

Port of Melbourne – Review of Gearing and Beta

Essential Services Commission

21 November 2023



FINAL REPORT

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1. EXECUTIVE SUMMARY

The Essential Services Commission (ESC) has asked CEPA to review the Port's approach to determining the gearing and equity beta parameters used in its return of capital calculation in the most recent 2023-24 Tarriff Compliance Statement (TCS).

A pricing order sets out how the return on capital must be determined. We have been asked to assess whether the Port's approach to determining gearing and beta parameters is consistent with the requirements of the pricing order, and in particular, whether the Port has used 'well accepted' approaches to determine these parameters. In addition to the pricing order, the Port and the ESC have agreed to a set of approaches that will be applied by the Port to calculate the return of capital. These approaches, outlined in the Undertaking, seek to address concerns the ESC raised in a review of the Port's historical compliance with the pricing order.

We previously advised the ESC on whether the Port's approach to calculating the return of capital was well accepted and provided a review of regulatory precedent to inform consideration of what are 'well accepted' approaches. Since our review, some key regulatory decisions have been made across Australia and New Zealand. However, we do not consider these have materially shifted our view of what are well accepted approaches to determine gearing and beta parameters. We also consider the approach outlined in the Undertaking remains well accepted.

We find that, based on the regulatory precedent across Australia and New Zealand, that the Port's approach to estimating beta and gearing is broadly well accepted. However, there are some elements of their implementation which may not be well accepted or where the approach implemented is not the only well accepted option available. Where alternative options are well accepted, we develop a range of beta and gearing parameters drawing on these well accepted approaches.

The Port were provided an opportunity to comment on our draft findings and where appropriate our assessment considers and responds to these comments.

1.1. THE COMPARATOR SAMPLE

The Port's advisors, Houston Kemp, constructed two comparator samples it considered were well accepted and used these to estimate beta and gearing. One of these samples restricted comparators to companies located in developed and advanced emerging countries through the application of a country filter, and the other did not. Houston Kemp's preferred estimates were drawn from the comparator sample that did not apply a country filter. In the 2023-24 TCS, the Port adopted a rate of return that was calculated with beta and gearing parameters derived from the comparator sample that applied a country filter. However, drawing on the advice of Houston Kemp, the Port considered that not applying a country filter was also a well accepted approach, and reserved its position to take such an approach in future regulatory periods. We consider the approach taken to constructing the comparator sample used to estimate gearing and beta for the 2023-24 TCS is well accepted and aligns with the Undertaking. However, we provide the following caveats:

- Based on the existing regulatory precedent, we agree it is well accepted to apply a country filter when including international comparators but do not consider there is sufficient precedent to support an approach that doesn't apply a country filter. Houston Kemp considers that the diversity of characteristics across different ports results in varied systematic risks and favour an approach that results in a larger sample to balance out fluctuations. They increase the sample size by not applying a country filter. However, if the larger sample is less comparable to the Port, we consider this could either increase or decrease the variance, while also increasing the bias. On balance, we do not consider that because port betas are more variable that this would favour a wider sample.
- We agree it is well accepted to apply filters to ensure the comparator sample is sufficiently liquid and note this is consistent with the Undertaking, which requires the use of 'appropriate filters' to exclude companies

with insufficient data or illiquid data, or whose market capitalisations are too small to serve as appropriate comparators. Houston Kemp does this by applying a market capitalisation filter, and two liquidity filters where they include firms that pass both liquidity filters¹. This is consistent with the approach we applied in our 2021 review and one we consider this is well accepted. The regulatory precedent and requirements of the Undertaking allow that other approaches to excluding companies with illiquid data would also be well accepted (such as IPART's use of the Amihud measure) as would different thresholds for the liquidity measures applied. However, we note the SoRA identifies that market capitalisation and industry specific sector filters should be applied consistently across the regulatory period.²

- Houston Kemp only includes firms in its port samples that in their view undertake the core function of a port owner or port owner-operator and manually adjust the final comparator samples based on this assessment. While we consider it well accepted to ensure the comparator sample sufficiently represents the Port's core operations, we identified some firms which in our view were also relevant to include³. We consider these firms are sufficiently similar to the Port to warrant being used as comparators and note this assessment is consistent with our previous review.
- The Undertaking also outlines that if the process does not generate a sample of comparable firms of sufficient size, the Port should repeat the steps using search criteria that are less restrictive. Rather than expand the comparator sample size by removing the country filter, we consider there are other less well accepted filters which could have been explored, including choices on market capitalisation or liquidity filtering thresholds.

The sample Houston Kemp constructed with a country filter had five comparators. We develop three alternative samples which include six to ten comparators. We consider this broader list of companies are suitable comparators to the Port of Melbourne's operations and use these to derive a range of beta and gearing estimates. We note that the Port's beta estimate fall within the range derived from our wider comparator list, however the Port's gearing estimate falls below the range derived from our wider comparator list.

We also estimated beta and gearing using a broader list of comparators which did not apply a country filter, however, these estimates to inform our advice of asset beta and gearing estimates for the Port of Melbourne.

1.2. BETA ESTIMATION

We considered the approach to estimating beta was well accepted and is consistent with the Undertaking. Houston Kemp estimated asset beta (using the sample with a country filter) at 0.70. Across our samples that apply a country filter, we estimate the Port's weekly asset beta likely falls within a range of 0.59 to 0.75 if using net debt or 0.53 to 0.69 if using gross debt.

In the 2022-23 TCS, Houston Kemp estimated an asset beta of 0.72. In our previous report to the ESC, we provided an asset beta range of 0.6 to 0.7.

Regulatory precedent is mixed on whether gross or net debt should be used. The argument to support using gross debt is that it isn't practical to assume a company will use its cash reserves to pay off debt, while the argument in support of using net debt is that the cash reserves of a company impact its risk, which is the primary consideration for calculating beta. On balance, we consider there is a strong theoretical rationale for using net debt in gearing and

¹ We note that the report written by Houston Kemp indicates they include firms which pass at least one liquidity filter, not both. However, we understand this is incorrect and Houston Kemp apply the same liquidity filter used in CEPA's 2021 report.

² ESC (2022), *Statement of Regulatory Approach – version 3.0*, December, p. 32.

³ The relevant samples also included China Container Terminal Corp Tianjin Tianjin Port Development Holdings Ltd. Between our draft and final report, we also included Saudi Industrial Services Company as our draft report mis-identified that this firm did not pass a 20% trading day check.

beta estimates and consider the Port's approach using net debt is well accepted. We note the Undertaking does not state whether gross or net debt should be used.

1.3. GEARING ESTIMATION

Houston Kemp estimated gearing (using the sample with a country filter) at 10%. We consider the approach taken to estimate gearing in the 2023-24 TCS is well accepted and aligns with the Undertaking. However, we provide the following caveats:

- Regulatory precedent is mixed on whether to use the same comparator set to estimate gearing and beta, with some regulators adjusting the gearing comparator set based on the financial structure of comparator firms. We consider it would also be well accepted to adjust the comparator sample used to estimate gearing where there was sufficient evidence that some firms may not adequately represent a benchmark efficient port. This differs to the requirements of the Undertaking, which specifies that gearing should be estimated using the beta comparator sample.
- Many regulators consider that gearing should remain stable across regulatory years and only adjust the benchmark gearing used if there is sufficient evidence to indicate a change in the gearing of an efficient benchmark firm. This is also expressed in the Undertaking whereby the Port should first refer to the benchmark gearing that currently applies, and then refer to the average gearing of the comparator sample as cross checks. While it is well accepted to adjust gearing to reflect the average gearing of the comparator sample, we consider it is also well accepted to apply judgement on whether there is sufficient evidence that the gearing of a benchmark efficient port has changed, or whether changes in gearing estimates year on year primarily reflects short-term adjustments in gearing across the comparator sample.
- While we agree there is a strong theoretical argument to use net, rather than gross debt to estimate gearing, it would also be well accepted to use gross debt based on the regulatory precedent. Houston Kemp could consider calculating gearing using gross debt as a cross-check to determine whether this materially impacts estimates. However, we note this is not a requirement of the Undertaking.

Across our samples that apply a country filter, we estimate the port sample's gearing likely falls within a range of 18% to 19% if using net debt or 25% to 26% if using gross debt. In the 2022-23 TCS, Houston Kemp estimated gearing of 20%. In our previous report to the ESC, we found support for gearing levels between 20-30% based on comparators.

2. INTRODUCTION

The Essential Services Commission (ESC) engaged CEPA to review the Port of Melbourne's (PoM's or the Port's) approach and implementation of benchmark gearing levels and benchmark equity beta in its 2023-24 Tariff Compliance Statement (TCS).

2.1. REGULATORY CONTEXT

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

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

In January 2022 the ESC released findings of the first of its five-yearly reviews into the Port's compliance with the pricing order over the period 1 July 2016 to 30 June 2021.⁴ The review found significant and sustained non-compliance with the pricing order requirements for the return on capital over the period where the Port's methodology and implementation of key drivers of the rate of return were not 'well accepted', and the WACC did not reflect that of an efficient entity with a similar degree of risk as the Port.⁵

To address the findings of the review, the Port prepared an Undertaking⁶ which commits to the approaches that will be applied by the Port to calculate the WACC in a way that addresses the ESC's findings on the return on capital. The Undertaking was accepted by the ESC Minister in May 2022 and is legally binding until 30 June 2027, in line with the ESC's next review.

2.2. TERMS OF REFERENCE

CEPA has been engaged by the ESC to review the Port's approach to determining the gearing and equity beta parameters used in its return of capital calculation in the 2023-24 TCS. We were asked to:

- Assess whether the Port's methodology to calculating benchmark gearing levels and its impact on its estimate of benchmark equity beta (and any other relevant WACC parameters) is consistent with the requirements of the pricing order.
- Assess whether the methodology used to calculate benchmark gearing levels is based on accepted approaches that go beyond a single source of information.
- Advise on current, best industry practice in Australia and other jurisdictions for regulated entities in calculating benchmark gearing and equity beta, particularly regarding selecting an appropriate comparator sample.

⁴ ESC (2021), *Inquiry into the Port of Melbourne compliance with the pricing order*, Final report, 31 December.

⁵ The ESC engaged CEPA to review the Port's approach and implementation of the return of capital. We delivered a report to the ESC in December 2021 with our findings. This report is available on the ESC's website. CEPA (2021), *Port of Melbourne five-year review – WACC*, Final report, 17 December.

⁶ Port of Melbourne (2022), *Undertaking to the Essential Services Commission Minister*, Public Summary, May.

- Calculate a range of estimated values of benchmark gearing, equity beta and any other affected WACC parameters based on the findings of the review.

Take account of comments from Port of Melbourne on our draft report.

2.3. STRUCTURE OF THIS REPORT

The remainder of this report is structured as follows:

- Section 3 discusses how we have interpreted the requirements of the pricing order and presents our overall conclusions of a reasonable range of estimated values of gearing and beta.
- Section 4 contains our findings on the comparator sample.
- Section 5 contains our findings on benchmark beta.
- Section 6 contains our findings on benchmark gearing.
- Further details are contained in the appendices:
 - Appendix A provides further details on the basis for selection of the comparator firms that we use to estimate beta and gearing.
 - Appendix B provides an overview of the comparator samples.
 - Appendix C provides a full set of asset beta and gearing estimates for all comparators in our samples.

3. WELL ACCEPTED APPROACHES

This section discusses how we have reviewed the Port's approach to calculating benchmark gearing levels, given the requirements of the pricing order. We then set out our conclusions on a reasonable range for gearing and beta parameters, drawing on the analysis discussed in Section 4.

This review acts as a timely update on sections of our baseline review, as it relates to benchmark gearing and beta, conducted in 2021 for the ESC on the Port's approach and implementation of the return on capital over the period 1 July 2016 to 30 June 2021.

3.1. A FRAMEWORK TO CONSIDER WELL ACCEPTED APPROACHES

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

- Clause 4.1.1. “An allowance to recover a return on its capital base, commensurate with that which would be required by a **benchmark efficient entity** providing services with a **similar degree of risk as that which applies to the Port Licence Holder in respect of the provision of the Prescribed Services** (see clauses 4.2 and 4.3)”.
- Clause 4.3.1. “The Port Licence Holder must use **one or a combination of well accepted approaches** that distinguish the cost of equity and debt, and so derive a weighted average cost of capital.”
- Clause 4.3.2. “The rate of return ... must be determined on a **pre-tax, nominal basis**”

The concepts expressed in Clause 4.1.1 are common within Australian regulatory practice. For example, the rate of return for an electricity distribution company should be “commensurate with the regulatory and commercial risks involved in providing the service”.⁷ The objective of this language is that the rate of return should be set to be that of an investment substitute for the Port, which means an asset with a similar degree of risk. The pricing order is made under powers granted by the Act (Section 49A) and one of the objectives of the Act (Section 48) is “to allow a provider of prescribed services a reasonable opportunity to recover the efficient costs of providing prescribed services, including a return commensurate with the risks involved”.⁸

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

Firstly, a working definition of “approach” is required. We discuss this in Section **Error! Reference source not found.**

Secondly, in an Australian regulatory context, the requirement of Clause 4.3.1 that the approach to estimation is “well accepted” is not common and may be unique. Clause 4.3.1 is an additional restriction to Clause 4.1.1 and has the effect of limiting the approaches that the Port can use. We consider the appropriate interpretation of “well accepted” in the context of the pricing order in Section 3.1.2

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

⁷ National Electricity Law, s.7A(5).

⁸ Port Management Act 1995, 48(1)(c).

3.1.1. Interpretation of ‘approach’

The pricing order requires that an “*approach*” be “*well accepted*”. Consistent with our previous review, we consider that there are two parts to an “*approach*”:

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

In our previous review, we found that the Port had proposed well accepted *methodologies* for a number of WACC parameters. However, its *implementation* of those methodologies may not have been well accepted.

In regard to the beta and gearing parameters provided in the Ports 2023-24 TCS, we find that the Port’s methodologies and implementation of those methodologies are broadly well accepted and are consistent with the Undertaking. While the Port maintain it is also well accepted to not apply a country filter when selecting international comparators, consistent with our previous review we consider the regulatory precedent indicates it is well accepted to apply a country filter. However, noting that the Port has calculated the rate of return using a comparator sample that applies a country filter, we consider the methodology applied in the 2023-24 TCS is well accepted.

We also consider there are some aspects where there are a range of implementation approaches that could be considered well accepted, including the application of filters used to derive the comparator sample, the choice of comparators, and how the estimates derived from the latest comparator sample inform the benchmark gearing and beta parameters used to calculate the rate of return.

The Port considers it necessary to distinguish between well accepted approaches for market wide parameters versus well accepted approaches for industry-specific parameters⁹:

“When estimating industry-specific parameters, we consider that an approach that is consistent with the general principles applied by regulators and courts in Australia and New Zealand is still well accepted, even if it departs from the implementation of the methodology set out in regulatory precedent for firms in other industries.”

We maintain that there are two parts to an approach – the high-level methodology and the implementation of that methodology – and to be well accepted, the methodology and implementation of that methodology should be well accepted. We consider it is appropriate to apply this reasoning to all rate of return parameters given the requirements of the pricing order applies to the overall rate of return.

3.1.2. Interpretation of ‘well accepted’

For the purpose of this advice, we sought to identify any update to interpretations of ‘well accepted’ since our 2021 review. In December 2022, the ESC provided guidance on well accepted approaches in its statement of regulatory approach (SoRA) for the Port of Melbourne pricing order as:

“A ‘well accepted approach’ is one that is widely accepted as appropriate for use when determining the weighted average cost of capital for a firm for the purposes of calculating a revenue requirement.”¹⁰

This is unchanged from the definition we considered in 2021. The SoRA also clarifies that for an approach to be well accepted, it must be widely accepted, which requires more than one source of evidence from appropriate

⁹ Houston Kemp (2023), *Port of Melbourne beta and gearing – review of CEPA report*, November, p. i.

¹⁰ ESC (2022), *Statement of Regulatory Approach – version 3.0 Port of Melbourne Pricing Order*, December, p. 27.

sources. Another interpretation was agreed between the ESC and the Port in May 2022 for the purposes of the Undertaking where a ‘well accepted approach’ is:¹¹

“...to be interpreted in accordance with the decisions of Australian Courts (which, for the purposes of this undertaking, includes the Australian Competition Tribunal) and will be applied consistently with those decisions, and Australian and New Zealand regulatory practice, as applicable at the time.”

The interpretations in the SoRA and Undertaking clearly point to consideration of approaches adopted by regulators, as these are determined precisely for the purpose of calculating a revenue requirement using a building block methodology.

To be considered good regulation, a methodology should be characterised by transparent evidence selection, legal resilience, and stakeholder comprehension. The regulatory process means that the evidence has been challenged, scrutinised, and found to be relevant and admissible. We consider these characteristics make regulatory precedent the most reliable indicator of ‘well accepted’.

As discussed in Section **Error! Reference source not found.**, an ‘approach’ comprises both a methodology and choices around how the methodology is implemented. Australian regulators primarily consider Australian precedent, while some cross check their conclusions against international practice. For this reason, we consider that Australian precedent is more useful for informing a judgement on “*well accepted*” approaches, compared to international jurisdictions. However, to align with Undertaking, we also consider relevant regulatory precedent in New Zealand.

The interpretations in the SoRA and Undertaking also encompass approaches used outside of a regulatory setting. The SoRA provides additional guidance that the views of regulators and other professionals engaged in the practice of economic regulation in regimes like that which apply to the Port may be appropriate in determining whether an approach is well accepted, noting this could include academics, economists, and financial practitioners.^{12,13}

While the guidance provided in the SoRA does not specify courts as is done in the Undertaking interpretation, we consider the inclusion of court decisions are also relevant where courts have been called to make decisions on the appropriate approach to determining the return on capital used in comparable regulatory frameworks in Australia.

Accordingly, in addition to reviewing Australian and New Zealand regulatory approaches, our analysis in Section 4 also considers whether any evidence put forward by the Port in their 2022-23 TCS from other professionals engaged in the practice of economic regulation, including Australian courts, financial practitioners, academics or economists, satisfies the “*well accepted*” criterion.

In making this assessment, we have considered the above interpretations of ‘well accepted’ in the context of the other requirements of the pricing order. A well accepted approach needs to:

- Reflect the required revenue of a benchmark efficient entity, in line with Clause 4.1.1 of the pricing order.
- Be widely accepted as appropriate for use, which requires more than one source of evidence from appropriate sources.
- Be widely accepted across all elements of an approach, which means both the methodology and implementation elements.

¹¹ Port of Melbourne (2022), *Undertaking to the Essential Services Commission Minister*, May, para. 28(d).

¹² ESC (2022), *Statement of Regulatory Approach – version 3.0 Port of Melbourne Pricing Order*, December, p. 27.

¹³ Our 2021 review found the approaches of academics and financial practitioners were not well accepted for the purpose of calculating a revenue requirement for a benchmark efficient entity and accordingly, did not place weight on these approaches when calculating the range for the Port’s return on capital.

One key limitation to this definition is that by relying on an approach being widely accepted, we introduce an element of historical precedent. This means our approach is unable to reflect advancements in cost of capital theory and associated methodologies until this is widely accepted and/or applied elsewhere.

3.2. REVIEW OF REGULATORY PRECEDENT

This section summarises our conclusions on which approaches to determining benchmark gearing and beta can be considered well accepted, based on the framework outlined in Section 3.1.

3.2.1. Review of regulatory precedent

We have undertaken a review of recent regulatory precedent to determine whether there have been any changes to what we considered well accepted approaches in our 2021 review. We focus on decisions relating to:

- The comparator sample
- Beta estimation methods
- Gearing estimation methods

We also considered evidence from other professions engaged in the practice of economic regulation where this has been referenced in relevant regulatory decisions. For the reasons noted above, our review has focused on Australian regulatory precedent. However, where relevant we have supplemented this with commentary on the approaches adopted by New Zealand regulators.

Table 3-1: Summary of recent regulatory decisions

Regulator	Previous regulatory precedent	Latest regulatory precedent	Considered in the 2023-24 TCS
Queensland Competition Authority	QCA (2020) ¹⁴	QCA (2023) ¹⁵	✓ ¹⁶
New Zealand Commerce Commission	Not in scope	NZCC (2023) ¹⁷	Not available ¹⁸
ACT Independent Competition and Regulatory Commission	ICRC (2018) ¹⁹	ICRC (2023) ²⁰	✓
Australian Energy Regulator	AER (2018) ²¹	AER (2023) ²²	✓

¹⁴ QCA (2020), *Final report – Gladstone Area Water Board Price Monitoring 2020-25*, May.

¹⁵ QCA (2023), *Rate of return review*, Final report, July.

¹⁶ QCA published an updated version of the final paper in 2023 after a making a few minor changes. The TCS references this previous version. The update does not impact sections relating to beta and gearing estimation.

¹⁷ Final decision is anticipated in December 2023. NZCC (2023), *Input Methodologies Cost of Capital Review – Draft Decision*, June.

¹⁸ Houston Kemp reference the NZCC's 2016 IM review.

¹⁹ ICRC (2018), *Regulated water and sewerage services prices 2018-23*, May.

²⁰ ICRC (2023), *Regulated water and sewerage services 2023-28*, May.

²¹ AER (2018), *Rate of Return instrument – Explanatory Statement*, December; AER (2018), *Discussion paper – Gearing*, February.

²² AER (2023), *Rate of Return Instrument – Explanatory Statement*, February.

Regulator	Previous regulatory precedent	Latest regulatory precedent	Considered in the 2023-24 TCS
Australian Competition and Consumer Commission	ACCC (2019) ²³	ACCC (2022) ²⁴	✓
Economic Regulation Authority WA	ERA (2019) ²⁵	ERA (2022) ²⁶	✓
Office of the Tasmanian Economic Regulator	OTTER (2018) ²⁷	OTTER (2022) ²⁸	✓
Supreme Court of Western Australia	Not available	WASC (2022) ²⁹	✓
Independent Pricing and Regulatory Tribunal	IPART (2018) ³⁰	IPART (2020) ³¹	✓ (2018 only)
Essential Services Commission of South Australia	ESCOSA (2020) ³²	No change.	✓

Source: CEPA analysis.

The intent of this review was to identify whether there have been substantial changes in regulatory practice since our last review that might support a different conclusion on well accepted approaches. While the scope of this review has been adjusted to include New Zealand regulatory precedent, we have not identified any significant changes in what is a well accepted approach to selecting the comparator sample and estimating beta and gearing since our previous review. The table below summarises the results of our review.

Table 3-2: Review of regulatory evidence

	The Port's approach	CEPA's review
Selecting the comparator sample	<ul style="list-style-type: none"> The Port's advisors developed two comparator samples to estimate asset beta and gearing. The samples differ through the application of a country filter. In developing the two comparator samples, the Port's advisors: <ul style="list-style-type: none"> Used comparators from relevant sectors. 	<ul style="list-style-type: none"> The approach applied by the Ports' advisors is broadly well accepted and aligns with the Undertaking. We consider it is well accepted to apply a country filter based on the regulatory precedent. We note the Undertaking does not specify the need for a country filter and so both approaches are consistent with the Undertaking.

²³ ACCC (2019), *Decision on Australian Postal Corporation 2019 price notification*, December

²⁴ ACCC (2022), *Decision on Australia Post's 2022 price notification*, December; Deloitte (2022), *Assessment of WACC for Australia Post's Reserved Letters Business*, August.

²⁵ ERA (2019), *2018 and 2019 Weighted Average Cost of Capital for the Freight and Urban Networks, and the Pilbara Railways*, Final Determination, August.

²⁶ ERA (2022), *Explanatory statement for the 2022 final gas rate of return instrument*, December.

²⁷ OTTER (2018), *2018 Water and Sewerage Price Determination Investigation – Final Report*, May.

²⁸ OTTER (2022), *Investigation into TasWater's prices and services for the period 1 July 2022 to 30 June 2026*, May.

²⁹ WASC (2022), *Perth Airport Pty Ltd -V- Qantas Airways Ltd*, February

³⁰ IPART (2018), *Review of our WACC method*, Final Report, February. IPART (2019), *Estimating equity beta*, Factsheet, April.

³¹ IPART (2020), *Estimating Equity Beta for the Weighted Average Cost of Capital*, August; IPART (2019), *Estimating equity beta*, Factsheet, April.

³² ESCOSA (2020), *SA Water Regulatory Determination 2020*, June.

The Port's approach	CEPA's review
<ul style="list-style-type: none"> ○ Used international comparators. ○ Applied market capitalisation and liquidity filters. ○ Manually removed companies they considered were not relevant. ● The Port chose to use the beta and gearing estimates derived from the comparator sample that applied a country filter when calculating the rate of return used in the 2023-24 TCS. 	<ul style="list-style-type: none"> ● The Undertaking states if the process outlined does not generate a sample of comparable firms of sufficient size, that the Port should repeat the steps using search criteria that are less restrictive. Rather than expand the sample size by removing the country filter, we consider there are other less well accepted filters which could have been explored, including choices on market capitalisation or liquidity filtering thresholds. ● We note some differences in the comparator samples developed by the Ports' advisors and CEPA, where different companies were judged to be relevant at the manual processing stage.
<p>Beta estimation</p> <ul style="list-style-type: none"> ● The Port estimated beta with: <ul style="list-style-type: none"> ○ an OLS regression; ○ across 5- and 10-year estimation periods; ○ using weekly and 4-weekly return specifications; ○ applying the local market index; and ○ applying the Brealey-Meyers deleveraging formula. 	<ul style="list-style-type: none"> ● The approach applied by the Ports' advisors is well accepted and aligns with the Undertaking.
<p>Gearing estimation</p> <ul style="list-style-type: none"> ● The Port estimated gearing as the average gearing of the beta comparator sample, using the book value of net debt. 	<ul style="list-style-type: none"> ● The approach applied by the Ports' advisors is well accepted and aligns with the Undertaking. ● We note the Undertaking and SoRA does not state a preference for gross or net debt and that it would be well accepted to use either. We consider there is a stronger theoretical rationale for using net debt. ● We consider it would also be well accepted to use a different comparator sample to estimate gearing and to only adjust the benchmark gearing used if there is sufficient evidence to indicate a change in the gearing of a benchmark efficient port.

Source: CEPA analysis.

3.3. BENCHMARK GEARING AND EQUITY BETA ESTIMATES

In line with our terms of reference, we have calculated parameters for beta and gearing using a well accepted approach. These parameter estimates are summarised in the table below. Our supporting analysis for each parameter is set out in the following sections.

Table 3-3: CEPA's view of the range of well accepted parameter values for the Port 2023-24

Parameter	The Port's proposal	CEPA range (low)	CEPA range (high)
Gearing	10%	18%	19%
Asset beta	0.70	0.59	0.75
Equity beta	0.78	0.72	0.93

Parameter values are derived from comparator samples which implement a country filter and use net debt in estimations.

4. COMPARATOR SAMPLE

The pricing order requires a return to be commensurate with that required by a benchmark efficient entity providing services with a similar degree of risk. If the Port was listed, we could estimate the Port's systematic risk, that is, the risk that cannot be removed through diversification, using market data to see how the returns of the Port were correlated with returns of the market. However, as the Port is not listed, we must estimate this risk by relying on data from listed companies that are sufficiently similar to the Port; that is, they are considered by investors to be investment substitutes and have the same degree of systematic risk as the Port.

This section examines what is a well accepted approach constructing a comparator sample for the Port of Melbourne.

4.1. THE PORT'S APPROACH

In this section, we consider the Port's approach to selecting the comparator sample. For the 2023-24 TCS, the Port was advised by Houston Kemp. The following sets out the approach applied by Houston Kemp.

Comparable industry categories

Houston Kemp identified potential comparators by running Bloomberg's EQS for active companies that:

- the Bloomberg Industry Classification Systems (BICS) classifies as 'Port & Harbour Operations'; and
- the Global Industry Classification Standard (GICS) classifies as 'Marine Ports & Services'.

Their EQS search was also restricted to only show the primary security of a company. This generated an initial sample of 292 comparators.

Market capitalisation and liquidity filters

They then applied market capitalisation and liquidity filters to narrow the comparator sample:

- A market capitalisation filter that omits comparators with a market capitalisation that is smaller than USD 100 million as of 31 March 2023; and
- A liquidity filter that omits comparators:
 - with an average bid-ask spread that exceeds 1 per cent over the averaging period; and
 - that were not traded on more than 20 per cent of available trading days.³³

Houston Kemp noted the liquidity filter will omit different companies for different averaging periods. For example, a company with an average bid-ask spread that exceeds 1% from 2019 to 2023 but less than 1% from 2014 to 2023 will be omitted when estimating gearing and asset beta for the former period but will not be omitted from the latter period.

Country filter

Houston Kemp developed two samples, one with no country filter, and one with a country filter that excludes firms with country of risk outside the FTSE Developed and Advanced Emerging country categories.³⁴ The FTSE

³³ We note that the report written by Houston Kemp indicates they include firms which pass at least one liquidity filter, not both, however through comments provided by the Port of Melbourne, understand this is incorrect and Houston Kemp apply the same liquidity filter used in CEPA's 2021 report.

³⁴ FTSE Russel (2023), *FTSE Equity Country Classification Interim Announcement, March 2023*, p.6. We note there are no changes in this version to the September 2022 version applied by Houston Kemp.

Developed and Advanced emerging countries filter was recommended by the ESC in their interim commentary on the Port's 2022-23 TCS.³⁵

Manually identifying appropriate comparators

Houston Kemp manually identified appropriate comparators by:

- reviewing Bloomberg descriptions of each country;
- assessing the breakdown of each company's revenues by segment; and
- carrying out desktop research such as reviewing company websites, annual reports, and investor presentations.

The approach applied by Houston Kemp resulted in two comparator samples; their preferred sample with no country filter and included 21 unique firms, and an alternative sample that applied a country filter and included five unique firms.

The approach to selecting the comparator sample is broadly consistent with the approach applied in the 2022-23 TCS, with the addition of presenting an alternative sample which applies a country filter. Applying a country filter was recommended by the ESC in its interim commentary.

4.2. REVIEW OF REGULATORY EVIDENCE

We assessed Australian and New Zealand regulatory precedent to understand what is a well accepted approach to selecting a comparator sample.

In our previous review, we noted that Australian regulators use a broad range of implementation approaches for constructing a comparator sample and identified four characteristics of the sample: the inclusion or not of companies outside the specific sector, the geography of listing and/or operation, the choice of additional filters, and the number of companies used for the sample.

The table overleaf summarises the regulatory precedent taken to selecting comparators.

³⁵ ESC (2022), *Interim commentary – Port of Melbourne Tariff Compliance Statement 2022–23*, December, pp 11-13.

Table 4-1: Regulatory precedent on comparator sample selection

Regulatory decision	Sector	Firms outside of sector	International firms	Country filter	Market cap filter	Liquidity filter	Time filter	Sample size
QCA (Aug 2023)	Energy and Water	Yes	Yes	Yes	Yes	Yes ³⁶	10 years ³⁷	39
NZCC (Jun 2023)	Electricity, Gas and Airports	No	Yes	Yes	No	Yes	5 years ³⁸	8 / 51 ³⁹
AER (Feb 2023)	Electricity and Gas	No	No ⁴⁰	Not applicable	No	No	Unclear	9
ACCC (Dec 2022)	Postage and Logistics	No	Yes	Not stated	No	No	Not stated	8 / 11 ⁴¹
ERA WA (Dec 2022)	Gas	No ⁴²	Yes	Yes	No	No	Majority of the estimation window	58
WASC (Feb 2022)	Airports	No	Yes	No	Yes ⁴³	Yes	5 years	20
IPART (Aug 2020)	Water	No	Yes	Yes	No	Yes	5 years	35

We also reviewed recent regulatory decisions by ICRC, OTTER and ESCSA, however these regulators do not undertake beta estimation using a comparator sample.

³⁶ QCA considered applying the Amihud measure like IPART. However, after applying a market cap filter of \$150mil US, they were confident the sample would pass the IPART criteria and so determined that the market cap filter was sufficient for identifying a liquid sample of firms.

³⁷ QCA consider that comparators should have a complete trading history over the chosen observation window and they estimate over a 10-year period.

³⁸ We note the NZCC draft decision IMs do not reference this, however the CEPA report on WACC parameters to NZCC applied a filter to remove firms with less than 5-years of trading history.

³⁹ Depends on sector being considered; 8 for airports and 51 for gas and electricity.

⁴⁰ Currently use international comparators as a cross-check. However, will consider using them in future if the sample size gets too small.

⁴¹ Depends on sector of firm being considered; 8 for postal and 11 for logistics.

⁴² ERA use a sample of gas and electricity companies they define as an energy network sample.

⁴³ Dr Hird applied the NZCC 2016 IM beta methodology, which included a market cap filter for the airports sample. Implicitly the judgement seems to accept this.

Comparators outside of sector

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

In its 2023 rate of return instrument, QCA noted:⁴⁴

“We do not consider that using a within-industry comparator will always yield a better estimate of beta for a particular entity. Ultimately, it is the covariance of the firm's returns with the market's returns that determine the beta of that firm”

And that:

“Depending on the risk profile of the business, it is possible that out-of-industry comparators may provide more relevant information than within industry comparators that are subject to different risks.”

We noted in our previous review that QCA used comparators from regulated energy and water firms in a determination for a coal export rail business based on an assessment that the systematic risk of these industries was most comparable to the regulated entity.⁴⁵ In its latest guidance, while QCA develops industry specific comparator samples, it notes it may not strictly apply these comparator samples to its regulated entities if it identifies that the risks of that entity are not comparable to the industry samples developed.⁴⁶ QCA also combine water and energy firms in the same sample based on their assessment of the systematic risk of these firms being comparable.⁴⁷

However, QCA also note that these issues may not be as relevant where listed pure play comparators exist:

“In the case of the AER, if it considers that it already has a sample of firms that meets its 'pure play' definition, then we would share the view that populating that sample with firms with a different level of risk would introduce bias into the sample.”

In its 2022 determination for gas, the ERA considered expanding its sample to include other listed domestic infrastructure companies alongside energy networks, however ultimately decided against it as they considered it would likely introduce additional idiosyncratic risks and they were not confident that the betas of domestic infrastructure firms were comparable to an energy network.⁴⁸

Recent regulatory precedent from these, and other, regulators would suggest it is well accepted to use comparators from within the sector, with a caveat that consideration should be given to whether the comparator sample sufficiently reflects the risk characteristics of the regulated entity. The Port's advisors agree with this.⁴⁹

“We also continue to consider that infrastructure firms from other industries should be excluded from our samples, since we consider such firms to be less comparable to the benchmark efficient port, and their inclusion will not result in a well accepted estimate of the beta of the benchmark efficient operator.”

⁴⁴ QCA (2023), *Rate of return review*, Final report, July, p.68 & 69.

⁴⁵ QCA (2018), *Aurizon Network's 2017 draft access undertaking*, Final Decision, December.

⁴⁶ QCA (2023), p. 73.

⁴⁷ QCA (2023), p. 105.

⁴⁸ ERA (2022), *Explanatory statement for the 2022 final gas rate of return instrument*, December, p.178.

⁴⁹ Houston Kemp (2023), *Port of Melbourne beta and gearing – review of CEPA report*, November, p. ii.

International comparators

Our previous review found strong support for using international comparators. We identify no changes in the regulatory precedent from recent decisions. The AER continues to use only Australian comparators in its determination, but since 2018 has used international comparators as a cross-check. The AER noted:⁵⁰

“...our view remains that there are likely considerable complexities around developing an approach using international firms as comparators. In particular, international firms likely have different characteristics and operating and market environments to the regulated ‘pure play’ Australian energy network businesses and, as a result, may not be directly comparable to those we regulate.”

The AER have included comparators that are delisted, and noted since the previous determination, the number of listed comparators has decreased from three to one, meaning equity beta is estimated with 8 delisted, and one listed, comparator. The AER further reduce the comparator sample used to calculate gearing by removing hybrid securities (securities with characteristics of both debt and equity) from the gearing estimation:⁵¹

“We do not consider that adding gearing estimates from other sectors or countries is required for this review. We do not consider there is sufficient evidence to suggest that any of these options would provide a significant improvement to our current estimate. As the overall level of risk of providing regulated services may differ between sectors and countries, we consider it appropriate to rely on Australian listed NSPs for our gearing estimation. This is consistent with our comparator set used to estimate equity beta.”

In advance of the 2016 Instrument, the AER stated their intention to understand how international comparators could be included in their comparator sample. All other regulatory decisions that apply a comparator sample approach use international comparators.

We consider it remains well accepted to use international comparators, particularly in cases like the Port, that have no domestic comparators within the same sector. We note Houston Kemp also consider the use of international comparators is appropriate.

Size of the comparator sample

Our previous review noted the size of our final comparator samples fell within the ranges used by Australian regulators, suggesting that it is not necessary to augment the samples with out-of-sector comparators.⁵²

A small comparator sample can lead to more volatile estimates, as fluctuations in individual company estimates are less likely to balance out, making outlier firms have a stronger influence on the final parameter estimate.

Both the AER and ERA have considered issues with comparator sample size in recent regulatory decisions. The AER uses 9 listed/de-listed Australian network service providers for beta and 5 listed/ delisted Australian network service providers for gearing.⁵³ In a recent explanatory statement, the AER states:⁵⁴

“A key issue on equity beta is the diminishing number of the Australian comparators we use for estimating beta. This has declined from 3 live firms in the 2018 review to being just one... For most of

⁵⁰ AER (2023), p. 19.

⁵¹ AER (2023), p. 84 & 92.

⁵² We developed four samples which ranged from 9 to 29 comparators for 5-year beta estimates and 7 to 22 comparators for 10-year beta estimates.

⁵³ The AER excludes hybrid securities from gearing estimation.

⁵⁴ AER (2023), *Rate of return instrument*, p. 19.

the period since 2018, we still had data from these 3 firms, but this underlines a challenge to our current approach going forward.”

They continue to say that while they have concerns about the comparability of international firms to those they regulate, they intend to work on this issue before the 2026 Instrument due to a decreasing number of comparators.

ERA has expanded the number of comparators used in its gas rate of return instrument to calculate beta from four Australian firms to 58. Following the same concerns as the AER that only one of the Australian comparator firms remained listed, they moved to include comparable international energy firms.⁵⁵ ERA continues to calculate gearing using the four Australian comparators.⁵⁶

Houston Kemp considers that decisions around sample size involve a trade-off between bias and variance. They note the smaller port sample which applies a country filter displayed higher variance than the larger sample without a country filter. They also state that fluctuations in the estimates for individual companies will be less likely to offset one another and the impact of outliers is greater in the wider sample. We agree that a smaller sample may have more variance in estimates, however a larger sample could equally introduce more variance and bias.⁵⁷

Regulatory precedent identifies some level of preference for industry-specific or country-filtered comparators (discussed below), which supports the view that regulators value ensuring the comparators closely resemble the regulated entity (low bias). ERA and AER's recent decisions demonstrate a willingness to accept small comparator samples when they closely match the regulated entity, with only one listed comparator being a threshold to consider change.

Country filters

Our previous review found that where international firms had been included, limits were often placed on which countries these can be drawn from. However, we noted there was not a uniform framework applied as to which countries were within scope.

When selecting a comparator sample, QCA noted:⁵⁸

“It is highly desirable for the firms to share similar risk characteristics...Firms within the same industry, operating in other countries, may face a different set of risk characteristics, due to factors such as materially different industry structures, regulatory settings and political environments.”

QCA also considered that firms originating from developed countries are preferable to those from developing or emerging economies.⁵⁹ The QCA energy and water industries sample included companies from Australia, Canada, and the US and would pass the FTSE country filter.⁶⁰ However, they noted that they may consider firms in developing countries if they were concerned the same was too small. They noted:⁶¹

“While firms operating in developing countries might face a greater level of sovereign risk, this may not necessarily be reflected in beta estimates of those firms, as the relative systematic risk of firms within the country may be unchanged.”

⁵⁵ ERA (2022), p. 161, 176 & 179.

⁵⁶ ERA (2022), p. 54.

⁵⁷ Consider a small sample with three comparators that are close to the ‘true’ beta (estimated as 0.40, 0.43 and 0.45). If another comparator which is less comparable is introduced with a beta of 0.60, we have introduced more variance and more bias into the sample.

⁵⁸ QCA (2023), p. 72.

⁵⁹ QCA (2023), p. 73

⁶⁰ QCA (2023), p.106-107.

⁶¹ QCA (2023), p. 73

IPART “*seeks markets that approximate Australia’s sovereign characteristics*”. This includes considering if the government bond and equity markets are “*sufficiently deep and liquid*” and whether the firm’s headquarters is consistent with their actual operating market. The water company sample used included firms in Malaysia, India, Europe, Philippines, Brazil, Hong Kong, Vietnam, Chile, Thailand, and the US.⁶² We note that India, the Philippines, Vietnam, and Chile would be excluded using the FTSE Developed and Emerging Countries filter.

The ACCC agreed that a set of international companies proposed by Deloitte were comparable, however did not state a clear justification. Companies selected were from Australia, Austria, Belgium, Germany, Italy, Japan, Malaysia, Netherlands, New Zealand, Portugal, Singapore, UK, and US and would pass the FTSE country filter.⁶³

ERA chose to include firms from jurisdictions most comparable to Australia “*assessed on the basis of regulatory and market characteristics*” and chose to examine listed firms in Canada, New Zealand, UK, and US.⁶⁴

In February 2022 the WASC decided in support of a comparator sample methodology that was based on the NZCC cost of capital input methodologies for regulated airports. This approach did not apply a country filter and included comparators in Australia, New Zealand, Europe, Türkiye, Serbia, Malta, India, Malaysia, China, Hong Kong, Japan, Thailand, and Mexico.⁶⁵

One key change to the regulatory precedent relates to the NZCC’s draft decision to include a country filter for airports in its recent cost of capital review. In making its decision, the NZCC noted:⁶⁶

“...it is common practice among regulators to ensure companies in the sample are trading in markets that are comparable to the host country, that is have similar systematic risk.”

NZCC’s draft decision includes eight comparator firms that passed the FTSE country filter in France, Spain, China, Austria, Switzerland, Germany, Australia, and New Zealand. The Chinese comparator was included because it trades in Hong Kong.

We consider it remains well accepted to apply a country filter to develop a list of comparators which share similar risks to the Port. We note the Port agrees, but also considers a comparator sample would also be well accepted without one. In the 2023-24 TCS, the Port’s advisors point to the NZCC regulatory precedent (which the WASC judgement is also based on). We consider this precedent has diminished in light of the NZCC’s latest draft decision, however we recognise that regulatory precedent is constantly shifting, and this draft decision was not public when the 2023-24 TCS was under development. On balance, as the only relevant regulatory precedent that supports not applying a country filter has been marked to change and all Australian regulators in our review undertake some form of filtering by country, we maintain it is well accepted to apply a country filter.

The Port consider it is necessary to distinguish between well accepted approaches for market wide parameters versus well accepted approaches for industry-specific parameters⁶⁷:

“When estimating industry-specific parameters, we consider that an approach that is consistent with the general principles applied by regulators and courts in Australia and New Zealand is still well accepted, even if it departs from the implementation of the methodology set out in regulatory precedent for firms in other industries.”

The Port also note that clause 25 of the Undertaking states the Port will select a sample of comparators consistent with the ‘general principles’ adopted by Australian and New Zealand regulators and courts, rather than well

⁶² IPART (2019), *Estimating Equity Beta*, Factsheet, April, p.4 & 7.

⁶³ ACCC (2022), Appendix A, p. iii.

⁶⁴ ERA (2022), p. 179.

⁶⁵ NZCC (2016), *Input methodologies review decisions – Topic paper 4: Cost of capital issues*, December, p. 241-244.

⁶⁶ NZCC (2023), *IM Review 2023 Draft Decision – Cost of capital – Topic Paper 4*, p. 68.

⁶⁷ Houston Kemp (2023), *Port of Melbourne beta and gearing – review of CEPA report*, November, p. i.

accepted approaches and identify a general principal applied by relevant regulators is the comparator sample should be sufficiently large to generate robust estimates.⁶⁸ We agree that sample size is an important consideration by regulators and discuss the regulatory precedent for this above. Based on the regulatory evidence, we do not consider that diverging from well accepted approaches to filtering by country is justified to increase the number of comparator firms in our sample when considering the number of active comparators available.

Market capitalisation and liquidity filters

Our previous review found mixed support for using a market capitalisation filter. Only one regulator, QCA, applied an explicit market capitalisation filter (US \$100 million), while ERA noted that comparators should be of similar size. QCA continues to apply a market capitalisation filter, now set at US \$150 million⁶⁹, while ERA appears to focus filtering to ensure comparators have materially similar regulated activities within similar regulatory regimes.⁷⁰

By including New Zealand regulatory precedent, we note the WASC decided in favour of the expert that applied NZCC's 2016 IM beta methodology to estimating a comparator sample. This methodology included a market capitalisation filter for the airports sample.⁷¹ However, the NZCC's recent IM draft decision does not include a market capitalisation filter for airports or energy comparator samples.⁷²

Our previous review also found mixed support for using liquidity filters. IPART applied the Amihud measure⁷³ to remove any observations for an individual comparator that produces an Amihud value of 25 or greater for a given week⁷⁴, while QCA applied two liquidity filters that removed companies with a bid-ask spread below 1% and more than 20% non-trading days over the sample period.⁷⁵

IPART continues to apply the Amihud liquidity measure.⁷⁶ In its latest determination, QCA considered applying the Amihud measure like IPART. However, after applying a market capitalisation filter, QCA noted all comparators in its sample would have passed the IPART liquidity filter and determined that a market capitalisation filter was sufficient for identifying a liquid sample of firms.⁷⁷ The NZCC have applied liquidity filters across the 2016 IMs and 2023 IM draft decision for regulated airports and energy businesses. The 2023 IM draft decision uses a combination of bid-ask spreads, percentage of shares available for trading and variability in asset beta across estimation methods (daily, weekly, and four-weekly) as indicators for whether a firm should be included. However, the NZCC note:⁷⁸

“We have not used a mechanistic method when applying these indicators, but rather have used our judgement based on the information across the indicators when considering whether to exclude a firm from the comparator sample.”

⁶⁸ Houston Kemp (2023), *Port of Melbourne beta and gearing – review of CEPA report*, November, p. 7.

⁶⁹ QCA (2023), p. 75.

⁷⁰ ERA (2022), p.179.

⁷¹ WASC (2022), *Perth Airport Pty Ltd -V- Qantas Airways Ltd*, February.

⁷² NZCC (2023), *Input Methodologies Cost of Capital Review – Draft Decision*, June, p.68.

⁷³ The Amihud liquidity measure reflects the percentage cost of executing a trade relative to the asset's daily return and trading volume. Higher values of the Amihud measure indicate greater illiquidity, as it implies that trading the asset results in a larger price impact due to lower liquidity.

⁷⁴ IPART (2020), *Estimating Equity Beta for the Weighted Average Cost of Capital*, final report, August, p. 5.

⁷⁵ CEPA provided advice on setting WACC parameters to QCA for the Gladstone Area Water Board and used our preferred liquidity filters.

⁷⁶ IPART (2020), p.5.

⁷⁷ QCA (2023), p. 75.

⁷⁸ NZCC (2023), p.78. CEPA has also advised the NZCC on setting WACC parameters and their methodology reflects our preferred liquidity filters.

We hypothesize that market capitalisation and liquidity filters are likely to interact as companies with a larger market capitalisation may be more liquid. A key assumption of the CAPM framework is there are no transaction costs, which provides a strong theoretical argument for ensuring companies included within the comparator sample are sufficiently liquid.

As in our previous review, we do not consider that regulatory precedent imposes limits on market capitalisation liquidity filters, and so an approach that is considered in the circumstances to provide the best estimate of the beta of a benchmark efficient operator should be used. However, as we consider there is a strong theoretical argument to ensure the comparator sample are sufficiently liquid, we prefer an approach that applies some combination of liquidity and/or market capitalisation filters. The regulatory precedent is not prescriptive in how a sufficiently liquid firms should be identified, and we consider there may be variations in the types of tests, or the thresholds of tests that would also be well accepted in so far as they derive a sample of sufficiently liquid firms.

We note the ESC's SoRA states that PoM should apply market capitalisation filters and industry filters consistently without varying them from one year to the next.⁷⁹ As Houston Kemp have applied market capitalisation and liquidity filters in the 2022-23 TCS, we consider using these same filters in the 2023-24 TCS remains well accepted.

Available data filter

Some regulators also remove firms that are seen to have sufficient time-series data. IPART sets this threshold for inclusion of a proxy firm to 60 months (5 years) noting:⁸⁰

"In our view a time series of less than three years is too short to calculate a reliable medium-run beta estimate. In many instances, a short time series will represent a newly established firm, which is likely inconsistent with our consideration of a mature benchmark efficient firm. Furthermore, short time series are more prone to measurement error, reducing the reliability of results."⁸¹

Similarly, QCA consider:

"Comparators should have a complete trading history over the chosen observation window. Including comparators that do not have a full set of observations could potentially introduce bias if the covariance of returns with the market changed over the observation window for the majority of firms within the sample."

The WASC and latest NZCC methodology also requires a minimum of 5-years of trading data.⁸² The ERA use a combination of listed and delisted firms, but notes they include firms where the majority of the observations are present in the estimation window.⁸³ It is unclear whether the AER, which also uses a combination of listed and delisted firms, applies a similar restriction.

Houston Kemp removes firms with less than 5 years of data from the comparator samples and estimate beta over 5- and 10-year estimation periods. However, some comparators used in their 10-year estimation periods do not have 10-years of data. While we previously estimated beta for comparators only where there is complete data over

⁷⁹ While not stated, we would expect the same advice to apply to liquidity filters.

⁸⁰ We note this reasoning mentions 36 months, which in a final decision, IPART changes to 60 months to improve statistical reliability. IPART (2020), p. 1.

⁸¹ IPART (2019), p. 6.

⁸² NZCC (2016), p. 63. We note the NZCC draft decision IMs do not reference this, however CEPA were asked to advice on WACC parameters and applied a filter to remove firms with less than 5-years of trading history.

⁸³ ERA (2022), p. 181.

the estimation period, we agree it is also well accepted to estimate beta where the majority of observations are present in the estimation window.⁸⁴

4.3. ASSESSMENT

The approach used to construct the comparator sample which the Port uses to calculate the rate of return in the 2023-24 TCS (with a country filter) is well accepted.

We reiterate that drawing on the available regulatory precedent, applying a country filter when using international comparators is the well accepted approach. Houston Kemp considers that the diversity of characteristics across different ports results in varied systematic risks and favour using a larger sample to balance out fluctuations. They increase the sample by removing the country filter. However, if the larger sample is less comparable to the Port, we consider this could either increase or decrease the variance, increasing the bias. On balance, we do not consider that because port betas are more variable that we should favour a wider sample.

The Port's approach to comparator selection is not the only well accepted approach and we provide the following caveats:

- While we found mixed support for using market capitalisation and liquidity filters, we consider there is a strong theoretical rationale to ensuring the comparator sample is sufficiently liquid which supports the use of some form of liquidity filter. This is also consistent with the Undertaking, which requires the use of 'appropriate filters' to exclude companies with insufficient data or illiquid data, or whose market capitalisations are too small to serve as appropriate comparators. Houston Kemp applies a market capitalisation filter, and two liquidity filters which are consistent with the approach in the 2022-23 TCS and the approach in our 2021 review. The regulatory precedent is not prescriptive in how a sufficiently liquid firms should be identified, and we consider there may be variations in the types of tests, or the thresholds of tests that would also be well accepted in so far as they derive a sample of sufficiently liquid firms.
- Houston Kemp only includes firms in its port sample that (in their view) undertake the core function of a port owner or port owner-operator and manually adjusts the final comparator samples based on this. While we consider it well accepted to ensure the comparator sample sufficiently represents the Port's core operations, we identified some additional firms which (in our view) were also relevant to include.
- The Undertaking also considers that if the process does not generate a sample of comparable firms of sufficient size, the Port should repeat the prescribed process using search criteria that are less restrictive. Rather than expand the comparator sample size by removing the country filter, we consider there are other less well accepted filters which could be explored, including choices on market capitalisation or liquidity filtering thresholds, to address sample size concerns.

4.4. CONSTRUCTING COMPARATOR SAMPLES

We consider the regulatory precedent indicates that it is well accepted to construct a comparator sample:

- Using firms whose activities are sufficiently similar to the Port of Melbourne's regulated operations;
- Using firms from outside Australia;
- Applying a country filter that limits the sample to firms that operate in markets with similar economic, political, and social conditions to Australia.

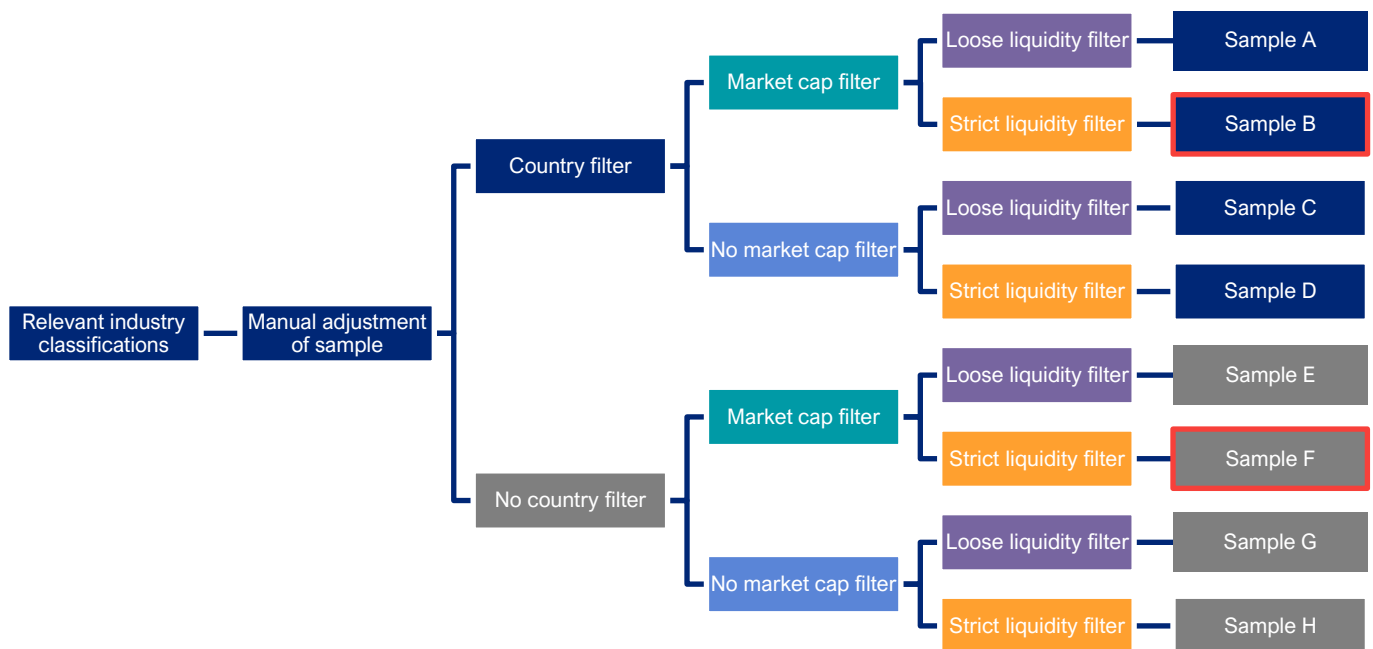
⁸⁴ The Port raised that two comparators, Westports Holdings and Qingdao Port International Co., which we removed from 10-year estimations had at least 9-years of data available. We agree it would also be well accepted to include these companies in 10-year estimations, particularly where these firms would be included next year regardless. Our final report includes these two comparators in 10-year estimates.

However regulatory precedent is mixed on whether it is well accepted to apply market capitalisation or liquidity filters. For this reason, we have constructed a range of comparator samples which apply different approaches to market capitalisation and liquidity.

We also construct some samples which do not apply a country filter to aid comparison to Houston Kemp’s results while noting we do not consider this approach to be well accepted. Appendix A provides a breakdown of potential comparator firms and which criteria they meet.

The figure below summarises the different samples considered. We note that Sample B and Sample F align to the sampling approach used by Houston Kemp and discussed in Section 4.1 and are circled in red. Sample B aligns with Houston Kemp’s alternative sample, and Sample F aligns with Houston Kemp’s preferred sample. Samples E to H apply no country filter and are shown in grey to indicate our judgement that these samples are not constructed with well accepted approaches.

Figure 4-1: Summary of the different comparator samples



Further discussion on liquidity and market capitalisation thresholds

Between our draft and final report, the Port’s advisors have clarified the liquidity filter applied in the 2023-24 TCS is consistent with the liquidity filter used in CEPA’s 2021 report. That is, they remove firms where the percentage of trading days where no trading occurred exceeded 20% of available trading days **and** (not or) where the average bid-ask spread for the period exceeded 1%. They do not consider it well accepted to include firms where only one of the two liquidity tests are met since both liquidity tests are important for ensuring that the resulting beta estimates are measured accurately and precisely.

We agree with the Port’s assessments that:⁸⁵

“If a firm’s shares trade with a bid-ask spread that is too high, then this may lead to inaccurate beta estimates because it introduces transaction costs, which violates the assumptions of the CAPM framework” and

⁸⁵ Houston Kemp (2023), *Port of Melbourne beta and gearing – review of CEPA report*, p. 9-10.

“If a firm’s shares are traded infrequently, then this may make it difficult to observe incremental changes in the value of the firm. For example, a shock that changes the value of the firm materially may shift both the bid price and ask price of the firm, but this shock will not be observed in historical prices if the firm’s shares do not trade on that day. This also biases the firm’s returns when calculating its beta.”

The discussion is materially about what filters are required to ensure a firm is sufficiently liquid that it is appropriate to use to estimate beta of the Port of Melbourne. While we have used certain thresholds (1% bid-ask spread and 20% non-trading days) the regulatory precedent is not prescriptive in how a sufficiently liquid firm should be identified, and we consider there may be variations in the types of tests, or the thresholds of tests that would also be well accepted in so far as they derive a sample of sufficiently liquid firms.

For instance, while Hutchison Port Holdings Trust, Thessaloniki Port Authority, South Port New Zealand, and Suria Capital Holdings fail the bid-ask spread test at a 1% threshold, they would all pass at 2%. Of those, only South Port New Zealand fails a 20% trading day test over a 10-year period, while all firms pass the 20% trading day test over the recent 5-year period. Suria Capital Holdings fails on market capitalisation when the threshold is set at \$100 million but would pass if the threshold was set at \$95 million. Santos Brasil Participacoes S.A is also removed from 10-year estimate for failing the 20% trading days check, but this is due to having no trading history before 2016 and does not inform us of the liquidity of this firm since 2016.⁸⁶

Our framework for testing different liquidity thresholds was informed by our interpretation of the Port’s approach to liquidity filters. While this has been corrected, we consider that samples which include the five additional firms that pass at least of the prescribed liquidity tests are also well accepted and we use these broader samples to estimate a well accepted range the Port’s beta and gearing parameters.

4.4.1. Constructing our samples

The below figure illustrates the sampling steps and the number of comparators included in Sample A. For simplicity this figure only presents the number of comparators for 5-year betas where we end up with 9 potential comparators. As the 10-year beta estimate requires a longer trading history, we end up with 7 comparators using the same procedure.

- We used Bloomberg’s EQS to identify potential comparators from BICS – ‘Port and Harbour Operations’ and GICS ‘Marine Ports and Services’ classifications and restricted our search to only include active companies and for the primary security listed. We note that while Houston Kemp identified 292 unique tickers, we identified 250 unique firms after removing duplicates. We also searched for firms included in the TRBC ‘Marine Port Services’ classification, however this did not result in any new firms once sampling steps were completed.
- We excluded companies with less than five years of trading history.
- We removed companies with less than US\$100 million market capitalisation as of 31 March 2023.
- We applied a liquidity filter which removed companies where the percentage of trading days where no trading occurred exceeded 20% of available trading days **or** where the average bid-ask spread for the period exceeded 1%.
- We applied a country filter which removed companies not listed in FTSE Russell “Developed” or “Advanced Emerging” countries.
- We manually reviewed the Bloomberg descriptions of each company, assessing the breakdown of each company’s revenues by segment; and carrying out desktop research such as reviewing company websites, annual reports, and investor presentations.

⁸⁶ However, the regulatory precedent would still reject Santos Brasil Participacoes as a suitable comparator for 10-year estimates as the majority of observations are not present in the estimation window.

Figure 4-2: CEPA comparator sampling process (5-year betas) for sample A



While this process follows the same sampling procedure that Houston Kemp applies to its alternative sample, our sample includes more companies than Houston Kemp. This is due to differences in judgement on what which companies are sufficiently similar to the Port during the manual adjustment stage. We provide our justification for including companies in our samples in Section 4.4.2 and Appendix A.

We previously identified that regulatory precedent is not settled on the use of liquidity or a market capitalisation filters. Accordingly, we consider how our beta estimate changes if we remove the market capitalisation filter or adjust the liquidity filter. In our judgement it is more accepted to apply some kind of liquidity measure to ensure that the comparator sample adheres to the CAPM assumption that firms are sufficiently liquid to incur no transaction costs. In this vein, we do not test consider how our beta estimation changes if we omit all liquidity filters. Instead, we test how beta estimates change with the application of different liquidity thresholds.

In the TCS, Houston Kemp conducts two liquidity tests; one which removes companies where the percentage of trading days where no trading occurred exceeds 20% of available trading days, and one which removes companies where the average bid-ask spread for the period exceeds 1%. This is consistent with the approach in our previous report. We also develop a sample which includes relevant firms that pass one of the two liquidity tests. In practice, this is the analogous to removing firms which have a bid-ask spread above 2%.

We consider that regulatory precedent identifies that applying a country filter is well accepted. However, we also consider how our beta estimate changes if we remove this filter. The table below summarises the number of companies that are included in each sample for five- and ten-year estimation periods.

Table 4-2: Summary of comparator samples

Sample	Country filter	Market cap filter	Liquidity filter	Sample size 5-yr, 10-yr
Sample A	Yes	Yes	Loose	9, 7
Sample B	Yes	Yes	Strict	6, 5
Sample C	Yes	No	Loose	10, 8
Sample D	Yes	No	Strict	6, 5

Sample	Country filter	Market cap filter	Liquidity filter	Sample size 5-yr, 10-yr
Sample E	No	Yes	Loose	29, 25
Sample F	No	Yes	Strict	23, 21
Sample G	No	No	Loose	20, 26
Sample H	No	No	Strict	23, 21
HK preferred sample	No	Yes	Loose	21, 18
HK alternate sample	Yes	Yes	Loose	5, 4

In Section 4.2, we hypothesised that market capitalisation and liquidity are likely to interact as companies with a larger market capitalisation may be more liquid. We find evidence to support this within our comparator samples where the comparator sample are the same for Samples A and D, and Samples F and H respectively. This implies that applying a strict liquidity filter has the same effect as applying a market cap filter across our wider sample. For brevity, we remove samples D and H which leaves us with six comparator samples for the following sections.

We note that the size of our preferred comparator samples (those that apply a country filter) are in line with those used by other regulators which suggests it is not necessary to apply less restrictive search criteria as directed by clause 25(c) of the Undertaking. This is provided that we are satisfied that the comparators chosen are representative of the risk characteristics of the Port of Melbourne.

4.4.2. Comparator deep-dive

Our final samples include some additional comparators to the samples in the 2023-24 TCS. This is primarily due to applying different liquidity filters or differences in opinion in which firms are sufficiently comparable to the Port. Our judgement of which firms provide comparable services to the Port of Melbourne is informed by the Port's Prescribed Services set out in s 49(1)l of the Port Management Act 1995 (Vic). These include:

- the provision of channels (except anchorages) for use by shipping in port of Melbourne waters, including the Shared Channels used by vessels bound either for the port of Melbourne or for the port of Geelong and the Dedicated Channels used by vessels bound for the port of Melbourne
- the provision of berths, buoys or dolphins in connection with the berthing of vessels in the port of Melbourne
- the provision of short-term storage or cargo marshalling facilities in connection with the loading or unloading of vessels at berths, buoys or dolphins in the port of Melbourne
- the provision of access to, or allowing use of, places or infrastructure... on port of Melbourne land for the provision of services to port users
- any other service that is prescribed by the regulations.

We err on the side of including comparators which appear to provide most, or all of these services, while noting that some comparators may provide services that are outside the scope of the port's primary services (such as loading and unloading cargo) but which are common across port operators.

We summarise these additional companies below with our reasoning for inclusion. A discussion of all comparators is included in Appendices A and B.

Table 4-3: Rationale for including additional comparators

Company	Company description	Reason for inclusion
With country filter		
China Container Terminal Corporation	China Container Terminal Corporation operates container terminals. The Company's terminals are located in the ports of Kaohsiung, Taichung, and Keelung in Taiwan.	BICS classification shows Port & Harbour Operations at 100%, and Port & Harbour operations is the majority revenue group. ⁸⁷
Hutchison Port Holdings Trust	Hutchison Port Holdings Trust is a container port business trust. The Trust invests in, develops, operates, and manages deep-water container ports in the Pearl River Delta. Hutchison Port Holdings also invests in other types of port assets such as river ports, as well as undertake certain port ancillary services that include warehousing and distribution services.	BICS classification shows Port & Harbour Operations at 100%, and revenue breakdown shows only Transport Operations & Services.
Thessaloniki Port Authority	Thessaloniki Port Authority SA manages the Thessaloniki harbor. The Company provides services such as loading and unloading cargo, warehousing, and offers electricity, water, and other services.	BICS classification shows Port & Harbour Operations at 100%, and majority revenue comes from Harbour Operations and Conventional Port.
South Port New Zealand	South Port New Zealand Limited operates the Bluff Harbor in the Port of Bluff, New Zealand. Operations at the harbour include dry warehousing and storage services, cold storage facilities, dry docking for vessels, cargo handling, log debarking, container servicing and mobile harbor crane services.	Majority revenue from Port & Warehousing Industries, and 2022 annual report shows significant revenue from port services.
Suria Capital Holdings	Suria Capital Holdings Berhad is an investment holding and property development company. The Company, through its subsidiaries, provides, maintains, regulates, and controls port services and facilities.	BICS classification shows Port & Harbour Operations at 90%, and revenue segment shows majority port operations.
No country filter		
Liaoning Port Co.	Liaoning Port Co., Ltd. provides logistics services. The Company offers container handling, container transportation, crude oil warehousing, gross cargo transportation, and other services. Liaoning Port provides its services throughout China.	No BICS segment revenue, however 2022 annual report shows significant revenue from port operation and management services at 77%.
Tianjin Port Holdings Co.	Tianjin Port Holdings Co., Ltd. provides port operation services. The Company offers commodity storage, transit transportation, container handling, dismantling and loading, and other services. Tianjin Port Holdings also provides financial services.	BICS classification shows Port & Harbour Operations at 70.00%, and product revenue shows majority port & harbour operations. ⁸⁸

⁸⁷ Houston Kemp do not consider this firm is sufficiently comparable to the Port of Melbourne because it derives substantial revenues from activities unrelated to container port operations (stevedoring). We identified this as a relevant comparator in our 2021 review and consider this remains a relevant comparator. Houston Kemp (2023), *Port of Melbourne beta and gearing – review of CEPA report*, p. 13.

⁸⁸ Houston Kemp do not consider this firm is sufficiently comparable to the Port of Melbourne because it derives substantial revenues from activities unrelated to container port operations (P & H - loading and unloading, selling, and port logistics business). We identified this as a relevant comparator in our 2021 review and consider this remains a relevant comparator. Houston Kemp (2023), *Port of Melbourne beta and gearing – review of CEPA report*, p. 13.

Company	Company description	Reason for inclusion
DaNang Port	DaNang Port Joint Stock Company operates a shipping port. The Company offers marine port services such as container tracking and handling to cruise ships and sea travellers. DaNang Port serves customers in worldwide.	BICS classification shows Port & Harbour Operations at 100%, and all product revenue shows port operations.
Port of Koper	Luka Koper (Port of Koper) operates a cargo port and specialized terminals in Slovenia. The Company offers handling, warehousing, distribution, processing, logistical, and other related services. Luka Koper is the only maritime cargo port in Slovenia located north on the Adriatic Sea.	BICS classification shows Port & Harbour Operations at 100%, and product revenue is entirely diversified port and logistics activities. Annual report shows significant container and car activities, but not a revenue breakdown.
Societe d'Exploitation des Ports	Societe' d'Exploitation des Ports, doing business as Marsa Maroc, manages and operates port terminals. The Company provides terminal and maintenance services including piloting, towing, refuelling, skidding, stacking, weighing and mooring. Marsa Maroc primarily serves the shipping industry in Morocco.	BICS classification shows Port & Harbour Operations but no percentage. However, 2022 annual report supports significant port operations.
Port of Hai Phong	Port of Hai Phong JSC is located in the North of Vietnam. The Company has four main branches: Hoang Dieu terminal, Chua Ve terminal, Tan Vu terminal, Bach Dang terminal.	BICS classification shows Port & Harbour Operations at 100%, and all product revenue port operations.
Starlog Enterprises	Starlog Enterprises Ltd operates within the Heavy construction sector. Starlog Enterprises Limited engages in the operation of ports, terminals, and infrastructure facilities in India. It also owns, operates, maintains, and gives on hire heavy duty cranes. The company was formerly known as ABG Infralogistics Limited and changed its name to Starlog Enterprises Limited.	BICS classification shows Port & Harbour Operations at 100% and all product revenue is port services.

Reason for inclusion draws on information obtained from Bloomberg. We primarily used BICS segment name and revenue percentage, supplemented with produce/ geographic revenue breakdowns.

Suria Capital Holdings has a market capitalisation below the US \$100 million threshold (US \$95.6 million) and are included in samples C and G which do not apply a market capitalisation filter.

Hutchison Port Holdings Trust, Thessaloniki Port Authority, South Port New Zealand, Suria Capital Holdings, Liaoning Port Co., Port of Koper, and Societe d'Exploitation des Ports fail the bid-ask spread liquidity test when the threshold is set at 1%, but pass at 2%. All firms pass the 20% trading day test over a 5-year period. We include these firms in samples A, C, E and G which apply a loose liquidity filter.

Following feedback from Houston Kemp, we also include Westports Holdings, Qingdao Port International Co. and Saudi Industrial Services Company in relevant samples for 5- and 10-year estimates. In our draft decision, we did not include Westports Holdings or Qingdao Port International Co. in 10-year estimates as they had 9 years of data. However, we accept it is appropriate to include these firms. We also include Saudi Industrial Services Company in Sample F as it has it meets both the trading day and bid-ask spread liquidity checks.⁸⁹

Da Nang Port, and Port of Hai Phong were also included in samples E and G for passing a loose liquidity filter in our draft report, however as they have bid-ask spreads above 2% we accept they may not be sufficiently liquid and remove them as comparators. Similarly, we remove Starlog Enterprises for having a market capitalisation of US

⁸⁹ Our draft report mis-identified that this firm did not pass a 20% trading day check.

\$3.3 million which is significantly below the \$100 million threshold and may be too small to serve as an appropriate comparator.

Houston Kemp do not consider that China Container Terminal Corporation or Tianjin Port Holdings Co. are sufficiently comparable to the Port of Melbourne because they derive substantial revenues from activities unrelated to container port operations (stevedoring, P & H - loading and unloading, selling, or port logistics business).⁹⁰ We identified these firms as relevant comparators in our 2021 review and consider they remain relevant.

Similarly, Houston Kemp also do not consider Gemadept Corporation (see Appendix A) is sufficiently comparable to the Port of Melbourne prior to 2018 as it derived substantial revenue from activities unrelated to container port operations (logistics) over this period. However, we continue to include Gemadept Corporation in both 5- and 10-year estimates as we consider their pre-2018 activities were sufficiently comparable to the Port of Melbourne.⁹¹

Houston Kemp also identified a difference in how we applied a country filter between our 2021 report and this report. In our draft report, we excluded China Merchants Port Holding Company, COSCO Shipping Ports, Qingdao Port International Co Ltd and Liaoning Port Co from our preferred samples failing the country filter but considered these companies passed the country filter in 2021. We have applied the country filter to the country of risk rather than the country of listing in this report which results in some additional countries being excluded from our country filtered samples. For example, a company that operates ports in the Bahamas but is listed in the United Kingdom would be excluded. The regulatory precedent indicates that limits are often placed on which countries comparators can be drawn from, however there is no uniform framework for how this is implemented. This approach appears consistent with Houston Kemp's approach.

⁹⁰ Houston Kemp (2023), *Port of Melbourne beta and gearing – review of CEPA report*, p. 13.

⁹¹ We note that over 2014-2017, 43% of Gemadept Corporation revenue was derived from port operations with the remainder from logistics. KB Securities Vietnam (2019), *Gemadept Corporation – Full report*, July, p. 3.

5. BETA ESTIMATION

In Section 4, we discussed how a comparator sample that provides services with a similar degree of risk to the Port can be used to estimate the risk of the Port. Understanding the risk of the Port is critical to determining an appropriate rate of return for the Port.

The ESC calculates the Port's rate of return as the weighted average cost of capital (WACC). The WACC on a pre-tax nominal basis is given by:

$$WACC_{pre-tax,nominal} = g \times R_d + \frac{(1 - g) \times R_e}{(1 - t) \times (1 - \gamma)}$$

Where g is gearing, the proportion of the company's debt over the total of its debt and equity, R_d is the pre-tax, nominal cost of debt,⁹² R_e is the post-tax, nominal cost of equity, which is further adjusted to the pre-tax, nominal cost of equity by applying a 'tax wedge' based on the company tax rate t and γ (gamma), a parameter between 0 and 1 which measures the value that investors derive from imputation credits.

The Sharpe-Lintner Capital Asset Pricing Model (SL-CAPM) is commonly used to estimate the cost of equity. Under the SL-CAPM (hereby CAPM), the post-tax, nominal cost of equity is calculated as:⁹³

$$R_e = R_f + \beta_e \times MRP$$

Where R_f is the risk free rate; MRP is the market risk premium, the difference between the expected market return and the risk-free rate; and β_e is the company's equity beta, a coefficient that measures the covariance between returns in the stock market as a whole and returns on the company's equity.

Within the framework of cost of capital estimation and the CAPM, risk is assessed through this beta parameter. This measures systematic risk, which is the extent to which returns are correlated with those of the market.

Equity beta includes the effect of debt on returns, while an asset beta (or unlevered beta) has these effects removed, thus allowing risk to be compared for companies with different capital structures. In regulatory contexts, observed equity betas from comparators are converted to asset betas to derive an estimate of the asset beta of the regulated company. The asset beta is then 're-levered' using the regulator's gearing assumption to derive the equity beta to be used in the CAPM formula.

We estimate asset beta across the comparator samples constructed in Section 4, to derive an estimate of the asset beta for the Port of Melbourne. Section 5 considers what is a well accepted approach to this estimation procedure.

5.1. THE PORT'S APPROACH

In this section, we consider the Port's approach to estimating beta. For the 2023-24 TCS, the Port was advised by Houston Kemp. Houston Kemp estimated the Port's equity beta by:

- estimating raw equity betas using OLS over five- and ten-year averaging periods for a combination of weekly and four-weekly frequencies;
- de-levering the equity betas using the Brealey-Myers formula to obtain asset betas; and
- re-levering the average asset beta using the benchmark gearing to obtain a re-levered benchmark equity beta.

⁹² The cost of debt is the sum of the risk-free rate (the rate of return on a risk-free asset), the debt risk premium (the additional return a lender requires as compensation for risk beyond the risk-free asset, which is a function of the company's credit rating) and debt raising costs (the transaction costs involved in obtaining debt finance).

⁹³ The CAPM formula can be expressed in nominal and real terms, depending on whether the risk free rate and market risk premium are in real or nominal terms. We express this in nominal terms to align with the Undertaking.

This estimation approach is consistent with the approach applied in the 2022-23 TCS. We note the ESC did not comment on this approach in the interim commentary.

5.2. REGULATORY EVIDENCE

We assessed Australian and New Zealand regulatory precedent to understand what is a ‘well accepted’ approach to estimating beta and whether the Port’s proposal is in line with these.

We identified six key characteristics where approaches can vary when estimating beta. These relate to the estimation procedure, period, return specification, choice of market index, deleveraging formula and whether to apply any special adjustments.

The table overleaf summarises the recent regulatory precedent taken to estimating beta. We find unanimous support for using a local market index. We also find near unanimous support for using the Brealey-Myers formula for de-leveraging, using OLS for estimation and not applying any special adjustments.

Recent regulatory precedent provides strong support for using weekly returns including using all trading days rather than just end of weeks. Although less common, regard is also had to monthly returns alongside weekly estimates. This is consistent with the findings of our previous review.

We find that some regulators apply discretion in how they reflect the observed beta from the comparator sample in their final decisions on an appropriate level of beta to calculate returns.

Table 5-1: Summary of regulatory precedent for beta estimation

Regulatory decision	Sector	Period	Return specification	Index selection	De-leveraging formula	Estimation procedure	Special adjustments	Regulatory discretion
QCA (Aug 2023)	Energy and Water	10-year	Weekly	Local	Brealey-Myers with a debt beta of 0.12	OLS	None	Yes
NZCC (Jun 2023)	Electricity, Gas and Airports	5-year intervals for airports, and last two 5-year intervals for energy	Daily, weekly and 4-weekly. Gives primary weight to weekly and 4-weekly	Local	Brealey-Meyers with zero debt beta ⁹⁴	OLS	Airports are adjusted for COVID years	No
AER (Feb 2023)	Electricity and Gas	Longest available; 5-year; Post tech boom and excluding GFC	Weekly	Local	Brealey-Meyers	OLS	None	Yes
ACCC (Dec 2022)	Postage and Logistics	5-year	Weekly	Local	Not stated	Regression	None	No
ERA WA (Dec 2022)	Gas	5-year; 10-year	Weekly	Local	Brealey-Meyers with zero debt beta	OLS and Least Absolute Deviation with country pooling applied	None	Yes
WASC (Feb 2022)	Airports	5-year; 10-years; 15-year ⁹⁵	Weekly; 4-weekly	Local	Brealey-Meyers ⁹⁶	Regression	None	No

⁹⁴ The Harris-Pringle formula is identical to the Brealey-Myers formula when debt beta is zero. Brealey-Meyers stated in this table for clarity.

⁹⁵ Both experts considered these estimation periods. The Court did not appear to pass an opinion on this issue as it was not in dispute.

⁹⁶ Dr Hird applied the NZCC 2016 IM beta methodology which uses the Harris-Pringle de-leveraging formula. We note that the impact of COVID-19 was not considered in the 2016 IMs or the judgement.

Regulatory decision	Sector	Period	Return specification	Index selection	De-leveraging formula	Estimation procedure	Special adjustments	Regulatory discretion
IPART (Aug 2020)	Water	5-years	Weekly	Local	Brealey-Meyers	OLS	Adjusted with Vasichok.	Yes
ICRC (May 2023)	Water	Average of recent Australian regulatory decisions for water, gas and electricity.						
OTTER (May 2022)	Water	Based on AER and other Australian regulator's decisions.						
ESCOSA (Jun 2020)	Water	Based on decisions of other Australian regulatory decisions in water, gas and electricity.						

Regulatory discretion

While IPART calculates beta from a comparator sample, it applies discretion as to whether they adjust the value of the beta parameter in its return calculations. Before IPART considers revising an established beta value for a price review, a threshold for change must be met where the prior beta estimate must be more than one standard deviation from the new mean estimate, and there must be persistent evidence over a long period (i.e., a regulatory period of four years or longer) of changed beta.⁹⁷ They also state:⁹⁸

“We intend to consider these estimates, along with other evidence on beta, as an input to our decisions on beta in future price reviews.”

The AER, ERA and QCA also apply regulatory discretion to determine the best point estimate for equity beta.⁹⁹ QCA calculates beta for a set of industry samples and note:

“The betas from these industry samples will serve as reference points that, while not determinative, will help guide our decision on an appropriate beta for the regulated entity under review. Other information we may consider when assessing an appropriate beta could include our past regulatory decisions and relevant decisions made by other regulators.”

The ACCC and NZCC appear to consider only the beta estimate of the comparator sample.¹⁰⁰ ICRC, OTTER and ESCOSA do not construct their own comparator sample or estimate beta and rely on the decisions of other Australian regulators.

5.3. ASSESSMENT

Having reviewed the above regulatory precedent, we consider Houston Kemp’s approach to estimating beta is well accepted.

5.4. ESTIMATING ASSET BETA

We consider the regulatory precedent indicates that it is well accepted to estimate beta:

- Use 5-year and 10-year estimation periods
- Use weekly and 4-weekly return specifications
- Use the local market index
- Use OLS estimation
- Use the Brealey-Myers deleveraging formula

It is less well accepted to use daily return specifications and apply special adjustments to estimations.

The table overleaf provides our estimates of beta for our six samples (samples A – C and E – G) and a re-estimation of Houston Kemp’s preferred and alternate samples across 5-year and 10-year estimation periods.

This data is summarised in the figure and tables below. This indicates that, averaging across our preferred comparator samples that apply a country filter (samples A – C), the Port’s weekly asset beta (when calculated using net debt) falls within a range of 0.59 to 0.75. In the 2022-23 TCS, Houston Kemp estimated asset beta for its

⁹⁷ IPART (2020), p.2.

⁹⁸ IPART (2019), p. 1.

⁹⁹ ERA (2022), p. 162; AER (2022), p. 174.

¹⁰⁰ ACCC (2022), p. iv; NZCC (2016); NZCC (2023).

alternative samples (that applied a country filter) at 0.70. In our previous report to the ESC, we proposed an asset beta range of 0.60 to 0.70. We consider our estimate of asset is broadly consistent with previous estimates.

We consider that as the four-weekly estimates are higher across all samples, this would support a point estimate towards the top of the weekly range. Using an average of the 5-yr and 10-yr estimates seeks to strike a balance between historical averages and reflecting recent market movements. It is possible that higher beta estimates across the 5-yr periods reflects increased risks due to covid-19 uncertainties which may not reflect the underlying risk of post-covid port operations. This could support a point estimate towards the middle of the range.

While it would also be well accepted to consider the range for weekly asset beta derived with gross debt (0.53 to 0.69), we maintain there is a stronger theoretical argument to rely solely on beta estimates that use net debt. This is because asset beta is primarily seeking to measure the risk of the underlying asset (the Port), not the risk of the underlying asset plus cash holdings.

Figure 5-1: Range of asset betas calculated using net and gross debt, averaged across 5-yr and 10-yr estimation periods.

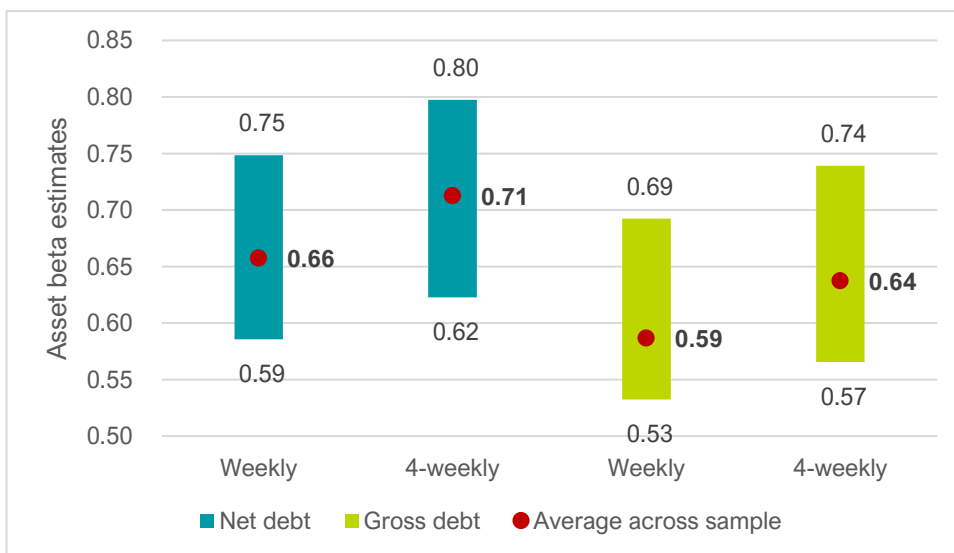


Table 5-2: Range of asset beta calculated using net and gross debt, averaged across 5-yr and 10-yr estimation periods

Samples A – C	Weekly asset beta (net debt)	4-weekly asset beta (net debt)	Weekly asset beta (gross debt)	4-weekly asset beta (gross debt)
Low	0.59	0.62	0.53	0.57
High	0.75	0.80	0.69	0.74
Average	0.66	0.71	0.59	0.64

Average is calculated across sample, not as the average of the range.

Table 5-3: Summary of asset beta estimation by sample, using net debt

Sample	Country filter	Market cap filter	Liquidity filter	Sample size 5-yr, 10-yr	5-yr weekly asset beta	5-yr 4-weekly asset beta	10-yr weekly asset beta	10-yr 4-weekly asset beta
Sample A	Yes	Yes	Loose	9, 7	0.66	0.73	0.59	0.63
Sample B	Yes	Yes	Strict	6, 5	0.75	0.80	0.59	0.62
Sample C	Yes	No	Loose	10, 8	0.70	0.79	0.66	0.71
Sample E	No	Yes	Loose	29, 25	0.71	0.76	0.73	0.76
Sample F	No	Yes	Strict	23, 21	0.73	0.76	0.73	0.76
Sample G	No	No	Loose	20, 26	0.72	0.78	0.74	0.78
HK alternate sample	Yes	Yes	Loose	5, 4	0.80	0.84	0.61	0.63
HK preferred sample	No	Yes	Loose	21, 18	0.74	0.77	0.73	0.77
Average for samples A – C					0.70	0.77	0.61	0.65
Average for samples E – G					0.72	0.76	0.73	0.76

Table 5-4: Summary of asset beta estimation by sample, using gross debt

Sample	Country filter	Market cap filter	Liquidity filter	Sample size 5-yr, 10-yr	5-yr weekly asset beta	5-yr 4-weekly asset beta	10-yr weekly asset beta	10-yr 4-weekly asset beta
Sample A	Yes	Yes	Loose	9, 7	0.59	0.66	0.53	0.57
Sample B	Yes	Yes	Strict	6, 5	0.69	0.74	0.56	0.59
Sample C	Yes	No	Loose	10, 8	0.59	0.67	0.56	0.60
Sample E	No	Yes	Loose	29, 25	0.64	0.69	0.67	0.69
Sample F	No	Yes	Strict	23, 21	0.67	0.70	0.68	0.71
Sample G	No	No	Loose	20, 26	0.64	0.69	0.67	0.70
HK alternate sample	Yes	Yes	Loose	5, 4	0.73	0.77	0.57	0.60
HK preferred sample	No	Yes	Loose	21, 18	0.68	0.71	0.68	0.71
Average for samples A – C					0.63	0.69	0.55	0.58
Average for samples E – G					0.65	0.69	0.67	0.70

6. GEARING

The pricing order also requires that gearing, which is the weighting of debt in the WACC, to relate to the gearing of the benchmark efficient entity. This section considers the appropriate method to obtain this weighting.

Gearing affects the WACC estimate in two ways:

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

The pre-tax nominal WACC formula used by the ESC to determine the benchmark return on capital for the Port of Melbourne:

$$WACC_{pre-tax,nominal} = g \times R_d + \frac{(1 - g) \times R_e}{(1 - t) \times (1 - \gamma)}$$

Where g is gearing, the proportion of the company's debt over the total of its debt and equity, R_d is the pre-tax, nominal cost of debt,¹⁰¹ R_e is the post-tax, nominal cost of equity, which is further adjusted to the pre-tax, nominal cost of equity by applying a 'tax wedge' based on the company tax rate t and γ (gamma), a parameter between 0 and 1 which measures the value that investors derive from imputation credits.

The Brealey-Myers de-leveraging formula applies the estimated gearing of the benchmark efficient entity to reach an estimate of asset beta for the Port of Melbourne:

$$\beta_e = \beta_a \times (1 + g)$$

Where β_e is the equity beta, β_a is the asset beta, and g is gearing, the proportion of debt and equity within the assumed capital structure.

We estimate gearing across the comparator samples constructed in Section 4, to derive an estimate of gearing for the Port of Melbourne. We then adjust the asset beta estimated in in Section 5 to an estimate of the Port's equity beta, using the Brealey-Myers de-leveraging formula. Section 6 considers what is a well accepted approach to estimating this gearing.

6.1. THE PORT'S APPROACH

To calculate gearing, Houston Kemp:

- Calculated the average of five-year and ten-year gearings from each comparator sample;
- Used the book value of net debt as the measure of the debt component of the gearing estimates; and
- Retained the NZCC's 2016 approach that sets a lower bound of zero gearing for each company, such that companies with negative net debt from large cash holdings will be treated as having zero leverage.

This approach is consistent with the approach applied in the 2022-23 TCS, which the ESC noted in their interim commentary was "well accepted". The Undertaking notes that gearing levels should be based on the average

¹⁰¹ The cost of debt is the sum of the risk-free rate (the rate of return on a risk-free asset), the debt risk premium (the additional return a lender requires as compensation for risk beyond the risk-free asset, which is a function of the company's credit rating) and debt raising costs (the transaction costs involved in obtaining debt finance).

gearing of the comparator set, where the Port should first refer to the benchmark gearing that currently applies, and then refer to the average gearing of the comparator sample as cross checks.¹⁰²

6.2. REGULATORY EVIDENCE

We assessed Australian and New Zealand regulatory precedent to understand what is a ‘well accepted’ approach to estimating gearing and whether the Port’s proposal is in alignment.

We identified five key characteristics where approaches can vary when estimating gearing. These relate to the debt metric used, the value metric used, whether gearing is calculated based on the comparator sample, whether regulators use other reference points and the threshold for change.

The table overleaf summarises the recent regulatory precedent taken to estimating gearing.

Our previous review did not focus heavily on gearing, however we found strong support for using the observed gearing of an appropriate comparator sample to set benchmark gearing in the Australian regulatory precedent. We also noted that most regulators consider a wider range of evidence than simply using the gearing of a comparator sample. We found regulators were mixed on whether to use net or gross debt for gearing calculations.

We find unanimous support for using the market value of equity for the value metric, using the observed average gearing of an appropriate comparator sample to inform a decision on gearing for the benchmark efficient entity, and calculating gearing over the same reference period used for estimating beta.

We find mixed support for using net or gross debt as a debt metric, whether gearing should be calculated using the same comparator sample used to estimate beta, and how regulators reflect the observed gearing from the comparator sample in their final decisions on an appropriate level of gearing to calculate returns.

¹⁰² Port of Melbourne (2022), *Undertaking to the Essential Services Commission Minister*, p. 7.

Table 6-1: Summary of regulatory precedent on gearing estimation

Regulatory decision	Sector	Debt metric	Value metric	Estimation period	Comparator set used	Retained previous value	Applies regulatory discretion
QCA (Jul 2023)	Energy and Water	Book value of gross debt	Market value of equity	Same as beta	Beta subset plus other industries	Yes	Yes
NZCC (Jun 2023)	Electricity, Gas and Airports	Book value of net debt	Market value of equity	Same as beta	Same as beta	No	No
AER (Feb 2023)	Electricity and Gas	Book value of gross debt	Market value of equity	Same as beta	Beta subset	Yes	Yes
ACCC (Dec 2022)	Postage and Logistics	Book value of net debt	Enterprise value	Unclear	Same as beta	No	No
ERA WA (Dec 2022)	Gas	Book value of gross debt	Market value of equity	Same as beta	Beta subset ¹⁰³	Yes	Yes ¹⁰⁴
WASC (Feb 2022)	Airports	Book value of net debt ¹⁰⁵	Total assets	Same as beta	Same as beta	No	No
IPART (2020)	Water	Book value of total debt ¹⁰⁶	Market value of equity	Same as beta	Same as beta	Yes	Yes
ICRC (May 2023)	Water	Average of recent Australian regulatory decisions in water, gas and electricity.					
OTTER (May 2022)	Water	Refers to AER decision.					
ESCOSA (Jun 2020)	Water	Chosen to be consistent with general regulatory practice in Australia and is consistent with the Commission's practice in previous decisions.					

¹⁰³ ERA removes some hybrid securities from the original beta comparator sample based on regulatory judgement, but not all.

¹⁰⁴ ERA applies regulatory discretion in its treatment of hybrid securities by choosing to include some in gearing estimations, and removes others.

¹⁰⁵ Court appears to have implicitly accepted the NZCC's methodology which applies net debt.

¹⁰⁶ We judge this to mean gross, not net debt.

Debt metric

Regulatory precedent is mixed on whether net or gross debt should be used to estimate gearing. QCA, AER, ERA and IPART used gross debt, while the ACCC, NZCC (and by extension, WASC) uses net debt to calculate gearing.¹⁰⁷ No regulators discussed their decision in detail, however we note from our previous review, that the AER concluded that it is inappropriate to use net debt and a measure of gross debt should be used instead.¹⁰⁸

The argument to support using gross debt is that it isn't practical to assume a company will use its cash reserves to pay off debt, while the argument in support of using net debt is that the cash reserves of a company impact its risk, which is the primary consideration for calculating beta. On balance, we consider there is a strong theoretical rationale for using net debt to calculate gearing.

Gearing comparator set

The NZCC, ACCC and IPART uses the same comparator sample to estimate both gearing and beta.

QCA uses a different comparator sample for gearing as it does for beta estimation. In addition to systematic risk, which is relevant for beta comparators, QCA also considers that firm specific risks, which are assumed to be diversifiable under the CAPM framework, are relevant. They also apply consideration as to whether country-specific factors, such as different tax regimes, limit the relevance of gearing derived from international comparators, and include the gearing of listed Australian infrastructure firms (comparators in different industries) if they consider the risks faced are broadly similar.¹⁰⁹

The AER use a subset of its beta comparator sample to estimate gearing, excluding hybrid securities which have characteristics of both debt and equity. They consider:¹¹⁰

“It is not clear that the use of hybrid securities is reflective of the practice of a benchmark NSP.”

However, the AER note that removing these firms does not materially impact the overall gearing estimate. This treatment marks a divergence from their previous precedent which calculated gearing using the same beta comparator sample. They also recognised a need to consider issues of using a small domestic sample size with predominantly delisted firms, but on balance, did not consider that adding gearing estimates from other sectors or countries was required.¹¹¹

“As the overall level of risk of providing regulated services may differ between sectors and countries, we consider it appropriate to rely on Australian listed NSPs for our gearing estimation.”

Like the AER, ERA considers the impact of hybrid securities on gearing estimation. Unlike the AER, ERA appears to include some hybrid securities, based on regulatory judgement:¹¹²

“Given the difficulty in first fully understanding the characteristics of hybrid securities and there being no simple method to adjust gearing for hybrid securities, the ERA applies regulatory judgement on recognising hybrid securities that have predominantly equity characteristics and then adjusting gearing estimates... The ERA’s approach removes hybrid securities that have predominantly equity characteristics from debt.”

¹⁰⁷ CEPA advised the NZCC on WACC parameters and used net debt to calculate gearing. We note this is not explicitly stated in the NZCC's IM papers.

¹⁰⁸ AER (2018), *Discussion paper – Gearing*, February, p. 20.

¹⁰⁹ QCA (2022), p. 24.

¹¹⁰ AER (2022), p. 84.

¹¹¹ AER (2022), p. 92.

¹¹² ERA (2022), p. 53.

Regulatory discretion

While all regulators who calculate beta from a comparator sample also calculate gearing from the comparator sample, regulators differ in how they reflect this observed gearing in regulatory decisions. QCA notes:¹¹³

“Other Australian regulators also generally consider similar factors in determining regulatory gearing benchmarks. For example, in recent decisions, the ACCC and ESCOSA stated they consider their past practice for the regulated entity; ESCOSA, IPART, the ACCC and the ICRC have considered other regulatory decisions; the AER, ERA and IPART have looked at the gearing of comparator firms; and the ERA and the AER stated they consider the risk of the firm.”

QCA considers the previous regulatory gearing as a starting point, and only depart from this benchmark if there is sufficient evidence of change. This evidence is informed by decisions of other Australian regulators, material changes in the risk profile of the regulated firm, and the gearing of relevant comparators:¹¹⁴

“If there is persuasive evidence that the current benchmark no longer represents efficient gearing, we will determine a new benchmark, having regard to factors such as Australian regulatory precedent, the firm’s current risk profile and the gearing of comparator firms.”¹¹⁵

In assessing regulatory gearing, QCA, AER, ERA and IPART consider that benchmark gearing for a regulated entity should remain reasonably stable overtime as they have established and stable risk profiles. IPART notes:¹¹⁶

“In practice, the gearing ratio should be stable over time, particularly as most firms we regulate operate a stable base of historic assets. On the other hand, the efficient gearing ratio for a benchmark firm could change over time, for example, if there are changes in investor preferences, tax reforms or other policy changes.”

The AER assess whether to adjust gearing estimates against principles of materiality and sustainability. Their approach only implements a change to overall gearing if the change is material and likely to be persistent. Unless a clear change is required, they prefer to maintain the current gearing ratio.¹¹⁷ After considering that the gap between the estimated gearing level and current gearing level was not sufficient to justify a change and retained the gearing ratio of their previous review.¹¹⁸

While IPART estimate the gearing ratio each time they estimate the WACC, they do not necessarily change it.¹¹⁹

“As for the equity beta, we would only revisit the gearing we use in our WACC calculations where there is sufficient evidence to support this.”

¹¹³ QCA (2023), p. 26.

¹¹⁴ QCA (2023), p. 23.

¹¹⁵ QCA (2023), p. 22.

¹¹⁶ IPART (2018), p. 73.

¹¹⁷ AER (2022), p. 95.

¹¹⁸ The AER estimated gearing between 70-74% and retained their benchmark gearing of 60%. AER (2022), p. 86.

¹¹⁹ IPART (2018), p. 66. IPART do not expand on what it considers ‘sufficient evidence’.

ERA applies regulatory judgement in deciding which hybrid securities to remove from its gearing comparator sample.¹²⁰ While ERA consider the gearing ratios of other regulators as a cross check, they place more emphasis on market information and its estimate of gearing from a comparator sample.¹²¹

The NZCC maintains its previous approach and uses the average leverage of the comparator sample. While they compare the changes in gearing estimates to the previous gearing decision, they do not appear to adjust their decision based on previous gearing levels.¹²² The ACCC also refer to the average gearing of the comparator sample used in each pricing notification.

6.3. ASSESSMENT

Having reviewed the regulatory precedent, we consider the approach undertaken by the Port in the 2023-24 TCS to estimate gearing is well accepted and aligns with the Undertaking. We consider the Port's choice of debt and equity metrics, and the time frame of estimation, is well accepted. There are, however, some alternative approaches which are also well accepted:

- Regulatory precedent is mixed on whether to use the same comparator set to estimate gearing and beta, with some regulators adjusting the gearing comparator set based on the financial structure of comparator firms. However, we note the Undertaking specifies using the beta comparator sample.
- Many regulators consider that gearing should remain stable across regulatory years and only adjust the benchmark gearing used if there is sufficient evidence to indicate a change in the gearing of an efficient benchmark firm. This sentiment is also expressed in the Undertaking whereby the Port should first refer to the benchmark gearing that currently applies, and then refer to the average gearing of the comparator sample as cross checks. Houston Kemp could consider whether there is sufficient evidence that the gearing of a benchmark efficient port has changed, or whether changes in gearing estimates year on year primarily reflects adjustments in gearing across the comparator sample.
- While we agree there is a strong theoretical argument to use net, rather than gross debt to estimate gearing, it is also well accepted to use gross debt. Houston Kemp could consider calculating gearing using gross debt as a cross-check to determine whether this materially impacts estimates. However, we note this is not a requirement of the Undertaking.

6.4. ESTIMATING GEARING

We consider the regulatory precedent indicates that it is well accepted to estimate gearing:

- Using net debt and the market value of equity;
- Over the same estimation period as beta (5- and 10-years);

As a cross-check, we also estimated gearing using gross debt to see if this materially changes our gearing estimates.

The table overleaf provides our estimates of beta for our six samples (samples A – C and E – G) and a re-estimation of Houston Kemp's preferred and alternate samples across 5-year and 10-year estimation periods.

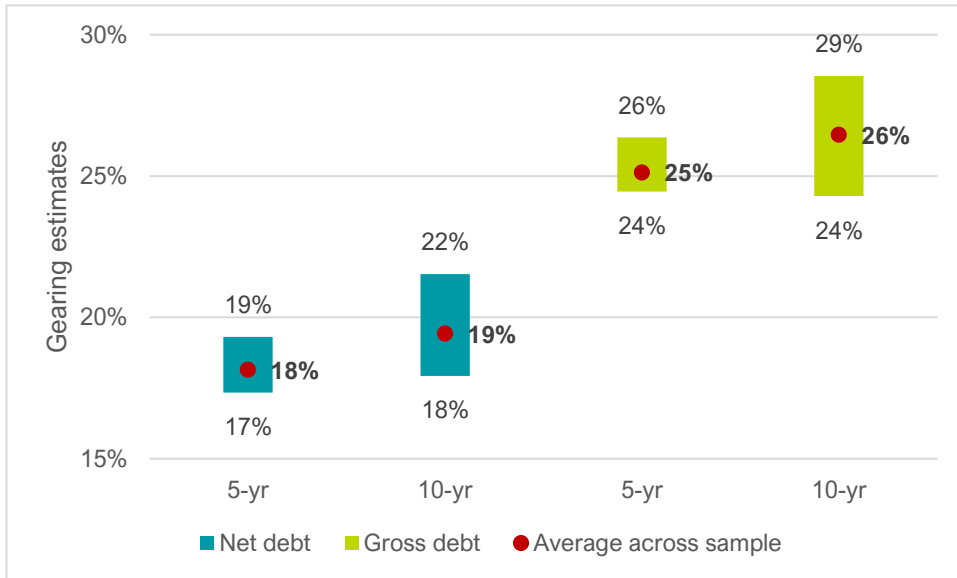
¹²⁰ ERA (2022), p. 53.

¹²¹ This aligns with ERA's guiding principles whereby decisions should be reflective of economic and finance principles and market information, fit for purpose, transparent, implementable and replicable, and sufficiently flexible as to allow for changing market conditions. ERA (2022), p. 22.

¹²² NZCC (2023), p. 105.

Based on our preferred samples that use a country filter, we estimate the port sample’s gearing likely falls within a range of 18% to 19% if using net debt or 25% to 26% if using gross debt. In the 2022-23 TCS, Houston Kemp estimated gearing of 20%. In our previous report to the ESC, we found support for gearing levels between 20-30%. We consider our estimate of gearing is broadly consistent with previous estimates.

Figure 6-1: Range of gearing estimates calculated using net and gross debt, averaged across weekly and four-weekly specifications



While it would also be well accepted to consider gearing derived using gross debt, we maintain there is a stronger theoretical argument to rely solely on net debt. This is because asset beta is primarily seeking to measure the risk of the underlying asset (the Port), not the risk of the underlying asset plus cash holdings. Where asset beta is estimated with net debt, it is important to be consistent and re-lever using gearing with the same underlying debt metric.

Table 6-2: Summary of gearing estimates by sample

Sample	Country filter	Market cap filter	Liquidity filter	Sample size 5-yr, 10-yr	5-yr gearing (net debt)	10-yr gearing (net debt)	5-yr gearing (gross debt)	10-yr gearing (gross debt)
Sample A	Yes	Yes	Loose	9, 7	0.19	0.22	0.26	0.29
Sample B	Yes	Yes	Strict	6, 5	0.18	0.18	0.25	0.24
Sample C	Yes	No	Loose	10, 8	0.17	0.19	0.24	0.27
Sample E	No	Yes	Loose	29, 25	0.21	0.21	0.29	0.29
Sample F	No	Yes	Strict	23, 21	0.23	0.21	0.30	0.28
Sample G	No	No	Loose	20, 26	0.21	0.21	0.29	0.28
HK alternate sample	Yes	Yes	Loose	5, 4	0.09	0.10	0.16	0.17
HK preferred sample	No	Yes	Loose	21, 18	0.21	0.20	0.28	0.26
Average for samples A – C					0.18	0.19	0.25	0.26
Average for samples E – G					0.22	0.21	0.30	0.28

Appendix A COMPARATOR SELECTION

Our judgement of which companies provide comparable services to the Port of Melbourne is informed by the Port's Prescribed Services set out in s 49(1)(c) of the Port Management Act 1995 (Vic). These include:

- the provision of channels (except anchorages) for use by shipping in port of Melbourne waters, including the Shared Channels used by vessels bound either for the port of Melbourne or for the port of Geelong and the Dedicated Channels used by vessels bound for the port of Melbourne
- the provision of berths, buoys or dolphins in connection with the berthing of vessels in the port of Melbourne
- the provision of short-term storage or cargo marshalling facilities in connection with the loading or unloading of vessels at berths, buoys or dolphins in the port of Melbourne
- the provision of access to, or allowing use of, places or infrastructure... on port of Melbourne land for the provision of services to port users
- any other service that is prescribed by the regulations.

We err on the side of including comparators which appear to provide most, or all of these services while noting that some comparators may also provide services that are outside the scope of the port's primary services (such as loading and unloading cargo). The table below provides information on companies included on our analysis and our justification for inclusion.

We have removed some firms since our draft report, these are noted at the bottom of the table with our amended reason for exclusion.

Ticker	Company	Bloomberg description	Reason for inclusion	Included by Houston Kemp
Included in country filter				
2613 TT Equity	China Container Terminal Corporation	China Container Terminal Corporation operates container terminals. The Company's terminals are located in the ports of Kaohsiung, Taichung, and Keelung in Taiwan.	BICS classification shows Port & Harbour Operations at 100%, and Port & Harbour operations is the majority revenue group.	
HHFA GR Equity	Hamburger Hafen un Logistik AG	Hamburger Hafen und Logistik AG (HHLA) provides services to the port in the European North Range. The Company's container terminals, transport systems, and logistic services provide a network between overseas port and European hinterland.	BICS classification shows Port & Harbour Operations at 93.01% and major revenue groups are Port Logistic and Container services.	Yes

Ticker	Company	Bloomberg description	Reason for inclusion	Included by Houston Kemp
HPHT SP Equity	Hutchison Port Holdings Trust	Hutchison Port Holdings Trust is a container port business trust. The Trust invests in, develops, operates, and manages deep-water container ports in the Pearl River Delta. Hutchison Port Holdings also invests in other types of port assets such as river ports, as well as undertake certain port ancillary services that include warehousing and distribution services.	BICS classification shows Port & Harbour Operations at 100%, and revenue breakdown shows only Transport Operations & Services.	
OLTH GA Equity	Thessaloniki Port Authority	Thessaloniki Port Authority SA manages the Thessaloniki harbor. The Company provides services such as loading and unloading cargo, warehousing, and offers electricity, water, and other services.	BICS classification shows Port & Harbour Operations at 100%, and majority revenue comes from Harbour Operations and Conventional Port.	
POT NZ Equity	Port of Tauranga	Port of Tauranga Limited activities include the provision of wharf facilities, back up land for the storage and transit of import and export cargo, berthage, cranes, tug and pilotage services for exporters, importers and shipping companies and the leasing of land and buildings. The Group also operates a container terminal and has bulk cargo marshalling operations.	BICS classification shows Port & Harbour Operations at 91.14%, and Port Operations is the majority revenue group.	Yes
PPA GA Equity	Piraeus Port Authority	Piraeus Port Authority SA manages the Piraeus harbor. The Company provides services such as loading and unloading cargo, warehousing, and transportation of cars. Piraeus Port Authority offers electricity, water, and other services. Piraeus Port Authority responsible for maintaining the port and controlling the movement of ships.	BICS classification shows Port & Harbour Operations at 100%, and revenue groups support port services.	Yes
SPN NZ Equity	South Port New Zealand	South Port New Zealand Limited operates the Bluff Harbor in the Port of Bluff, New Zealand. Operations at the harbour include dry warehousing and storage services, cold storage facilities, dry docking for vessels, cargo handling, log debarking, container servicing and mobile harbor crane services.	Majority revenue from Port & Warehousing Industries, and 2022 annual report shows significant revenue from port services.	
STBP3 BZ Equity	Santos Brasil Participacoes S.A	Santos Brasil Participacoes S.A., through its subsidiaries, operates and manages container terminals in ports of Brazil. The Company provides logistics, transportation and distribution services integrated to port terminals.	BICS classification shows Port & Harbour Operations at 78.21%, and majority revenue from Port & Harbour Operations.	Yes

Ticker	Company	Bloomberg description	Reason for inclusion	Included by Houston Kemp
SURIA MK Equity	Suria Capital Holdings	Suria Capital Holdings Berhad is an investment holding and property development company. The Company, through its subsidiaries, provides, maintains, regulates, and controls port services and facilities.	BICS classification shows Port & Harbour Operations at 90%, and revenue segment shows majority port operations.	
WPRTS MK Equity	Westports Holdings	Westports Holdings Berhad provides port services. The Company offers container and cargo services, marine services, rental services and other ancillary services. Westports provides its services to the import and export industries.	BICS classification shows Port & Harbour Operations at 100%, and revenue segments are mostly port and container.	Yes
Excluded from country filter				
000582 CH Equity	Biebuwan Port Co.	Beibuwan Port Co., Ltd. provides support services for water transportation, including loading and unloading, storage, transportation, and other port related services. Through its subsidiaries, the Company also acts as an oversea transportation agent and develops real estate.	BICS classification shows Port & Harbour Operations at 100%, but mostly from loading/unloading and storage services.	Yes
002040 CH Equity	Nanjing Port Co.	Nanjing Port Co., Ltd. operates as a port transportation service agency. The Company transports crude oil, refined oil, and liquid chemical products. Nanjing Port also provides general cargo handling and warehousing, container disassembly, electronic data exchange, information consultation, and logistics services.	BICS classification shows Marine Support Services at 71.91%, and majority revenue from container division.	Yes
1199 HK Equity	Costco Shipping Ports	COSCO SHIPPING Ports Limited, through its subsidiaries, provides ports services worldwide. The Company operates container terminals, and provides container handling, storage, transportation, management, and stevedoring services.	BICS classification shows Port & Harbour Operations at 100%, and mainly container terminal revenue	Yes
144 HK Equity	China Merchants Port Holdings Company	China Merchants Port Holdings Company Limited, through its subsidiaries and associated companies, operates ports, airports, and other container and cargo terminals around the world. The Company also manages toll roads, properties, and assets management.	BICS classification shows Port & Harbour Operations at 98.49%, and product revenue mainly port operations.	Yes
201872 CH Equity	China Merchants Port Group	China Merchants Port Group Co., Ltd. offers port operation services. The Company mainly develops, operates, and manages ports. China Merchants Port Group also provides bonded logistics services.	BICS classification shows Port & Harbour Operations at 97.25%, and product revenue predominantly port services.	Yes

Ticker	Company	Bloomberg description	Reason for inclusion	Included by Houston Kemp
2880 HK Equity	Liaoning Port Co.	Liaoning Port Co., Ltd. provides logistics services. The Company offers container handling, container transportation, crude oil warehousing, gross cargo transportation, and other services. Liaoning Port provides its services throughout China.	No BICS segment revenue, however 2022 annual report shows significant revenue from port operation and management services at 77%.	No – removed due to liquidity
600017 CH Equity	Rizhao Port Co.	Rizhao Port Co., Ltd. conducts port management and operation businesses. The company provides cargo warehousing, handling, transportation, and transit services. Rizhao Port provides port services for coal, cements, steel materials, minerals, and wood products.	BICS classification shows Port & Harbour Operations at 93.94%, and product revenue predominantly port services.	Yes
600018 CH Equity	Shanghai International Port Group	Shanghai International Port (Group) Co., Ltd. offers port operation services. The Company provides cargo handling, port logistics, port commerce, pilotage, tugboat, shipping tally, and other port related services. Shanghai International Port (Group) provides services for worldwide customers.	BICS classification shows Port & Harbour Operations at 55.83%, and product revenue shows significant port logistics and operations.	Yes
600717 CH Equity	Tianjin Port Holdings Co.	Tianjin Port Holdings Co., Ltd. provides port operation services. The Company offers commodity storage, transit transportation, container handling, dismantling and loading, and other services. Tianjin Port Holdings also provides financial services.	BICS classification shows Port & Harbour Operations at 70.00%, and product revenue shows majority port & harbour operations.	
601008 CH Equity	Jiangsu Lianyungang Port Co.	Jiangsu Lianyungang Port Co., Ltd. operates port and harbors. The Company provides loading, unloading, storage, port equipment rentals, port maintenance, and other services. Jiangsu Lianyungang Port also operates equipment repairing.	BICS classification shows Port & Harbour Operations at 72.57%, but product revenue shows majority loading and unloading.	Yes
601018 CH Equity	Ningbo Zhoushan Port Company	Ningbo Zhoushan Port Company Limited operates port transportation and logistics businesses. The Company provides container, iron ore, crude oil, and other cargo handling and loading services. Ningbo Zhoushan Port provides services for worldwide customers.	BICS classification shows Port & Harbour Operations at 100%, but majority revenue from integrated logistics and container handling.	Yes
601228 CH Equity	Guangzhou Port Company	Guangzhou Port Company Limited provides port and harbor operation services. The Company offers loading, discharging, storing, bonded warehousing, logistics, and other port services. Guangzhou Port also	BICS classification shows Port & Harbour Operations at 68.66%, but product revenue shows	Yes

Ticker	Company	Bloomberg description	Reason for inclusion	Included by Houston Kemp
		operates technology import and export, commodity trade, and other businesses.	mostly loading and related business.	
6198 HK Equity	Qingdao Port International Co.	Qingdao Port International Co., Ltd. operates ports and harbors. The Company provides loading, unloading, cargo storage, tugboat operation, port passenger transportation, and other services. Qingdao Port International also operates financing, ports construction, and other businesses.	BICS classification shows Port & Harbour Operations at 98.48%, and product revenue shows majority is logistics and port value added services.	Yes
ADSEZ IN Equity	Adani Ports and Special Economic Zone Limited	Adani Ports and Special Economic Zone Limited operates a shipping port on the west coast of India. The Company provides cargo handling, transportation, storage, logistics, and evacuation services to energy, railway, thermal power generation and transmission, agricultural, and logistics industries.	BICS classification shows Port & Harbour Operations at 100%, and product revenue shows port operations.	Yes
GMD VN Equity	Gemadep Corporation	Gemadep Corporation is a shipping company. The Company's business activities include port operations, container liner service, shipping and forwarding agency logistics, project cargo transport, real estate, and financial investment.	BICS classification shows Port & Harbour Operations at 79.17%, and product revenue is predominantly port operations.	Yes
GPPV IN Equity	Gujaran Pipavav Port	Gujarat Pipavav Port Ltd. operates a marine shipping port. The port loads and unloads container, bulk, and liquid cargo.	BICS classification shows Port & Harbour Operations at 100% and product revenue is predominantly port services.	Yes
LKPG SV Equity	Port of Koper	Luka Koper (Port of Koper) operates a cargo port and specialized terminals in Slovenia. The Company offers handling, warehousing, distribution, processing, logistical, and other related services. Luka Koper is the only maritime cargo port in Slovenia located north on the Adriatic Sea.	BICS classification shows Port & Harbour Operations at 100%, and product revenue is entirely diversified port and logistics activities. Annual report shows significant container and car activities, but not a revenue breakdown.	
MSA MC Equity	Societe d'Exploitation des Ports	Societe d'Exploitation des Ports, doing business as Marsa Maroc, manages and operates port terminals. The Company provides terminal and maintenance services including piloting, towing, refuelling, skidding,	BICS classification shows Port & Harbour Operations but no percentage. However, 2022	

Ticker	Company	Bloomberg description	Reason for inclusion	Included by Houston Kemp
		stacking, weighing and mooring. Marsa Maroc primarily serves the shipping industry in Morocco.	annual report supports significant port operations.	
NMTP RM Equity	Novorossiysk Commercial Sea Port	Novorossiysk Commercial Sea Port PJSC owns and operates the Novorossiysk Port on the Black Sea. The Company processes, loads, and unloads cargo. Novorossiysk Commercial Sea Trade Port handles mainly crude oil but also services dry cargo such as metals, cement, sugar, grain and containers.	BICS classification shows Port & Harbour Operations at 96.65% and product revenue from stevedore and fleet activities.	Yes
SISCO AB Equity	Saudi Industrial Services Company	Saudi Industrial Services Company (Sisco) provides catering services, operates gasoline filling stations, and manages the desalination project of the Jeddah Islamic Seaport.	BICS classification shows Port & Harbour Operations at 91.08%, and product revenue shows majority logistics and port operations.	Yes
Removed since draft report				
STAEL IN Equity	Starlog Enterprises	Starlog Enterprises Ltd operates within the Heavy construction sector. Starlog Enterprises Limited engages in the operation of ports, terminals, and infrastructure facilities in India. It also owns, operates, maintains, and gives on hire heavy duty cranes. The company was formerly known as ABG Infralogistics Limited and changed its name to Starlog Enterprises Limited.	BICS classification shows Port & Harbour Operations at 100% and all product revenue is port services. Removed due to materially low market capitalisation.	
CDN VN Equity	DaNang Port	DaNang Port Joint Stock Company operates a shipping port. The Company offers marine port services such as container tracking and handling to cruise ships and sea travellers. DaNang Port serves customers in worldwide.	BICS classification shows Port & Harbour Operations at 100%, and all product revenue shows port operations. Removed due to illiquidity.	
PHP VN Equity	Port of Hai Phong	Port of Hai Phong JSC is located in the North of Vietnam. The Company has four main branches: Hoang Dieu terminal, Chua Ve terminal, Tan Vu terminal, Bach Dang terminal.	BICS classification shows Port & Harbour Operations at 100%, and all product revenue port operations. Removed due to illiquidity.	

Ticker	Company	Bloomberg description	Reason for inclusion	Included by Houston Kemp
DVP VN Equity	Dinh Vu Port	Dinh Vu Port Investment & Development JSC owns and operates the Dinh Vu Port. The Company is involved in port development, general cargo, container, dry bulk and combined terminals.	BICS classification shows Port & Harbour Operations at 100%, and product revenue is entirely Port and Harbour operations. Removed due to unreliable net debt data resulting in asset beta estimates above 10.	No – removed due to market capitalisation filter

Reason for inclusion draws on information obtained from Bloomberg. We primarily used BICS segment name and revenue percentage, supplemented with produce/ geographic revenue breakdowns.

Appendix B COMPARATOR SAMPLES

The below table summarises which comparators are included in each sample.

Ticker	Company	Country filter	Market cap filter	Liquidity 5-yr	Liquidity 10-yr	Sample A	Sample B	Sample C	Sample E	Sample F	Sample G	HK preferred	HK alternate
2613 TT Equity	China Container Terminal Corporation	Yes	Yes	Strict	Strict	✓	✓	✓	✓	✓	✓		
HHFA GR Equity	Hamburger Hafen un Logistik AG	Yes	Yes	Strict	Strict	✓	✓	✓	✓	✓	✓	✓	✓
HPHT SP Equity	Hutchison Port Holdings Trust	Yes	Yes	Loose	Loose	✓		✓	✓		✓		
OLTH GA Equity	Thessaloniki Port Authority	Yes	Yes	Loose	Loose	✓		✓	✓		✓		
POT NZ Equity	Port of Tauranga	Yes	Yes	Strict	Strict	✓	✓	✓	✓	✓	✓	✓	✓
PPA GA Equity	Piraeus Port Authority	Yes	Yes	Strict	Strict	✓	✓	✓	✓	✓	✓	✓	✓
SPN NZ Equity	South Port New Zealand	Yes	Yes	Loose	-	✓*		✓*	✓*		✓*		
STBP3 BZ Equity	Santos Brasil Participacoes S.A.	Yes	Yes	Strict	-	✓*	✓*	✓*	✓*	✓*	✓*	✓*	✓*
SURIA MK Equity	Suria Capital Holdings	Yes	No	Loose	Loose			✓			✓		

Ticker	Company	Country filter	Market cap filter	Liquidity 5-yr	Liquidity 10-yr	Sample A	Sample B	Sample C	Sample E	Sample F	Sample G	HK preferred	HK alternate
WPRTS MK Equity	Westports Holdings	Yes	Yes	Strict	-	✓	✓	✓	✓	✓	✓	✓	✓
000582 CH Equity	Biebuwan Port Co.	No	Yes	Strict	Strict				✓	✓	✓	✓	
002040 CH Equity	Nanjing Port Co.	No	Yes	Strict	Strict				✓	✓	✓	✓	
1199 HK Equity	Costco Shipping Ports	No	Yes	Strict	Strict				✓	✓	✓	✓	
144 HK Equity	China Merchants Port Holdings Company	No	Yes	Strict	Strict				✓	✓	✓	✓	
201872 CH Equity	China Merchants Port Group	No	Yes	Strict	Strict				✓	✓	✓	✓	
2880 HK Equity	Liaoning Port Co.	No	Yes	Loose	Loose				✓		✓		
600017 CH Equity	Rizhao Port Co.	No	Yes	Strict	Strict				✓	✓	✓	✓	
600018 CH Equity	Shanghai International Port Group	No	Yes	Strict	Strict				✓	✓	✓	✓	
600717 CH Equity	Tianjin Port Holdings Co.	No	Yes	Strict	Strict				✓	✓	✓		

Ticker	Company	Country filter	Market cap filter	Liquidity 5-yr	Liquidity 10-yr	Sample A	Sample B	Sample C	Sample E	Sample F	Sample G	HK preferred	HK alternate
601008 CH Equity	Jiangsu Lianyungang Port Co.	No	Yes	Strict	Strict				✓	✓	✓	✓	
601018 CH Equity	Ningbo Zhoushan Port Company	No	Yes	Strict	Strict				✓	✓	✓	✓	
601228 CH Equity	Guangzhou Port Company	No	Yes	Strict	-				✓*	✓*	✓*	✓*	
6198 HK Equity	Qingdao Port International Co.	No	Yes	Strict	-				✓	✓	✓	✓	
ADSEZ IN Equity	Adani Ports and Special Economic Zone Limited	No	Yes	Strict	Strict				✓	✓	✓	✓	
GMD VN Equity	Gemadept Corporation	No	Yes	Strict	Strict				✓	✓	✓	✓	
GPPV IN Equity	Gujaran Pipavav Port	No	Yes	Strict	Strict				✓	✓	✓	✓	
LKPG SV Equity	Port of Koper	No	Yes	Loose	Loose				✓		✓		
MSA MC Equity	Societe d'Exploitation des Ports	No	Yes	Loose	-				✓*		✓*		

Ticker	Company	Country filter	Market cap filter	Liquidity 5-yr	Liquidity 10-yr	Sample A	Sample B	Sample C	Sample E	Sample F	Sample G	HK preferred	HK alternate
NMTP RM Equity	Novorossiysk Commercial Sea Port	No	Yes	Strict	Strict				✓	✓	✓	✓	
SISCO AB Equity	Saudi Industrial Services Company	No	Yes	Loose	Loose				✓	✓	✓	✓	
Total 5-yr						9	6	10	29	23	30	21	5
Total 10-yr						7	5	8	25	21	26	18	4

A * indicates that a company was not included in 10-year estimations due to insufficient data.

Appendix C ASSET BETA AND GEARING ESTIMATES

The table below sets out our asset beta and gearing estimates, by company, across the samples shown in Section **Error! Reference source not found.** A dash indicates there was insufficient data to calculate a 10-year estimate.

C.1. SAMPLE A

Sample A applies country, market capitalisation, and loose liquidity filters. We consider sample A is well accepted.

Ticker	Asset beta (net debt)				Asset beta (gross debt)				Gearing (net debt)		Gearing (gross debt)	
	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr gearing	10-yr gearing	5-yr gearing	10-yr gearing
2613 TT Equity	0.49	0.57	0.50	0.58	0.49	0.56	0.49	0.56	63%	48%	65%	54%
HHFA GR Equity	0.91	0.88	0.78	0.82	0.87	0.84	0.73	0.77	28%	21%	34%	29%
HPHT SP Equity	0.70	0.79	0.64	0.69	0.66	0.75	0.60	0.66	61%	61%	69%	69%
OLTH GA Equity	0.60	0.62	0.58	0.57	0.37	0.38	0.35	0.35	0%	0%	14%	9%
POT NZ Equity	0.60	0.67	0.57	0.63	0.60	0.67	0.57	0.63	10%	10%	10%	11%
PPA GA Equity	0.51	0.54	0.56	0.56	0.42	0.45	0.49	0.49	0%	3%	19%	19%
SPN NZ Equity	0.12	0.40	-	-	0.12	0.40	-	-	6%	-	6%	-
STBP3 BZ Equity	1.45	1.47	-	-	1.27	1.29	-	-	0%	-	10%	-
WPRTS MK Equity	0.53	0.66	0.52	0.52	0.52	0.64	0.50	0.50	6%	6%	10%	10%
Average	0.66	0.73	0.59	0.63	0.59	0.66	0.53	0.57	19%	22%	26%	29%

C.2. SAMPLE B

Sample B applies country, market capitalisation, and strict liquidity filters. We consider sample B is well accepted.

Ticker	Asset beta (net debt)				Asset beta (gross debt)				Gearing (net debt)		Gearing (gross debt)	
	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr gearing	10-yr gearing	5-yr gearing	10-yr gearing
2613 TT Equity	0.49	0.57	0.50	0.58	0.49	0.56	0.49	0.56	63%	48%	65%	54%
HHFA GR Equity	0.91	0.88	0.78	0.82	0.87	0.84	0.73	0.77	28%	21%	34%	29%
POT NZ Equity	0.60	0.67	0.57	0.63	0.60	0.67	0.57	0.63	10%	10%	10%	11%
PPA GA Equity	0.51	0.54	0.56	0.56	0.42	0.45	0.49	0.49	0%	3%	19%	19%
STBP3 BZ Equity	1.45	1.47	-	-	1.27	1.29	-	-	0%	-	10%	-
WPRTS MK Equity	0.53	0.66	0.52	0.52	0.52	0.64	0.50	0.50	6%	6%	10%	10%
Average	0.75	0.80	0.59	0.62	0.69	0.74	0.56	0.59	18%	18%	25%	24%

C.3. SAMPLE C

Sample C applies country and loose liquidity filters. We consider sample C is well accepted.

Ticker	Asset beta (net debt)				Asset beta (gross debt)				Gearing (net debt)		Gearing (gross debt)	
	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr gearing	10-yr gearing	5-yr gearing	10-yr gearing
2613 TT Equity	0.49	0.57	0.50	0.58	0.49	0.56	0.49	0.56	63%	48%	65%	54%
HHFA GR Equity	0.91	0.88	0.78	0.82	0.87	0.84	0.73	0.77	28%	21%	34%	29%
HPHT SP Equity	0.70	0.79	0.64	0.69	0.66	0.75	0.60	0.66	61%	61%	69%	69%
OLTH GA Equity	0.60	0.62	0.58	0.57	0.37	0.38	0.35	0.35	0%	0%	14%	9%
POT NZ Equity	0.60	0.67	0.57	0.63	0.60	0.67	0.57	0.63	10%	10%	10%	11%
PPA GA Equity	0.51	0.54	0.56	0.56	0.42	0.45	0.49	0.49	0%	3%	19%	19%
SPN NZ Equity	0.12	0.40	-	-	0.12	0.40	-	-	6%	-	6%	-
STBP3 BZ Equity	1.45	1.47	-	-	1.27	1.29	-	-	0%	-	10%	-
SURIA MK Equity	1.14	1.33	1.13	1.27	0.64	0.75	0.73	0.82	0%	0%	8%	13%
WPRTS MK Equity	0.53	0.66	0.52	0.52	0.52	0.64	0.50	0.50	6%	6%	10%	10%
Average	0.70	0.79	0.59	0.62	0.59	0.67	0.56	0.60	17%	19%	24%	27%

C.4. SAMPLE E

Sample E applies market capitalisation and loose liquidity filters. We do not consider sample E is well accepted due to a lack of country filter.

Ticker	Asset beta (net debt)				Asset beta (gross debt)				Gearing (net debt)		Gearing (gross debt)	
	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr gearing	10-yr gearing	5-yr gearing	10-yr gearing
000582 CH Equity	0.57	0.52	0.72	0.67	0.53	0.48	0.68	0.64	22%	20%	31%	26%
002040 CH Equity	0.73	0.72	0.74	0.68	0.69	0.69	0.71	0.65	16%	13%	23%	17%
1199 HK Equity	0.58	0.66	0.58	0.63	0.55	0.63	0.54	0.58	50%	35%	57%	46%
144 HK Equity	0.63	0.60	0.73	0.72	0.60	0.58	0.69	0.68	40%	29%	46%	36%
201872 CH Equity	0.43	0.36	0.47	0.42	0.42	0.34	0.45	0.40	46%	26%	53%	32%
2613 TT Equity	0.49	0.57	0.50	0.58	0.49	0.56	0.49	0.56	63%	48%	65%	54%
2880 HK Equity	0.44	0.47	0.64	0.70	0.40	0.43	0.59	0.64	21%	23%	33%	34%
600017 CH Equity	0.62	0.69	0.85	0.85	0.61	0.67	0.83	0.82	46%	36%	49%	40%
600018 CH Equity	0.91	0.81	0.92	0.90	0.82	0.73	0.85	0.83	14%	12%	27%	22%
600717 CH Equity	0.71	0.69	0.92	0.87	0.62	0.60	0.81	0.76	24%	21%	41%	39%
601008 CH Equity	0.79	1.00	0.89	0.96	0.74	0.93	0.85	0.92	38%	34%	47%	40%
601018 CH Equity	0.84	0.85	0.83	0.94	0.77	0.78	0.79	0.89	19%	16%	29%	23%

Ticker	Asset beta (net debt)				Asset beta (gross debt)				Gearing (net debt)		Gearing (gross debt)	
	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr gearing	10-yr gearing	5-yr gearing	10-yr gearing
601228 CH Equity	0.74	0.80	-	-	0.71	0.76	-	-	24%	-	31%	-
6198 HK Equity	0.65	0.66	0.80	0.95	0.48	0.49	0.59	0.70	0%	0%	9%	9%
ADSEZ IN Equity	0.92	0.96	1.02	1.01	0.89	0.93	1.00	0.99	19%	21%	23%	24%
GMD VN Equity	0.84	0.79	0.87	0.76	0.82	0.77	0.80	0.70	15%	13%	18%	23%
GPPV IN Equity	0.82	1.15	0.80	1.18	0.68	0.94	0.71	1.04	0%	0%	1%	1%
HHFA GR Equity	0.91	0.88	0.78	0.82	0.87	0.84	0.73	0.77	28%	21%	34%	29%
HPHT SP Equity	0.70	0.79	0.64	0.69	0.66	0.75	0.60	0.66	61%	61%	69%	69%
LKPG SV Equity	0.81	0.82	0.87	0.90	0.70	0.71	0.80	0.84	5%	17%	21%	26%
MSA MC Equity	1.18	1.32	-	-	1.09	1.22	-	-	1%	-	10%	-
NMTP RM Equity	0.60	0.62	0.52	0.59	0.56	0.58	0.50	0.56	25%	38%	33%	44%
OLTH GA Equity	0.60	0.62	0.58	0.57	0.37	0.38	0.35	0.35	0%	0%	14%	9%
POT NZ Equity	0.60	0.67	0.57	0.63	0.60	0.67	0.57	0.63	10%	10%	10%	11%
PPA GA Equity	0.51	0.54	0.56	0.56	0.42	0.45	0.49	0.49	0%	3%	19%	19%

Ticker	Asset beta (net debt)				Asset beta (gross debt)				Gearing (net debt)		Gearing (gross debt)	
	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr gearing	10-yr gearing	5-yr gearing	10-yr gearing
SISCO AB Equity	0.82	0.87	0.82	0.79	0.74	0.79	0.77	0.73	21%	32%	33%	41%
SPN NZ Equity	0.12	0.40	-	-	0.12	0.40	-	-	6%	-	6%	-
STBP3 BZ Equity	1.45	1.47	-	-	1.27	1.29	-	-	0%	-	10%	-
WPRTS MK Equity	0.53	0.66	0.52	0.52	0.52	0.64	0.50	0.50	6%	6%	10%	10%
Average	0.71	0.76	0.73	0.76	0.64	0.69	0.67	0.69	21%	21%	29%	29%

C.5. SAMPLE F

Sample F applies market capitalisation and strict liquidity filters. We do not consider sample F is well accepted due to a lack of country filter.

Ticker	Asset beta (net debt)				Asset beta (gross debt)				Gearing (net debt)		Gearing (gross debt)	
	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr gearing	10-yr gearing	5-yr gearing	10-yr gearing
000582 CH Equity	0.57	0.52	0.72	0.67	0.53	0.48	0.68	0.64	22%	20%	31%	26%
002040 CH Equity	0.73	0.72	0.74	0.68	0.69	0.69	0.71	0.65	16%	13%	23%	17%
1199 HK Equity	0.58	0.66	0.58	0.63	0.55	0.63	0.54	0.58	50%	35%	57%	46%
144 HK Equity	0.63	0.60	0.73	0.72	0.60	0.58	0.69	0.68	40%	29%	46%	36%
201872 CH Equity	0.43	0.36	0.47	0.42	0.42	0.34	0.45	0.40	46%	26%	53%	32%
2613 TT Equity	0.49	0.57	0.50	0.58	0.49	0.56	0.49	0.56	63%	48%	65%	54%
600017 CH Equity	0.62	0.69	0.85	0.85	0.61	0.67	0.83	0.82	46%	36%	49%	40%
600018 CH Equity	0.91	0.81	0.92	0.90	0.82	0.73	0.85	0.83	14%	12%	27%	22%
600717 CH Equity	0.71	0.69	0.92	0.87	0.62	0.60	0.81	0.76	24%	21%	41%	39%
601008 CH Equity	0.79	1.00	0.89	0.96	0.74	0.93	0.85	0.92	38%	34%	47%	40%
601018 CH Equity	0.84	0.85	0.83	0.94	0.77	0.78	0.79	0.89	19%	16%	29%	23%
601228 CH Equity	0.74	0.80	-	-	0.71	0.76	-	-	24%	-	31%	-

Ticker	Asset beta (net debt)				Asset beta (gross debt)				Gearing (net debt)		Gearing (gross debt)	
	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr gearing	10-yr gearing	5-yr gearing	10-yr gearing
6198 HK Equity	0.65	0.66	0.80	0.95	0.48	0.49	0.59	0.70	0%	0%	9%	9%
ADSEZ IN Equity	0.92	0.96	1.02	1.01	0.89	0.93	1.00	0.99	19%	21%	23%	24%
GMD VN Equity	0.84	0.79	0.87	0.76	0.82	0.77	0.80	0.70	15%	13%	18%	23%
GPPV IN Equity	0.82	1.15	0.80	1.18	0.68	0.94	0.71	1.04	0%	0%	1%	1%
HHFA GR Equity	0.91	0.88	0.78	0.82	0.87	0.84	0.73	0.77	28%	21%	34%	29%
NMTP RM Equity	0.60	0.62	0.52	0.59	0.56	0.58	0.50	0.56	25%	38%	33%	44%
POT NZ Equity	0.60	0.67	0.57	0.63	0.60	0.67	0.57	0.63	10%	10%	10%	11%
PPA GA Equity	0.51	0.54	0.56	0.56	0.42	0.45	0.49	0.49	0%	3%	19%	19%
SISCO AB Equity	0.82	0.87	0.82	0.79	0.74	0.79	0.77	0.73	21%	32%	33%	41%
STBP3 BZ Equity	1.45	1.47	-	-	1.27	1.29	-	-	0%	-	10%	-
WPRTS MK Equity	0.53	0.66	0.52	0.52	0.52	0.64	0.50	0.50	6%	6%	10%	10%
Average	0.73	0.76	0.73	0.76	0.67	0.70	0.68	0.71	23%	21%	30%	28%

C.6. SAMPLE G

Sample G applies loose liquidity filters. We do not consider sample G is well accepted due to a lack of country filter.

Ticker	Asset beta (net debt)				Asset beta (gross debt)				Gearing (net debt)		Gearing (gross debt)	
	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr gearing	10-yr gearing	5-yr gearing	10-yr gearing
000582 CH Equity	0.57	0.52	0.72	0.67	0.53	0.48	0.68	0.64	22%	20%	31%	26%
002040 CH Equity	0.73	0.72	0.74	0.68	0.69	0.69	0.71	0.65	16%	13%	23%	17%
1199 HK Equity	0.58	0.66	0.58	0.63	0.55	0.63	0.54	0.58	50%	35%	57%	46%
144 HK Equity	0.63	0.60	0.73	0.72	0.60	0.58	0.69	0.68	40%	29%	46%	36%
201872 CH Equity	0.43	0.36	0.47	0.42	0.42	0.34	0.45	0.40	46%	26%	53%	32%
2613 TT Equity	0.49	0.57	0.50	0.58	0.49	0.56	0.49	0.56	63%	48%	65%	54%
2880 HK Equity	0.44	0.47	0.64	0.70	0.40	0.43	0.59	0.64	21%	23%	33%	34%
600017 CH Equity	0.62	0.69	0.85	0.85	0.61	0.67	0.83	0.82	46%	36%	49%	40%
600018 CH Equity	0.91	0.81	0.92	0.90	0.82	0.73	0.85	0.83	14%	12%	27%	22%
600717 CH Equity	0.71	0.69	0.92	0.87	0.62	0.60	0.81	0.76	24%	21%	41%	39%
601008 CH Equity	0.79	1.00	0.89	0.96	0.74	0.93	0.85	0.92	38%	34%	47%	40%
601018 CH Equity	0.84	0.85	0.83	0.94	0.77	0.78	0.79	0.89	19%	16%	29%	23%

Ticker	Asset beta (net debt)				Asset beta (gross debt)				Gearing (net debt)		Gearing (gross debt)	
	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr gearing	10-yr gearing	5-yr gearing	10-yr gearing
601228 CH Equity	0.74	0.80	-	-	0.71	0.76	-	-	24%	-	31%	-
6198 HK Equity	0.65	0.66	0.80	0.95	0.48	0.49	0.59	0.70	0%	0%	9%	9%
ADSEZ IN Equity	0.92	0.96	1.02	1.01	0.89	0.93	1.00	0.99	19%	21%	23%	24%
GMD VN Equity	0.84	0.79	0.87	0.76	0.82	0.77	0.80	0.70	15%	13%	18%	23%
GPPV IN Equity	0.82	1.15	0.80	1.18	0.68	0.94	0.71	1.04	0%	0%	1%	1%
HHFA GR Equity	0.91	0.88	0.78	0.82	0.87	0.84	0.73	0.77	28%	21%	34%	29%
HPHT SP Equity	0.70	0.79	0.64	0.69	0.66	0.75	0.60	0.66	61%	61%	69%	69%
LKPG SV Equity	0.81	0.82	0.87	0.90	0.70	0.71	0.80	0.84	5%	17%	21%	26%
MSA MC Equity	1.18	1.32	-	-	1.09	1.22	-	-	1%	-	10%	-
NMTP RM Equity	0.60	0.62	0.52	0.59	0.56	0.58	0.50	0.56	25%	38%	33%	44%
OLTH GA Equity	0.60	0.62	0.58	0.57	0.37	0.38	0.35	0.35	0%	0%	14%	9%
POT NZ Equity	0.60	0.67	0.57	0.63	0.60	0.67	0.57	0.63	10%	10%	10%	11%
PPA GA Equity	0.51	0.54	0.56	0.56	0.42	0.45	0.49	0.49	0%	3%	19%	19%

Ticker	Asset beta (net debt)				Asset beta (gross debt)				Gearing (net debt)		Gearing (gross debt)	
	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr gearing	10-yr gearing	5-yr gearing	10-yr gearing
SISCO AB Equity	0.82	0.87	0.82	0.79	0.74	0.79	0.77	0.73	21%	32%	33%	41%
SPN NZ Equity	0.12	0.40	-	-	0.12	0.40	-	-	6%	-	6%	-
STBP3 BZ Equity	1.45	1.47	-	-	1.27	1.29	-	-	0%	-	10%	-
SURIA MK Equity	1.14	1.33	1.13	1.27	0.64	0.75	0.73	0.82	0%	0%	8%	13%
WPRTS MK Equity	0.53	0.66	0.52	0.52	0.52	0.64	0.50	0.50	6%	6%	10%	10%
Average	0.72	0.78	0.74	0.78	0.64	0.69	0.67	0.70	21%	21%	29%	28%

C.7. HOUSTON KEMP – PREFERRED SAMPLE

This output recreates the preferred sample Houston Kemp estimates in the TCS. We do not consider this sample is well accepted due to a lack of country filter.

Ticker	Asset beta (net debt)				Asset beta (gross debt)				Gearing (net debt)		Gearing (gross debt)	
	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr gearing	10-yr gearing	5-yr gearing	10-yr gearing
000582 CH Equity	0.57	0.52	0.72	0.67	0.53	0.48	0.68	0.64	22%	20%	31%	26%
002040 CH Equity	0.73	0.72	0.74	0.68	0.69	0.69	0.71	0.65	16%	13%	23%	17%
1199 HK Equity	0.58	0.66	0.58	0.63	0.55	0.63	0.54	0.58	50%	35%	57%	46%
144 HK Equity	0.63	0.60	0.73	0.72	0.60	0.58	0.69	0.68	40%	29%	46%	36%
201872 CH Equity	0.43	0.36	0.47	0.42	0.42	0.34	0.45	0.40	46%	26%	53%	32%
600017 CH Equity	0.62	0.69	0.85	0.85	0.61	0.67	0.83	0.82	46%	36%	49%	40%
600018 CH Equity	0.91	0.81	0.92	0.90	0.82	0.73	0.85	0.83	14%	12%	27%	22%
600717 CH Equity	0.71	0.69	0.92	0.87	0.62	0.60	0.81	0.76	24%	21%	41%	39%
601008 CH Equity	0.79	1.00	0.89	0.96	0.74	0.93	0.85	0.92	38%	34%	47%	40%
601018 CH Equity	0.84	0.85	0.83	0.94	0.77	0.78	0.79	0.89	19%	16%	29%	23%
601228 CH Equity	0.74	0.80	-	-	0.71	0.76	-	-	24%	-	31%	-
6198 HK Equity	0.65	0.66	0.80	0.95	0.48	0.49	0.59	0.70	0%	0%	9%	9%

Ticker	Asset beta (net debt)				Asset beta (gross debt)				Gearing (net debt)		Gearing (gross debt)	
	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr gearing	10-yr gearing	5-yr gearing	10-yr gearing
ADSEZ IN Equity	0.92	0.96	1.02	1.01	0.89	0.93	1.00	0.99	19%	21%	23%	24%
GMD VN Equity	0.84	0.79	0.87	0.76	0.82	0.77	0.80	0.70	15%	13%	18%	23%
GPPV IN Equity	0.82	1.15	0.80	1.18	0.68	0.94	0.71	1.04	0%	0%	1%	1%
HHFA GR Equity	0.91	0.88	0.78	0.82	0.87	0.84	0.73	0.77	28%	21%	34%	29%
NMTP RM Equity	0.60	0.62	0.52	0.59	0.56	0.58	0.50	0.56	25%	38%	33%	44%
POT NZ Equity	0.60	0.67	0.57	0.63	0.60	0.67	0.57	0.63	10%	10%	10%	11%
PPA GA Equity	0.51	0.54	0.56	0.56	0.42	0.45	0.49	0.49	0%	3%	19%	19%
SISCO AB Equity	0.82	0.87	0.82	0.79	0.74	0.79	0.77	0.73	21%	32%	33%	41%
STBP3 BZ Equity	1.45	1.47	-	-	1.27	1.29	-	-	0%	-	10%	-
WPRTS MK Equity	0.53	0.66	0.52	0.52	0.52	0.64	0.50	0.50	6%	6%	10%	10%
Average	0.74	0.77	0.73	0.77	0.68	0.71	0.68	0.71	21%	20%	28%	26%

C.8. HOUSTON KEMP – ALTERNATE SAMPLE

This output recreates the alternate sample Houston Kemp estimates in the TCS. We consider this sample is well accepted.

Ticker	Asset beta (net debt)				Asset beta (gross debt)				Gearing (net debt)		Gearing (gross debt)	
	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr weekly	5-yr 4 weekly	10-yr weekly	10-yr 4 weekly	5-yr gearing	10-yr gearing	5-yr gearing	10-yr gearing
HHFA GR Equity	0.91	0.88	0.78	0.82	0.87	0.84	0.73	0.77	28%	21%	34%	29%
POT NZ Equity	0.60	0.67	0.57	0.63	0.60	0.67	0.57	0.63	10%	10%	10%	11%
PPA GA Equity	0.51	0.54	0.56	0.56	0.42	0.45	0.49	0.49	0%	3%	19%	19%
STBP3 BZ Equity	1.45	1.47	-	-	1.27	1.29	-	-	0%	-	10%	-
WPRTS MK Equity	0.53	0.66	0.52	0.52	0.52	0.64	0.50	0.50	6%	6%	10%	10%
Average	0.80	0.84	0.61	0.63	0.73	0.77	0.57	0.60	9%	10%	16%	17%



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