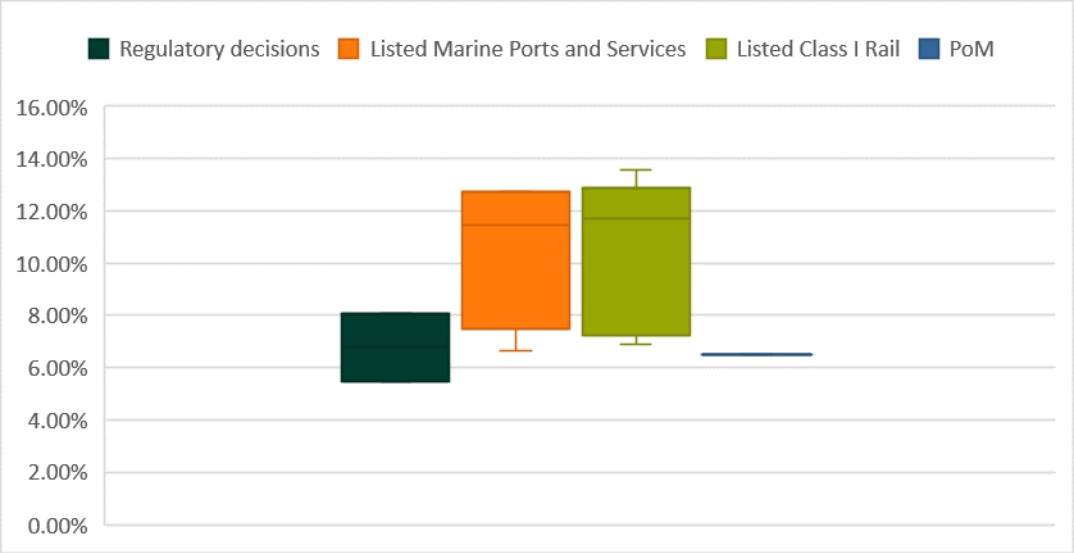
Next, we present regulatory and listed comparator estimates on the basis of WACC margins (the WACC less the risk-free rate). Regulatory decisions provide a reference point for establishing an appropriate WACC, but for a range of reasons, including the comparability of regulated firms with the BEE as well as the reservations with applying

[63] Regulated transport entities that are subject to revenue caps or equivalent mechanisms that insulate their revenue (Aurizon Network, QR, DBCT, ARTC (Hunter Valley) and Port of Newcastle) or were not the subject of regulatory decisions in the last decade (ARTC Interstate) were excluded from the benchmarking process.

regulatory benchmarks in the context of the Pricing Order it is also important to consider evidence on WACC from listed, non-regulated comparators.

As such, we present WACC estimates for the Class I railroads and Marine Ports and Services entities from our comparator set. The calculations presented here are based on Bloomberg-generated estimates of the SL CAPM return on equity and return on debt. All calculations are expressed as pre-tax nominal estimates using country specific corporate taxation rates. These WACC margins are presented in Figure 4.

Figure 4 Pre-tax nominal WACC margins



Data source: Synergies calculations, various regulatory decisions, Bloomberg

PoM's pre-tax nominal WACC margin is situated:

- within the range of relevant Australian regulatory transport decisions - PoM's pre-tax nominal WACC of 8.23% remains below that of Pilbara Railways (9.00% as at 30 June 2020), and PoM's estimated WACC margin of 6.53% is well below that of Pilbara railways (8.08%). This is despite the ERA having implemented a substantial decrease in the MRP along with an increase in gamma that together decreased the pre-tax nominal WACC for Pilbara railways by approximately 200 basis points compared to earlier decisions (not including the fall in the risk-free rate). The ERA has retained its previous asset beta and gearing assumptions for Arc Infrastructure and it has applied only a slight decrease of 0.05 in the Pilbara railways asset beta in light of changes in relevant comparator estimates.
- towards the lower end of the range for listed Class I railroads (the median WACC margin for Class I railroads is 500 basis points above the WACC margin for PoM),

- towards the lower end of the range for listed Marine Ports and Services entities (the median WACC margin for listed Marine Ports and Services entities is significantly higher than the WACC margin for PoM, by a margin of approximately 494 basis points).

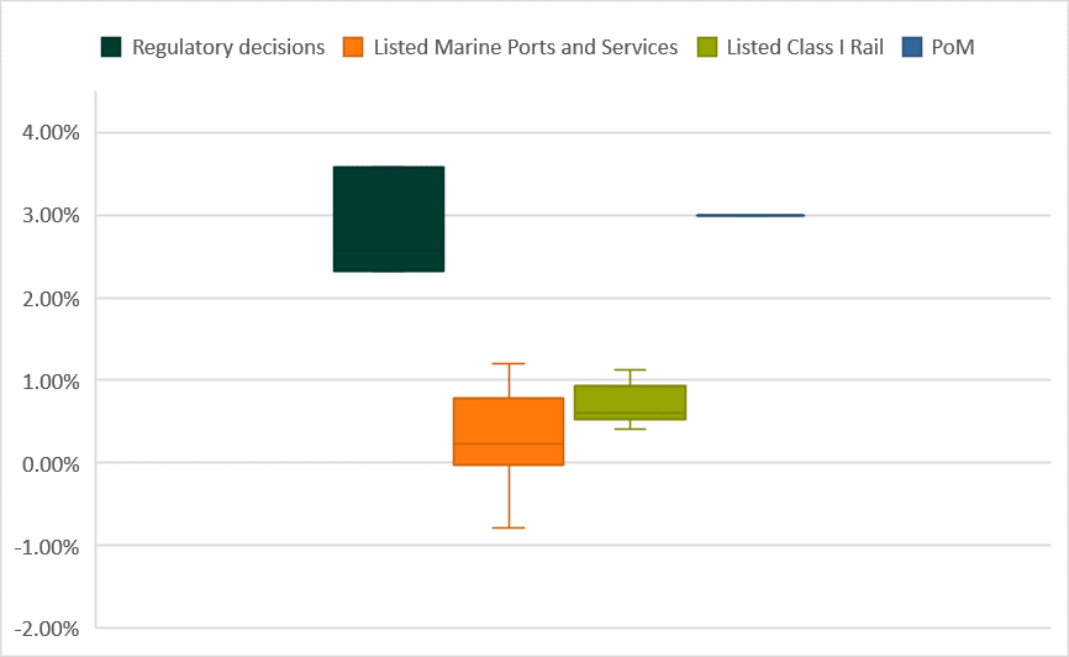
In the following subsection, we disaggregate the WACC margins into cost of equity and cost of debt margins, in an attempt to isolate the drivers of these differences.

8.4.4 Impact of cost of debt assumptions

Overall WACC comparisons of PoM with international non-regulated listed comparators are complicated by the low cost of debt assumptions that Bloomberg adopts for certain companies, including those in our comparator set. This occurs because Bloomberg applies a debt adjustment factor, which is a multiple of the risk-free rate. When the risk-free rate is very low (as it currently is both in Australia and internationally) this leads to relatively low (and, in our view, unrealistic) cost of debt estimates. As a result, a comparison of cost of equity margins is more informative.

Debt margins for regulatory decisions are relatively uncontroversial but depend on timing (risk free rate and debt margin) and whether or not the trailing average approach is adopted. On the other hand, the on-the-day cost of debt margins Bloomberg applies to the listed comparators are considerably lower than that arising from the trailing average methodology that we have implemented for PoM. Debt margins for regulatory and listed comparators are shown in Figure 5. Median DRPs reported by Bloomberg across both sectors of listed comparators are less than 1% above the risk-free rate.

Figure 5 Debt risk premia (DRP)



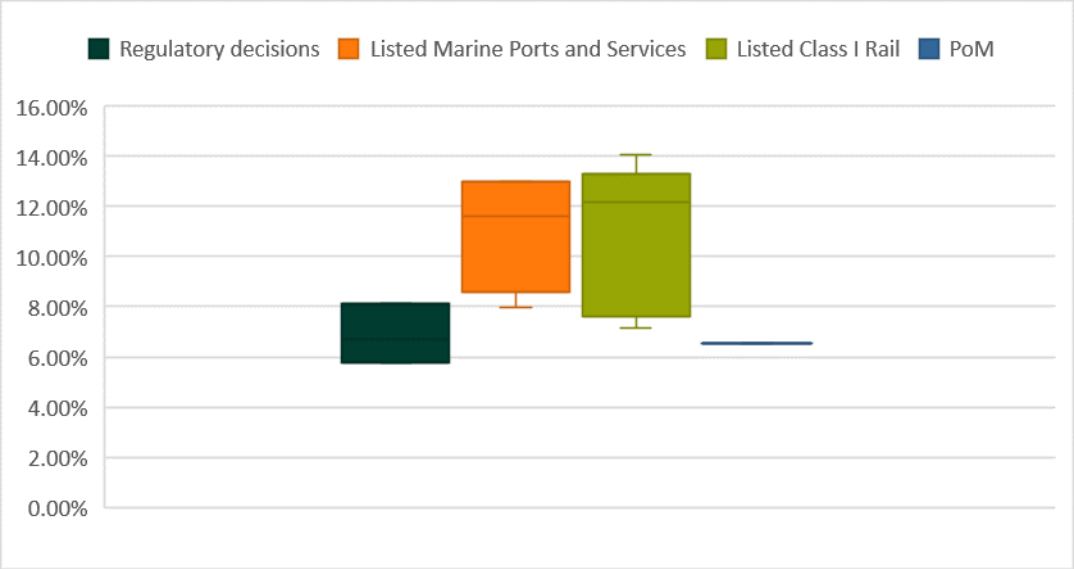
Data source: Synergies calculations, various regulatory decisions, Bloomberg

8.4.5 Adjusted pre-tax nominal WACC margins

Clearly, the Bloomberg-generated debt margins for listed comparators are unlikely to be commensurate with those required by the BEE in its provision of the Prescribed Services. Moreover, the debt margin for PoM is based on a trailing average which reduces comparability with a purely forward-looking assessment available from Bloomberg. As a result, to enhance comparability, we have re-calculated the WACC margins adopting the same cost of debt as that which we have applied for the BEE. For consistency, we have also adopted the BEE's trailing average cost of debt for the Australian regulatory decisions in this assessment.

Using these revised pre-tax nominal WACC margin estimates, shown in Figure 6, PoM's WACC margin is within the range of relevant Australian regulatory transport decisions. On the other hand, PoM's WACC margin is below the listed Class I Rail and listed Marine Ports and Services WACC margin ranges.

Figure 6 Pre-tax WACC margins adjusted for the BEE's trailing average cost of debt



Data source: Synergies calculations, various regulatory decisions, Bloomberg

8.5 Conclusion

In undertaking these benchmarking comparisons, we note that a precise comparison of WACC decisions is elusive as the risk profile of each regulated entity in the transport sector differs materially. Moreover, when comparing regulatory decisions, regulators adopt different approaches to the estimation of the cost of capital – with different assumptions being made for WACC parameters and averaging intervals. There is inherent uncertainty surrounding the true value of key parameters, as evidenced by the range of assumed values for parameters such as the MRP and gamma.[64] Each parameter assumption exerts a significant influence on the regulator's determination of the cost of capital. It is possible regulators balance to some extent the exercise in regulatory discretion in making judgements (and trade-offs) on these parameters.

Moreover, regulated transport encompasses a diversity of entities and regulatory treatments, to the point where several transport entities, which are subject to revenue caps, are benchmarked for the purposes of their relevant BEE against energy networks.

Accordingly, we consider attempting a precise reconciliation of PoM's WACC with regulatory decisions is inviting false precision to the analysis and a more relevant insight in terms of PoM's compliance with the Pricing Order can be gained from undertaking a reconciliation on the basis of broad relativities and rankings. It also highlights the benefit

[64] Among Australian regulators, the current MRP range is 5.9%-7.2%, while the current gamma range is 0.25-0.585. Updating the risk-free rate methodologies of Australian regulators to 31 March 2021 results in a range for the risk-free rate of 1.70% to 2.25%.

of broadening the perspective of the comparison beyond regulatory decisions to include unregulated comparators for the purposes of this aspect of the ESC's assessment framework.

With these caveats in mind, our main findings highlight that our WACC estimate is consistent with the returns required by the BEE with a similar degree of risk as that which applies to PoM in the provision of the Prescribed Services:

- PoM's post-tax unlevered cost of equity margin estimate (which is the most informative basis for comparison given international differences in tax regimes) is within the range of comparable Australian regulatory transport decisions and is situated towards the lower end of cost of equity margins for Listed Marine Ports and Services and Class I railroads.
- PoM's pre-tax nominal WACC estimate is situated within the range of relevant Australian regulatory transport decisions. This is despite the fact that changes the ERA has made to its WACC parameters involved a substantial decrease in the MRP along with an increase in gamma. Together, these changes decreased the pre-tax nominal WACC for Pilbara railways by approximately 200 basis points relative to earlier decisions (even before taking lower risk-free rates into consideration). The ERA's decisions meant that the allowed rate of return for affected entities fell even further than the falls in the risk-free rate to recent low levels.
- PoM's pre-tax nominal WACC margin is towards the lower end of the WACC margin ranges for listed Class I railroads and Marine Ports and Services entities, especially when we take account of differences between cost of debt for these entities and that which we have applied for the BEE.

This chapter demonstrates that our proposed WACC estimate satisfies the requirements of the Pricing Order and is commensurate with the return on capital that would be required by a BEE providing services with a similar degree of risk as applicable to PoM in providing the Prescribed Services.

Additionally, Synergies' approach to the estimation of the WACC parameters for the TCS submission complies with the guiding principles of this step, as we consider that these naturally form part of a robust WACC estimation process.

A Market power of US railways

A.1 Introduction

In the interim commentary, the ESC expressed the initial view that PoM should review its approach of including railways as direct comparators for the BEE.[65] The ESC recommended that care should be exercised with the weighting that is applied to this sector.[66]

Although the 2020 interim commentary did not elaborate on the ESC's concerns about the weighting applied railroads in the 2020 interim commentary, we understand from past commentaries that the degree of competition faced by Class I railroads is one of the first principles risk factors that is assumed to most significantly differentiate railroads from the BEE.

In this attachment, we evaluate data from the Association of American Railroads on a wide range of Class I railroad data relating to haul lengths, market share, freight composition, railroad costs and revenues. Our main findings are that:

- average haul lengths have increased over time across a range of commodity classes (which hampers the competitiveness of other modes of transportation, such as trucking);
- revenue margins have doubled in the last ten years (which demonstrates that railroads have been able to increase revenue despite falling costs); and
- on average, the largest railroad in each state accounts for 61% of total track miles, while the two largest railroads in each state account for a combined average share of 93%.

All of these factors either contribute to, or are a result of, limited competitive pressures faced by Class I railroads. In conjunction with the fact that Class I railroads have lower operating leverage relative to the BEE, and both have volumes dominated by domestic freight, we consider that Class I railroads are highly relevant comparators for the BEE.

[65] ESC (2020). Interim commentary – Port of Melbourne tariff compliance statement 2020-21, 16 December, p.14.

[66] Because 6 of the 13 companies in the listed comparator set for the BEE are railroads, railroad betas are assigned slightly less than equal weighting in the determination of the overall asset beta estimate.

A.2 Background

The ESC's views on the systematic risk profile of Class I railroads has been informed by a Frontier Economics report it commissioned in 2019.[67] Frontier Economics view was that "the question of the inclusion of railroads ultimately reduces to whether these comparators are likely to face risks that are sufficiently similar to those faced by the Port," a statement with which we concur.[68] As part of its own first principles analysis, Frontier Economics considered a comprehensive set of risk drivers which we have summarised in Table 27.

Table 27 Summary of systematic risk factors for Class I railroads considered by Frontier Economics

Factor	Frontier commentary	Synergies assessment of impact on BEE's systematic risk relative to railroads
Extent of competition facing railways	Frontier Economics concluded that PoM faces little competition, but considered that, in contrast, other regulators have found that North American railroads face significant competition for intermodal traffic, and more limited competition for bulk freight. Frontier Economics described competition exposure for railroads as being to a "significant degree", whereas PoM's exposure was only considered to be to a "minor degree"	↓ Decreases the BEE's systematic risk exposure relative to Class I railroads
Cost structure / Operating leverage	Railroad operations of rolling stock have a higher proportion of operating costs to fixed costs compared to below rail (track only) operations. This reduces railroad operating leverage relative to the BEE, which as a landlord port does not have the same vertical integration between track and transport as Class I railroads. The BEE will have a lower proportion of incremental or avoidable cost associated with increased or reduced activity and consequently the BEE's earnings will be relatively more affected by activity levels.	↑ Increases the BEE's systematic risk exposure relative to Class I railroads
Freight composition	US railroads handle a materially greater proportion of bulk freight than containerised (intermodal) freight compared to PoM. This raises the issue of whether there are differences in systematic risk between bulk and container freight businesses. Both the BEE and Class I railroads have trade exposure. Frontier Economics uses the contrasting examples of Pilbara railways transporting iron ore and railways that transport agricultural products to illustrate how bulk freight can be either high or low risk. Frontier Economics concludes that the impact on risk cannot be resolved without further investigation of each railway's particular characteristics.	Uncertain, although some of the issues raised by Frontier Economics actually reflect a combination of both product-related and competition-related considerations.
Contracting arrangements	Frontier Economics understands there is likely to be considerable variation in terms and conditions offered to US railroad customers. In contrast to Class I railroads, which benefit from a mixture of short and long-term contracts, PoM's current charges are predominantly traffic-based without long-term contracts. This provides less revenue certainty in the event of economy downturns/upturns.	↑ Increases the BEE's systematic risk exposure relative to Class I railroads

Source: Adapted from Frontier Economics report for the ESC (pp.14-15)

[67] Frontier Economics (2019). Issues in cost of capital estimation for the Port of Melbourne – Prepared for the Essential Services Commission, 12 December.

[68] Frontier Economics (2019), p.12.

Consequently, the only possible risk driver that Frontier Economics has identified as having the potential to lower the BEE's exposure relative to Class I railroads is the degree of competitive pressure. This contrasts with the passage in its "Key Findings" table, which states that *most* risks are higher than for the BEE:[69]

> Our analysis suggests there is evidence that North American railroads are not reasonable comparators to the Port. The nature of risks appears quite different, with most risks being higher than the Port.

Competition among Class I railroads has historically been a key focus for Australian economic regulators when considering these comparators for the WA rail networks, ARTC, the NSW Rail Access Undertaking, and Queensland Rail. These are summarised in Table 28.

Table 28 Australian regulatory commentary on Class I railroads

Regulator	Position on competitive pressures facing Class I railroads
ERA	Overseas rail operators would possess a higher level of systematic risk, relative to an Australian railway operator, given that American and Canadian railway operators were expected to face higher degrees of competition from alternative forms of transportation such as roads
ACCC	North American railways may have higher market risk [compared to ARTC] because they often compete with one another due to parallel infrastructure. Despite this, on balance the ACCC considers that North American and other overseas rail operators' asset betas (average 0.7) generally support ARTC's argument for an asset beta of 0.65 for its Interstate Rail Network.
IPART	The equity beta of US Class 1 railroads is high (0.93) because the regulation of the US Class 1 railroads is non-constraining and a substantial portion of their revenues is subject to competition from other railroads and other forms of transport. As a result, stranding risk is higher and revenues are sensitive to the economic cycle.
QCA	Class 1 railroads face competitive pressure from parallel lines and alternative modes of transport. This enhances the level of counterparty risk, as customers have the ability to move their business from one Class 1 railroad operator to a competing operator. Class 1 railroads are generally not subject to a comprehensive regulatory regime that buffers their cash flows. This is to be expected given they face competitive pressure from parallel lines and alternative modes of transport

Source: Various regulatory decisions ERA, September 2015, final decision, Review of the method for estimating the Weighted Average Cost of Capital for the Regulated Railway Networks, p. 148; ACCC, April 2008, draft decision, 2008 ARTC Interstate access undertaking, p. 155; IPART, July 2014, final report and decision, NSW Rail access undertaking – review of the rate of return and remaining mine life, p. 17; QCA, April 2019, Draft Decision, Queensland Rail's 2020 Draft Access Undertaking, pp. 147-148.

Although Australian regulators have observed that Class I railroads face competitive pressures, the key issue is whether these characteristics result in railroads facing a similar degree of systematic risk as that applicable to the BEE in its provision of Prescribed Services.

The various commentaries emphasise two aspects of competition that regulators and practitioners have focused on: railroads competing with one another; and railroads competing with other modes of transportation. To evaluate this competitive position

[69] Frontier Economics (2019), p.3.

more comprehensively, we have examined the literature on competition faced by Class 1 railroads.

Since the passage of the Staggers Act in 1980, many US railroads have merged. The number of Class I railways has declined over the past 40 years from 41 to five: the Burlington Northern Santa Fe (BNSF) and Union Pacific Southern Pacific (UPSP) in the west, CSX and Norfolk Southern (NS) in the east, and the Kansas City Southern (KCS) in the center. Both horizontal ("parallel") and vertical ("end-to-end") mergers were part of this consolidation.

The last round of mergers was in the 1990s when the number of major competitors reduced from four to two in the west (with BN combining with ATSF in 1995 and UP combining with SP in 1996), and from three to two in the east (with CSX and NS carving up the assets of Conrail in 1998).[70] On the Canadian side, Canadian railway shipping has remained divided between two transcontinental carriers, the Canadian National (CN) and Canadian Pacific (CP) railways. These mergers have led to significant concentration in the US rail industry.

A 2014 paper by the US Department of Agriculture reported that:[71]

> Since the passage of the Staggers Act in 1980, many railroads have merged. The market share of Class I railroads has increased since then, while the number of Class I railroads has fallen to only seven. Through railroad mergers, rail-to-rail competition has been reduced, railroad market power has increased, and rail costs have fallen by over half in real terms. Over much of this period, most of these reduced costs were passed on to shippers as savings through lower rates. Since 2004, however, average rail rates per ton-mile for all commodities have climbed 36 percent, negating some of the savings over the period.

This report echoed the findings of an earlier 2006 paper by the US Government Accountability Office (GAO), which observed that:[72]

> Concerns about competition and captivity remain as traffic is concentrated in fewer railroads. GAO's analysis of limited available measures indicates that the extent of

[70] Russell Pittman, May 2009, Railway Mergers and Railway Alliances: Competition Issues and Lessons for Other Network Industries, Economic Analysis Group Discussion Paper.

[71] United States Department of Agriculture (2014). Railroad Concentration, Market Shares, and Rates, February, p.1 Accessed from: https://www.ams.usda.gov/sites/default/files/media/Railroad%20Concentration%2C%20Market%20Shares%2C%20and%20Rates.pdf

[72] US Government Accountability Office (2006). Freight Railroads - Industry Health Has Improved, but Concerns about Competition and Capacity Should Be Addressed, p.2. Accessed from: https://www.gao.gov/assets/260/252473.pdf

> captivity appears to be dropping, but the percentage of traffic traveling at rates substantially over the threshold for rate relief has increased. Also, some areas with access to only one major railroad have higher percentages of traffic traveling at rates above the threshold. These findings may reflect reasonable economic practices by the railroads or a possible abuse of market power. GAO's analysis is limited by available data and proxy measures but suggests that shippers in selected markets may be paying excessive rates, meriting further inquiry and analysis.

These commentaries suggest the possibility of the existence of market power in US Railroads, which requires further assessment based on relevant data, that we have undertaken next.

A.3 Analysis of Class I railroad market power

Increased railroad concentration could indicate an increase in railroad market power, which can be assessed by, for instance, analysing evidence of deviation between the market price and costs. Our view is that a growing wedge between changes in price and costs over time would indicate existence of market power.

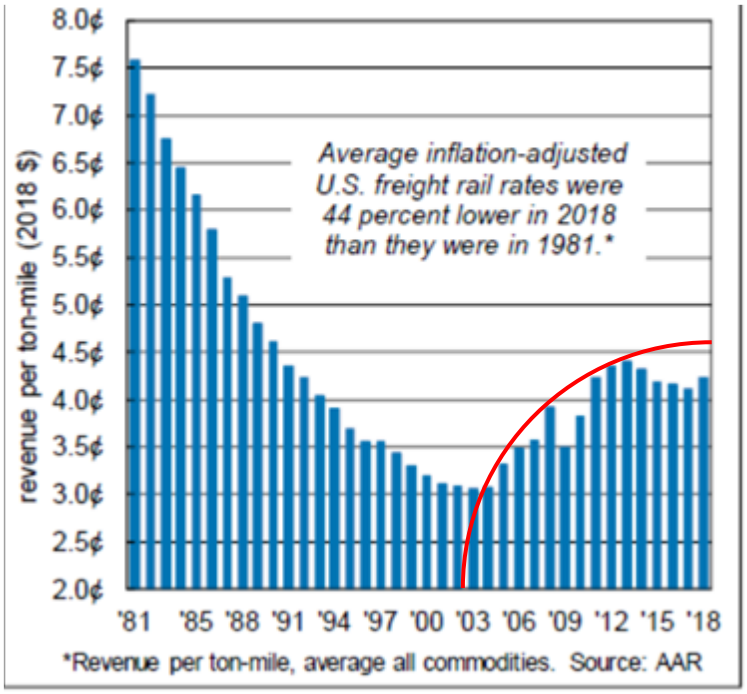
We considered the following evidence to assess market power exerted by US railroads:

- Data on price and cost
- Composition of freight carried by US Class I railroads and their competition environment
- The share of track miles operated by each Class I railroad in each state.

A.3.1 Data on railroads price and cost

Figure 7 shows the inflation adjusted average revenue per ton-mile from 1981 to 2018, published by the Association of American Railroads (AAR). The figure shows that from about 2003/04 average rail rates per ton-mile has increased by 30 to 50 percent in real terms.

Figure 7 Historical average inflation-adjusted U.S. freight rail rates (1981-2018)

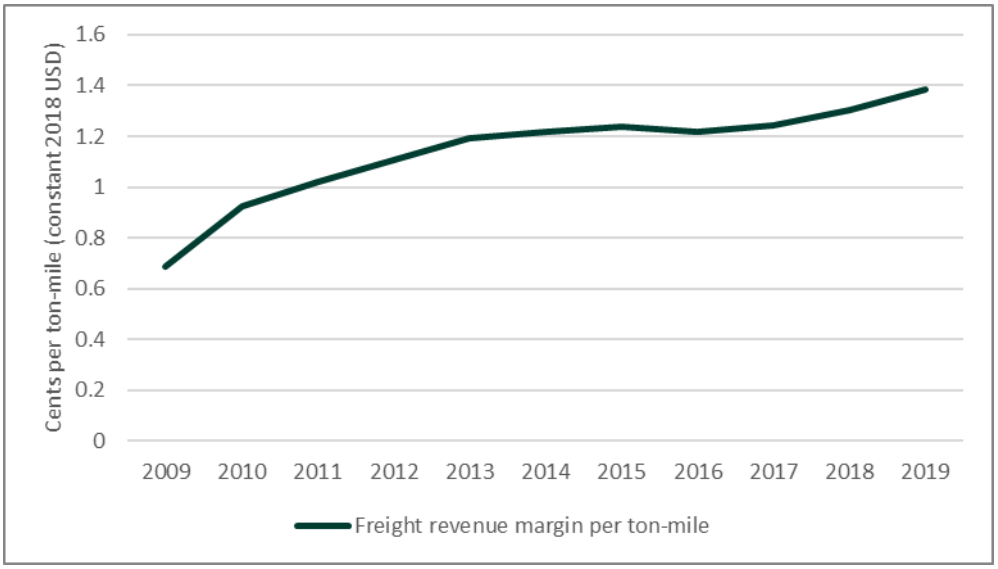


Data source: https://www.aar.org/wp-content/uploads/2018/08/Overview-of-Americas-Freight-RRs.pdf

Revenue margins

The inflation-adjusted rail rates in the previous section demonstrate that US railroads have been able to increase prices above the rate of CPI over the last 20 years, but they do not reveal the extent to which the operating expenses faced by railroads have changed over the same time period. While we have not been able to collect cost data extending back as far back as 1981, we have been able to analyse AAR data on freight revenue margins since 2009. Figure 8 illustrates that the freight revenue margin for US railroads has more than doubled in the last 10 years in real terms.

Figure 8 Freight revenue margin per ton-mile



Note: Revenue margins are reported on a real basis. The margin is calculated as freight revenue less freight operating expenses per ton-mile

Data source: AAR Railroad Ten-Year Trends 2009-2018 (with preliminary 2019 data)

Producer price and cost indices for rail transportation

As an alternative indicator of prices, we considered the Producer Price Index by Industry: Rail Transportation, published by FRED.[73] This data series encompasses all railways and is not limited to Class Is (although Class Is would represent the bulk of the revenue). We understand this series represents nominal prices, therefore we considered the FRED series as published as well as an adjusted series we generated by deflating the PPI by US GDP implicit deflator, which would represent inflation-adjusted changes in prices of rail freight transportation services.

As an indicator of rail costs, we considered the Rail Adjustment cost factor (RCAF) published by the Surface Transportation Board (STB). The STB publishes three types of RCAF on a quarterly basis: RCAF (Unadjusted)[74] and the productivity adjusted RCAF (Adjusted) and RCAF-5[75]. The US Department of Agriculture characterises RCAF to

[73] https://alfred.stlouisfed.org/series?seid=PCU4821148211

[74] The RCAF (Unadjusted) is an index reflecting cost changes experienced by the railroad industry, without reference to changes in rail productivity.

[75] The RCAF (Adjusted) is an index that is derived by derived by modifying the RCAF (unadjusted) for moving five-year productivity gains. It reflects national average productivity changes as originally developed and applied by the Interstate Commerce Commission (ICC), the calculation of which is currently based on a five-year moving average. The RCAF-5 is an index that also reflects national average productivity changes; however, those productivity changes are calculated as if a five-year moving average had been applied consistently from the productivity adjustment's inception in 1989.

measure 'real rail costs adjusted for railroad productivity'.[76] For the purpose of this analysis, we considered RCAF (adjusted), which is most likely to represent changes in real rail costs.

The relative movement in these two series could give an indication of the relative movement of prices and costs of railroads. In a competitive market, it is expected that these two series will tend to move together, albeit possibly subject to a lag.

Since the two series, FRED and RCAF, are determined with reference to different base periods, we re-based them against their April 2000 number. RCAF is a quarterly index and FRED is a monthly index. For a like for like comparison, we used the FRED monthly index at beginning of January, April, July and October as representative of corresponding quarters. Further, given the difference in the magnitude of the RCAF series, we normalised it on a scale of 100. Data is presented for quarterly numbers for the period April 2000 to January 2020.

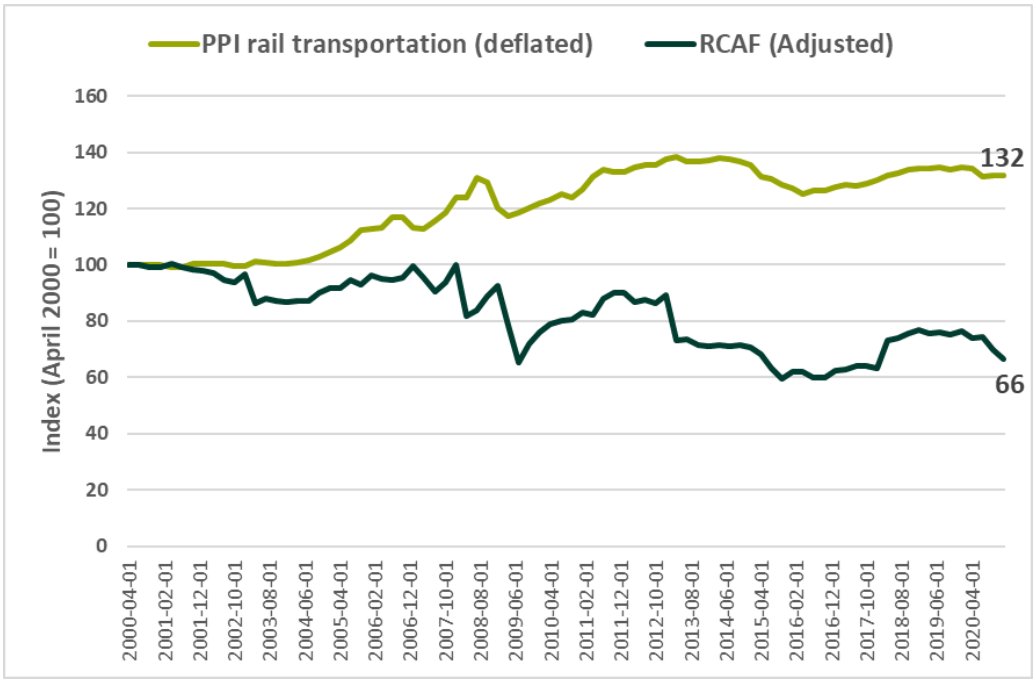
We considered the FRED series deflated by the US GDP Implicit Price deflator (which we re-based to April 2000 to be consistent with the reference base for the other indices we have used in our analysis).

Figure 9 shows an increased gap between FRED (deflated) and RCAF series, particularly since 2013. In that period,

- FRED (deflated) prices increased by 32%
- Real rail costs decreased by 34%

[76] US Department of Agriculture, Railroad Concentration, Market shares, and Rates, Feb 2014.

Figure 9 FRED (deflated) and RCAF trend



Data source: Synergies analysis based on FRED, RCAF and US GDP Implicit deflators data

A.3.2 Freight composition of US railroads

According to US Department of Transportation, of rail freight, 91 percent are bulk commodities, such as agriculture and energy products, automobiles and components, construction materials, chemicals, coal, equipment, food, metals, minerals, and paper and pulp. The remaining 9 percent is intermodal traffic, which generally consists of consumer goods and other miscellaneous products.[77]

Frontier Economics observed that the freight composition of the US railroads contains a materially greater proportion of bulk freight than containerised (intermodal) freight than does the Port. This observation is consistent with the latest data reported by the AAR, although this data does not differentiate between domestic freight and freight destined for export. However, it is anticipated that the majority of bulk freight transported on Class I railroads is domestic-oriented, which mirrors the domestic nature of PoM's container volumes, which are heavily import-oriented.

Relevantly, Frontier also observed that other regulators have found that the North American railroads face significant competition for intermodal traffic, and more limited competition for bulk freight. On this view, since bulk freight accounts for the majority of

[77] U.S. Department of Transportation. Freight rail overview. Available from: https://railroads.dot.gov/rail-network-development/freight-rail/freight-rail-overview

freight moved by US railroads, it would follow that US railroads face limited competition overall. This would be consistent with the evidence of higher margins of US railroads shown earlier.

Additionally, we have analysed data regarding freight revenue composition by commodity class for the Class I railroad sector using data from the AAR for 2020. The data is generally consistent with the high-level evidence above regarding the split between bulk traffic and intermodal. For the Class I railroad sector as a whole, the largest categories are as follows:

- Chemicals and allied products (17% of Class I railroad revenue);
- Miscellaneous mixed shipments (which according to the AAR consists largely of intermodal – 15% of Class I railroad revenue);
- Farm products (10% of Class I railroad revenue);
- Coal (10% of Class I railroad revenue);
- Food and kindred products (9% of Class I railroad revenue);
- Transportation equipment (e.g. cars and other vehicles) (8% of Class I railroad revenue)

The precise revenue decompositions differ by railroad, but in most instances they do not depart materially from the sector averages.

The intensity of competition pressure will also depend on:

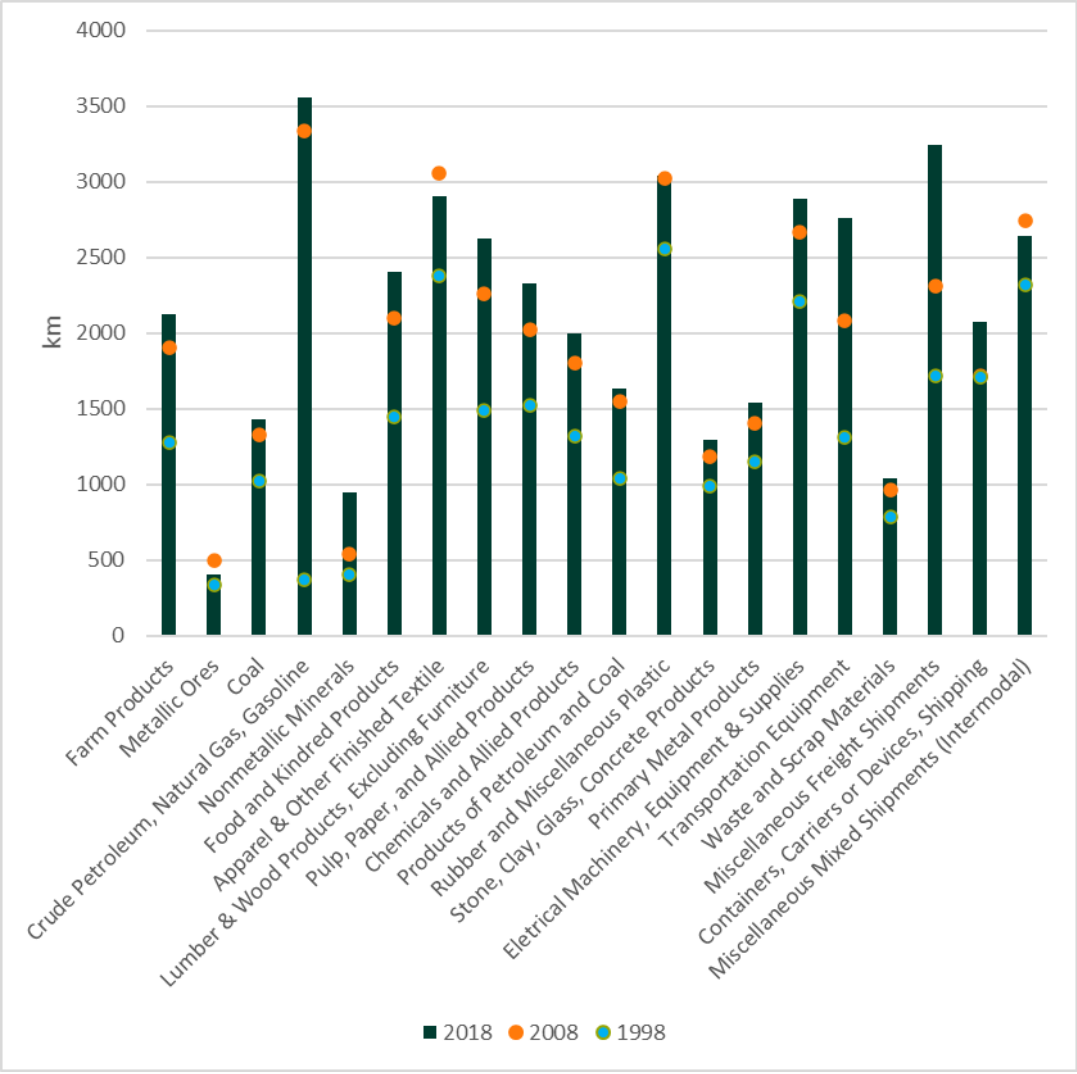
- Product characteristics (eg density, volume) and customer requirements (eg transit time, frequency and reliability)
- Haul length – considered as origin – destination pairing, including interchange; and
- Proximity of competing terminals to the particular railway undertaking the movement – both at origin and destination.

As demonstrated in the following sections, the majority of US rail hauls are such that rail as a mode is advantaged over trucking (mainly due to product characteristics and haul length) and that the location of terminal infrastructure means that one rail provider will naturally be advantaged over another (typically one other) rail provider given the origin destination pairing of any movement.

A.3.3 Haul lengths

As illustrated by Figure 10, the average haul length for every commodity increased between 1998 and 2018. Between 2008 and 2018, the average haul length increased for every commodity except for minor decreases in the length of Miscellaneous Mixed Shipments (which consists largely of intermodal) and Apparel and Other Finished Textiles (which accounts for only 1% of total Class I traffic). Shorter hauls (metallic ores, coal, minerals and waste and scrap materials) are particularly dense materials that will naturally be attracted to rail as a transport mode.

Figure 10 Change in average haul lengths by commodity (1998-2018)

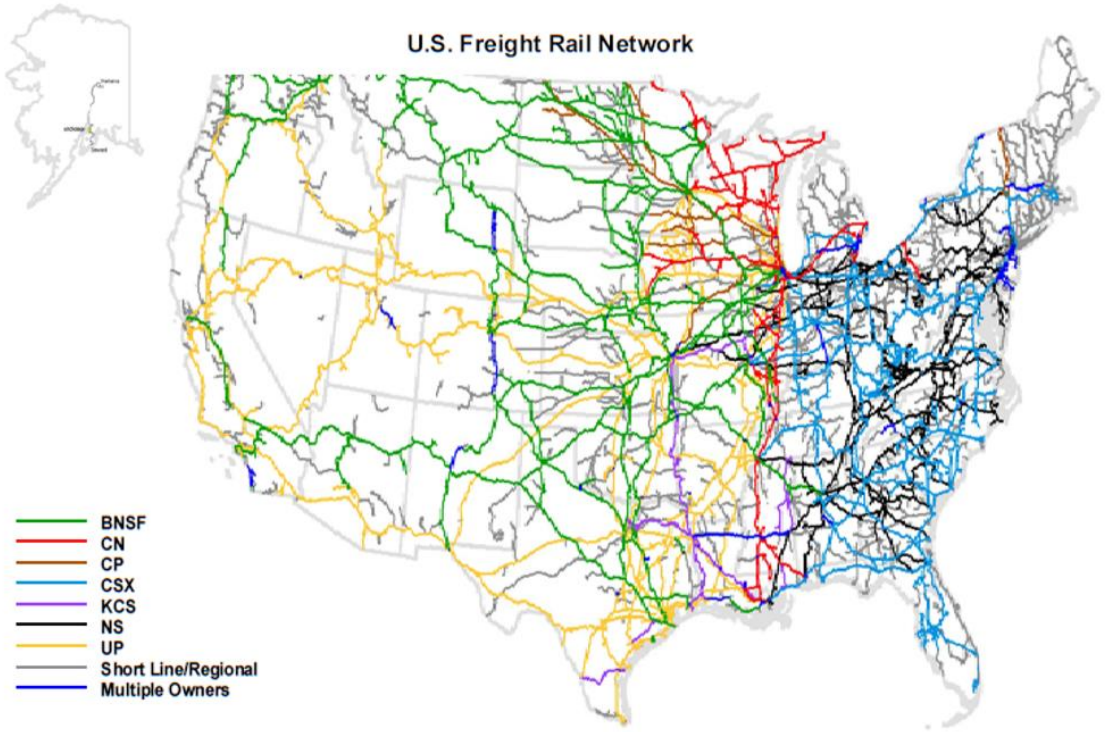


Data source: AAR

A.3.4 Proximity and competition between Class I railroads

Figure 11 presents a map of the US freight rail network, with the network of each Class I railroad (as well as other regional rail roads) shown in different colours. Although there is a higher concentration of railroads on the East Coast, BNSF and Union Pacific are the dominant railroads on the West Coast. As detailed below though, even on the East Coast, there are specific regions where one railroad is dominant.

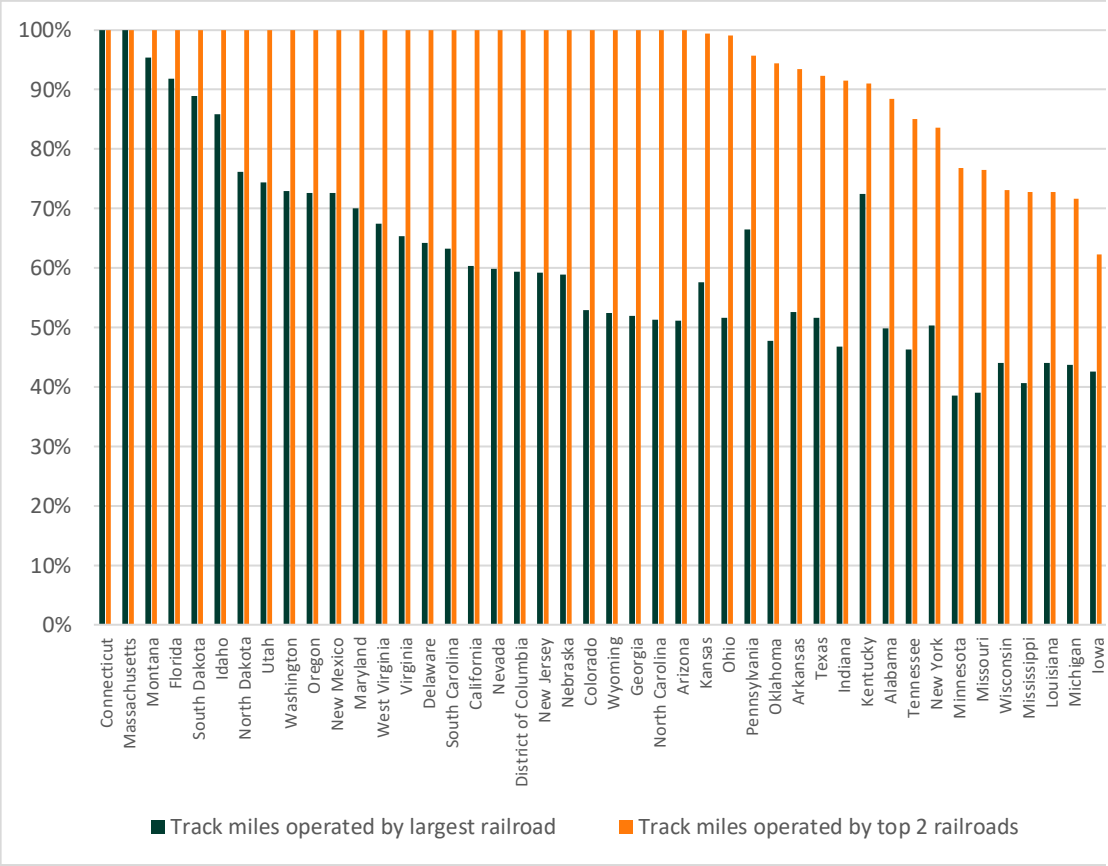
Figure 11 Map of US freight rail network



Data source: AAR

Figure 12 displays the proportion of track miles operated by the largest railroad, and top two largest railroads, respectively, in each US state. The proportion of track miles operated by the largest railroad in the state are denoted by a green bar, while the orange bar for each state shows the total share of miles operated by the two largest railroads in the state. On average, the largest railroad in each state accounts for 61% of total track miles, while the two largest railroads in each state account for a combined average share of 93%.

Figure 12 Share of track miles operated by largest railroads, by State



Note: States excluded from this figure (such as Hawaii and Alaska) do not have Class I railroad operations.
Data source: AAR

With regard to specific Class I railroads, the data underpinning Figure 12 reveals the following key insights:

- CSX operates 92% of track miles on Florida, 100% of track miles in Massachusetts and Connecticut, 63% of track miles in South Carolina, and 67% in West Virginia;
- There is a roughly 50/50 split between BNSF and Union Pacific in Arizona, with the map in Figure 11 illustrating that the BNSF and Union Pacific tracks are at opposite ends of the state and therefore not in direct competition with each other;
- Union Pacific accounts for 86% of track miles in Idaho, 72% in Utah, and 73% in Oregon;
- Norfolk Southern operates two-thirds of track miles in both Pennsylvania and Virginia;

Consequently, while there are instances of multiple Class I railroads operating in the same state, there are significant parts of the US where competition between Class I

railroads is either limited or close to absent. Even where multiple railroads operate in a given state, the infrastructure may be situated in different parts of the state rather than parallel to each other.

A.4 Conclusion on market power of Class I railroads

Having regard to a range of characteristics (including but not limited to the competition environment), we retain our view that freight railroads (in particular, North American Class I railroads) are appropriate comparators, and indeed, reflect some of the most relevant comparators to the BEE, despite having lower operating margins (which will tend to exert a dampening effect on beta).

Further, contrary to the arguments put forward by regulators, Class I railroads do not appear to be exposed to a significant degree of competition; rather, our analysis indicates the existence of market power among Class I railroads. The evidence in this attachment demonstrates that increased margins for US railroads have occurred at a time of increased market concentration in US railroads, which is also consistent with the existence of market power. This conclusion is consistent with the evidence that US railroads carry the type of freight (bulk freight) for which there is limited competition. Moreover, average haul lengths have increased for virtually all commodities over the last two decades, which has hampered the competitiveness of other transport modes, such as trucking. Shorter haul traffics are inevitably particularly dense cargoes that are inherently ill suited to road transport.

Also, for railways, operations of rolling stock have a higher proportion of operating costs to fixed costs compared to below rail (track only) operations. Overall, this will reduce operating leverage of railroads relative to the BEE because Class I railways would have relatively higher proportion of avoidable costs than PoM.

B Beta diagnostics

The purpose of this attachment is to present estimates that reinforce the robustness of our beta analysis. We have estimated portfolio betas for each of the industry sectors (Marine Ports and Services, and Railroads), and we have also experimented with different monthly starting days for the monthly returns used in our beta estimates.

B.1 Portfolio Betas

An informative robustness test for our beta estimates is to evaluate the beta for each sector using a value-weighted portfolio of the comparable companies, rather than averaging across the firms in each sector. The returns of each stock in the portfolio were weighted by market capitalisation in each month/week. In a similar way, the monthly/weekly market return was calculated as the weighted average of the monthly/weekly returns for each company's home country benchmark. Likewise, each company's gearing ratio was also weighted by its market capitalisation. The results from these estimates are presented in Table 29.

Table 29 Portfolio Asset Beta Estimates

Timeframe	Marine Ports and Services	Railroads	All firms
5 Year Portfolio (Monthly)	0.77	0.90	0.89
5 Year Portfolio (Weekly)	0.74	0.86	0.85
10 Year Portfolio (Monthly)	0.73	0.91	0.88
10 Year Portfolio (Weekly)	0.72	0.90	0.88

Source: Bloomberg, Synergies calculations

For the Marine Ports and Services sector, the 5-year monthly (weekly) portfolio beta is 0.77 (0.74), while the 10-year monthly (weekly) portfolio beta is 0.73 (0.72). These estimates are higher than those that result from simple averages or medians of the sample (see Chapter 4). This can be attributed to the weighting of firms according to their market capitalisations.

In regard to the Railroads sector, the 5-year monthly and weekly and 10-year monthly and weekly portfolio betas (0.90, 0.86, 0.91 and 0.90, respectively) are similar to the corresponding average and median asset betas for the sector (which range between 0.80 and 0.90). The portfolio betas for the full sample of firms (i.e. both Marine Ports and Services and Railroads) are closer to the portfolio beta estimates for Railroads than for Marine Ports and Services. 94% of the total market capitalisation of the comparator set is accounted for by the Railroads sample. As a result, the overall portfolio beta will more closely resemble the estimate for this sector.

B.2 Beta estimates using different monthly and weekly starting days

By default, the monthly and weekly returns used in our beta analysis are calculated at the end of each month or week. To add robustness to our beta estimates, we have compiled supporting beta estimates using every other day of the month or week, and have averaged across these individual estimates. Results over both a five-year and ten-year timeframe are displayed in Table 30, and reinforce an asset beta value of 0.70.

Table 30 Beta estimates averaged across different starting days

	Monthly returns		Weekly returns	
Timeframe	**31-day Average**	**31-day Median**	**5-day Average**	**5-day Median**
5 Years	0.79	0.79	0.75	0.72
10 Years	0.79	0.74	0.76	0.76

Note: To accommodate different month lengths throughout the year, we have also taken averages over 28 days. This causes no difference in the 10 year estimates, and a difference of only 0.01 in the average for the 5 year estimates.

Source: Bloomberg, Synergies

The results presented in the table above are based on 31-day averages. If the given starting date falls on a weekend or public holiday in a particular month, we use the most recent trading day as an approximation. For example, where the starting day is set to be the 15th of the month, if the 15th falls on a weekend, the value from the previous trading day is used as an approximation. To accommodate different month lengths throughout the year, we have also taken averages over 28 days. This has virtually no impact on the findings.

C WACC benchmarking

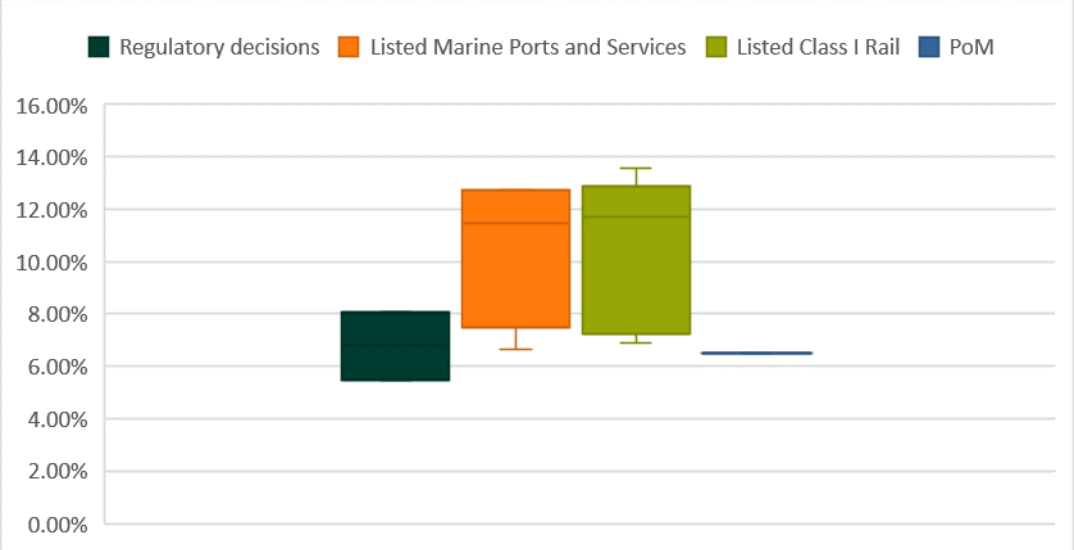
This attachment sets out a range of comparison metrics for benchmarking purposes, some of which are less relevant, but nevertheless supplement the analysis of WACC and cost of equity margins in Chapter 8. The attachment concludes with additional information on the Bloomberg-generated WACC estimates for listed comparators.

C.1 Benchmarking outcomes

C.1.1 Pre-tax nominal WACC margins

Figure 13 displays the pre-tax nominal WACC margins from Chapter 8. As discussed there, comparison with listed comparators on this metric is complicated by the low cost of debt margins that Bloomberg adopts for these estimates. Nevertheless, PoM's WACC sits towards the lower end of the WACC ranges for Class I railroads and Marine Ports and Services. An adjustment for the cost of debt is addressed in section C.1.6 below.

Figure 13 Regulatory and listed comparator pre-tax nominal WACC margins

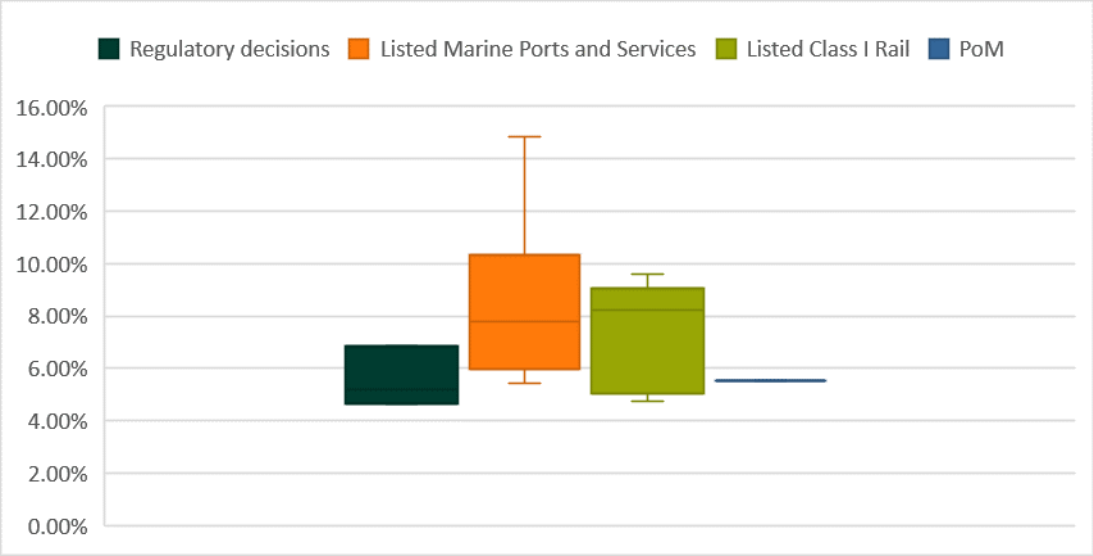


Data source: Synergies calculations, various regulatory decisions, Bloomberg

C.1.2 Post-tax nominal WACC margins

Although the Pricing Order stipulates that the WACC for the BEE should be calculated on a pre-tax nominal basis, a comparison of post-tax nominal WACC margins is informative for distinguishing the impact of differing gamma assumptions (0.50 in the case of PoM, 0.25 in the case of IPART, and 0.50 in the case of the ERA decisions). PoM's post-tax nominal WACC margin sits in the middle of the regulatory range.

Figure 14 Regulatory and listed comparator post-tax nominal WACC margins



Data source: Synergies calculations, various regulatory decisions, Bloomberg

C.1.3 Cost of equity margins

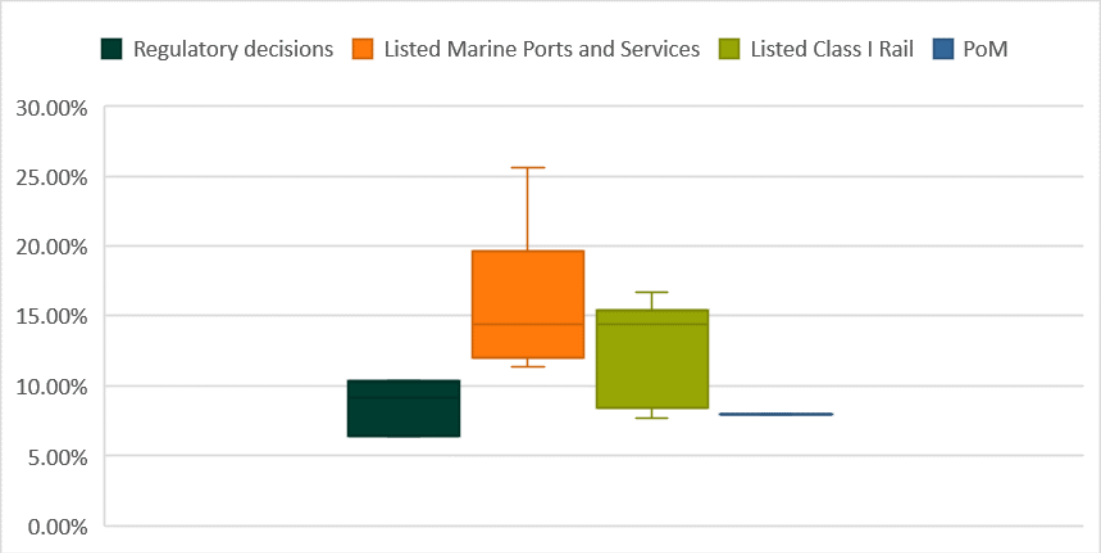
Cost of equity margins can be presented using a number of specifications, each with their own merits. We consider each of these approaches in turn.

C.1.4 Pre-tax cost of equity margins

Levered

Figure 15 displays pre-tax cost of equity margins on a levered basis. This means that part of the difference in cost of equity margins could still be attributable to differences in gearing (i.e. financial risk) rather than differences in asset betas (i.e. systematic risk). In any case, PoM's cost of equity margin estimate is at the lower end of the range defined by listed comparators, and sits within the range of regulatory comparators. however, this comparison is affected by there being no allowance made for differing gearing levels. This issue is addressed if we compare equity margins on an unlevered basis.

Figure 15 Regulatory and listed comparator pre-tax cost of equity margins (levered)

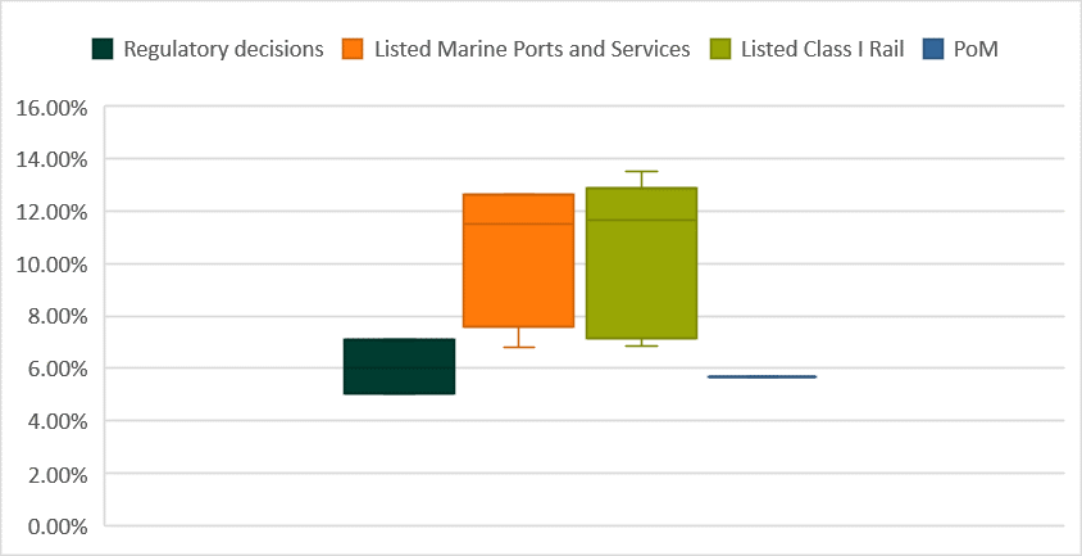


Data source: Synergies calculations, various regulatory decisions, Bloomberg

Unlevered

Figure 16 presents the same cost of equity margins as in Figure 15, but instead calculated on an unlevered basis. In other words, they have been calculated assuming zero gearing (i.e. asset beta = equity beta) to eliminate the impact of gearing from the comparison. The previous comparison is confounded by the impact of gearing, because two entities with the same asset betas could have different equity betas (and in turn, have a different cost of equity) depending on their gearing assumptions. PoM's estimate lies below the range for the listed comparators, and lies within the range of regulated post-tax cost of equity margins.

Figure 16 Regulatory and listed comparator pre-tax cost of equity margins (unlevered)



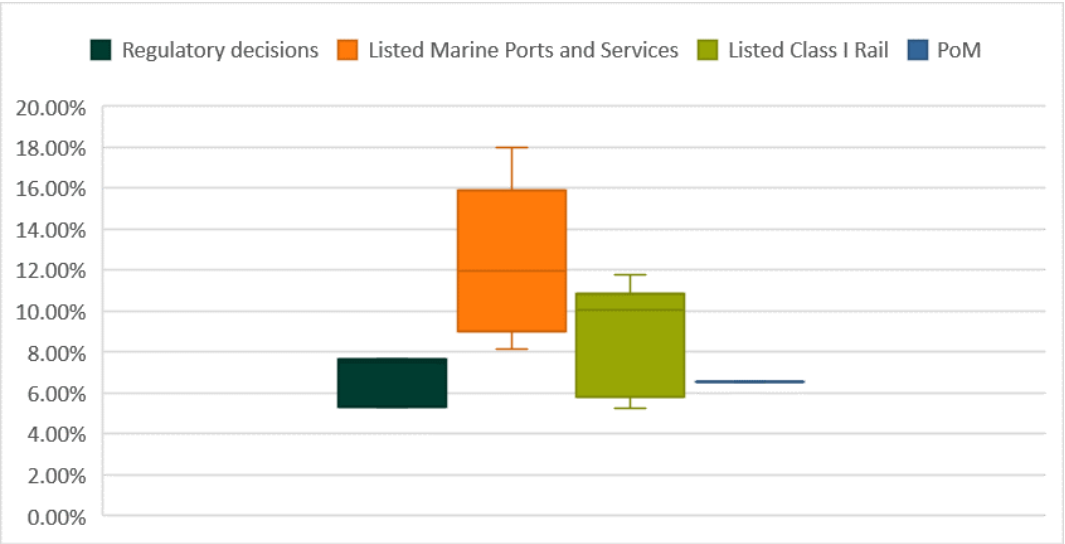
Data source: Synergies calculations, various regulatory decisions, Bloomberg

C.1.5 Post-tax cost of equity margins

Levered

As shown in Figure 17, PoM's post-tax cost of equity margin estimate is well below the majority of listed comparators on a levered basis. PoM's post-tax cost of equity margin sits within the range of regulated post-tax cost of equity margins.

Figure 17 Regulatory and listed comparator post-tax cost of equity margins (levered)

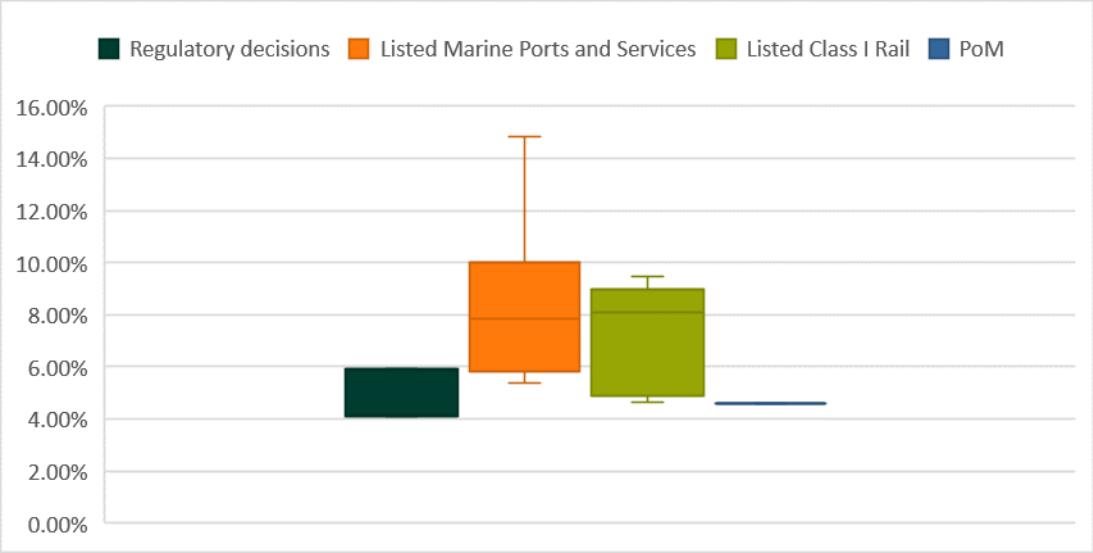


Data source: Synergies calculations, various regulatory decisions, Bloomberg

Unlevered

On an unlevered basis, PoM's post-tax cost of equity margin is again within the range of regulated post-tax cost of equity margins, as shown in Figure 18. In effect, the post-tax cost of equity margin comparison removes the impact of differences in gearing as well as gamma.

Figure 18 Regulatory and listed comparator post-tax cost of equity margins (unlevered)

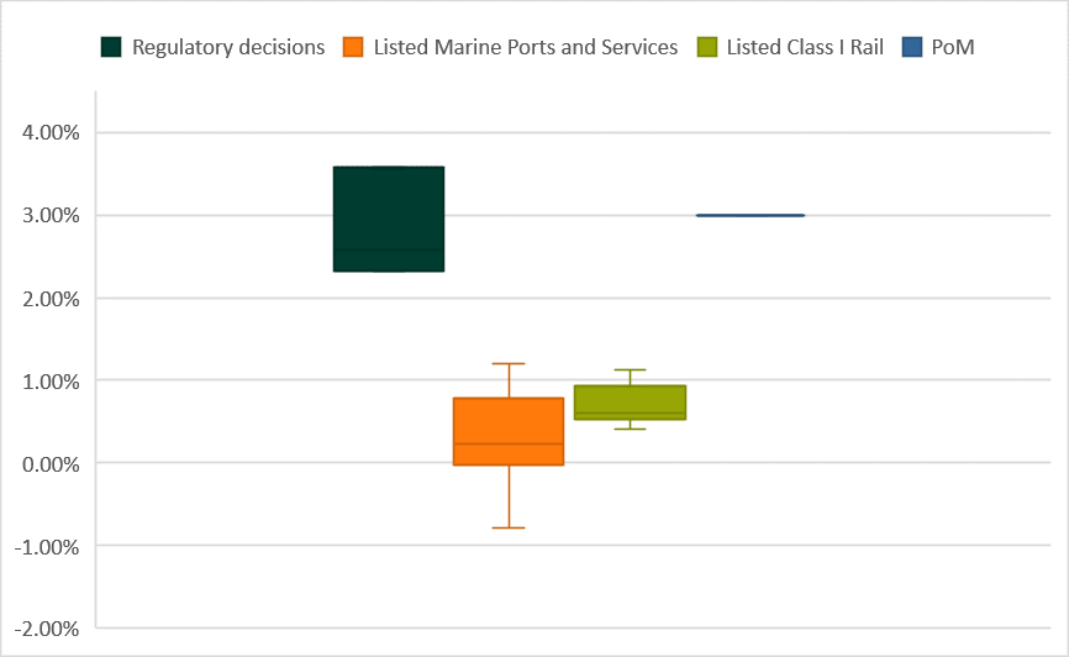


Data source: Synergies calculations, various regulatory decisions, Bloomberg

C.1.6 Comparison of DRPs

The significantly lower WACC margins for listed Marine Ports and Services entities is due to anomalies in Bloomberg's cost of debt estimation. Figure 19 shows the debt risk premia (DRPs), measured as the cost of debt less the risk-free rate, for regulated and listed comparators.

Figure 19 Regulatory and listed comparator debt risk premia (DRP)



Data source: Synergies calculations, various regulatory decisions, Bloomberg

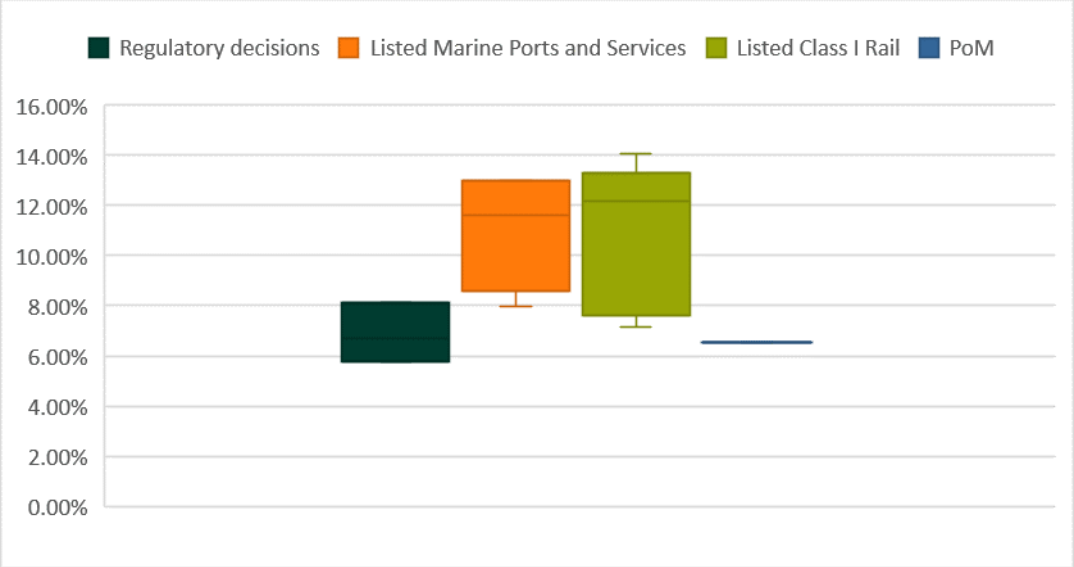
The median DRP for listed Marine Ports and Services is only 0.24%, while the margin for Class I railroads is only 0.60%. In the case of Hamburger Hafen und Logistik, Bloomberg applies a cost of debt of 0%. The reported risk-free rate for Germany is -0.24%. This means that Bloomberg is unable to apply its methodology of applying a debt adjustment multiple to the risk-free rate. Accordingly, in order to compare WACC margins, it is necessary to address the cost of debt on a comparable basis.

C.1.7 Adjusted WACC margins adopting the cost of debt applicable to PoM

The results in Figure 19 make clear that Bloomberg-generated debt margins for listed comparators are unlikely to be commensurate with those required by the BEE in its provision of the Prescribed Services. The majority of these debt margins are well below any current regulatory allowance in Australia. As a result, a more informative comparison can be made by re-calculating the WACC margins adopting the same cost of debt as that which we have applied for the BEE. We address adjusted pre-tax and post-tax WACC margins in turn.

C.1.8 Adjusted pre-tax WACC margins

Figure 20 Pre-tax WACC margins adjusted for the BEE's trailing average cost of debt



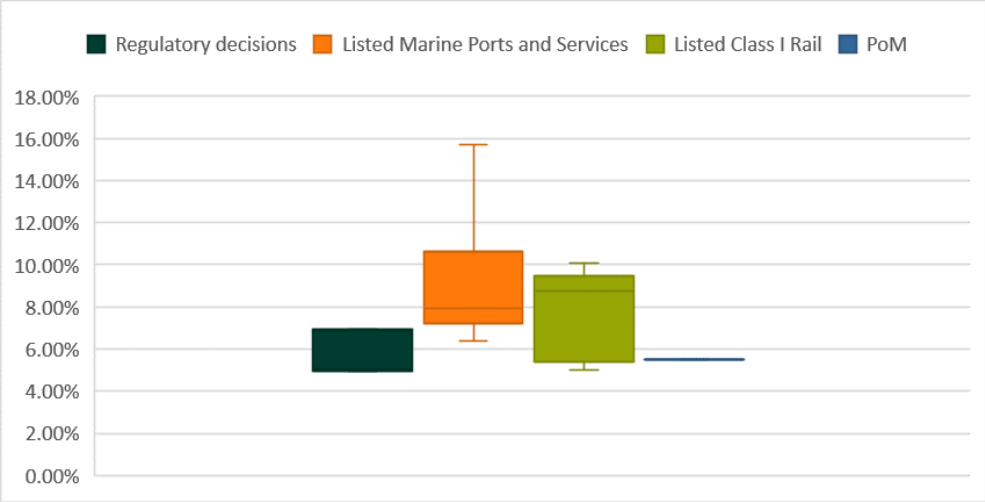
Data source: Synergies calculations, various regulatory decisions, Bloomberg

A comparison of pre-tax nominal WACC margins after adjusting for the cost of debt is likely to be the most suitable basis on which to benchmark the required return for the BEE. The median WACC margins for Marine Ports and Services and Class I railroads are now more than 450 basis points above PoM, with PoM situated below the lower end of the range for both sectors. PoM's WACC margin is within the regulatory range.

C.1.9 Adjusted post-tax WACC margins

It is also informative to examine post-tax WACC margins after adjusting for the use of a trailing average for the cost of debt. Interestingly, the WACC margin ranges across sectors are more similar on a post-tax basis.

Figure 21 Post-tax WACC margins adjusted for the BEE's trailing average cost of debt



Data source: Synergies calculations, various regulatory decisions, Bloomberg

C.2 Supplementary information on listed comparator methodology

The purpose of this section is to provide further detail on the methodology for the Bloomberg-generated listed comparator WACC estimates that we presented in Chapter 8.

Pre-tax WACC estimates for North American Class I railroads and Marine Ports and Services companies have been calculated using country specific corporate tax rates. PoM's estimated WACC margin is 6.53%, which is situated materially below the Class I railroad and Ports WACC margins. Note that the WACC margins presented here are before applying the trailing average cost of debt methodology used for the BEE.

Table 31 North American Class I railroad WACC estimates

	Bloomberg country risk premium	Bloomberg return on debt	Pre-tax nominal WACC	Risk-free rate	WACC margin
CSX Corporation	9.05%	2.29%	13.54%	1.59%	11.95%
Kansas City Southern	9.05%	2.30%	13.03%	1.59%	11.44%
Norfolk Southern Corporation	9.05%	2.26%	15.14%	1.59%	13.55%
Union Pacific Corporation	9.05%	2.10%	14.22%	1.59%	12.63%
Canadian Pacific Railway	8.33%	2.75%	8.44%	1.52%	6.92%
Canadian National Railway Company	8.33%	2.49%	8.87%	1.52%	7.35%
Average	**8.81%**	**2.36%**	**12.21%**	**1.57%**	**10.64%**

	Bloomberg country risk premium	Bloomberg return on debt	Pre-tax nominal WACC	Risk-free rate	WACC margin
Median	**9.05%**	**2.29%**	**13.28%**	**1.59%**	**11.69%**

Source: Bloomberg, Synergies calculations

Table 32 Marine Ports and Services WACC estimates

	Bloomberg country risk premium	Bloomberg return on debt	Pre-tax nominal WACC	Risk-free rate	WACC margin
Qube Holdings	9.26%	2.31%	13.52%	1.76%	11.76%
Port of Tauranga	12.73%	1.00%	13.15%	1.68%	11.47%
Hamburger Hafen und Logistik	14.18%	0.00%	20.88%	-0.24%	21.12%
China Merchants Port Holding Company	14.10%	4.05%	15.88%	3.16%	12.72%
COSCO Shipping Ports	14.10%	4.47%	11.87%	3.16%	8.71%
Dalian Port	14.10%	3.50%	10.67%	3.16%	7.51%
Hutchinson Port Holdings Trust	10.61%	1.65%	8.23%	1.57%	6.65%
Average	**12.73%**	**2.43%**	**13.46%**	**2.04%**	**11.42%**
Median	**14.10%**	**2.31%**	**13.15%**	**1.76%**	**11.47%**

Source: Bloomberg, Synergies calculations