WESTERN AUSTRALIAN
TREASURY CORPORATION

FINANCIAL SOLUTIONS FOR THE BENEFIT OF ALL WESTERN AUSTRALIANS

RATES OF RETURN FOR WESTERN AUSTRALIAN PORTS

DEPARTMENT OF TRANSPORT

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Executive Summary

This report presents an integrated framework for estimating a weighted-average cost of capital (WACC) for each of the Western Australian port authorities. When determining an appropriate WACC, WATC has followed the standard regulatory practice of estimating the WACC for a *benchmark firm*, in this instance a port with a specific set of attributes that influence its ability to perform commercially.

The foundation of the risk assessment is a credit rating model by *Moody's Investor Services*. The rating model allows each port to be scored on a range of qualitative risk criteria – such as scale, exposure to volume risk and customer concentration – making it possible to differentiate the risks of the WA ports. These results feed through to the estimation of a number of the WACC parameters.

Methodology

The recommended methodology can be summarised as follows:

1. Using the Moody's survey, determine the *range* of potential final overall credit ratings for the benchmark port by:
    a. scoring the qualitative risk factors as per the survey responses;
    b. assuming that the financial metrics of the benchmark port can vary from the best investment grade level (Aaa) to the lowest investment grade level (Baa2);
    c. taking a risk-weighted average of these factors to produce the highest and lowest potential overall credit ratings.
2. Map the allowed 0% to 60% debt-to-value ratios to the highest and lowest overall credit ratings, respectively, from the Moody's survey.
3. Use a subset of the Moody's survey questions to determine the asset beta for the port.
4. Calculate the debt beta as the gearing varies using (2).
5. Calculate the equity beta for each gearing value.
6. Calculate the debt risk premium as the gearing varies using (2).
7. Calculate the WACC for each gearing/rating.
8. Find the gearing/rating that minimises the WACC.

The implemented spreadsheet model allows the user to identify the optimal target capital structure of the benchmark port, the associated final overall credit rating, and the WACC.

Issues

The issues identified in estimating a WACC for each port are as follows:

- There are a lack of observable Australian benchmarks for a number of the WACC inputs (e.g., no sub-investment grade debt risk premia, no listed ports), necessitating the introduction of a number of assumptions.
- The survey responses require moderation to ensure consistent assessment. The WACC outcomes are principally driven by these inputs.
- The averaging period for the risk-free rate and the debt risk premium has been selected by the Department of Transport to be ten years. This decision involves weighing up the strict application of corporate finance theory (to provide a market-sensitive hurdle rate) against the desire for stable prices for customers.

- Due to existing non-commercial contracts, a number of ports will not be able to achieve the higher return targets unless the asset bases are written down.

Results

Using a ten-year averaging period for the risk-free rate and the debt risk premium, the real and nominal pre-tax WACC estimates using data up to 30 June 2013 are presented in the table below. These estimates are for illustration purposes only as the Department of Transport will need to finalise all the key inputs.

Port WACCs	Albany	Broome	Bunbury	Dampier	Esperance	Fremantle	Geraldton	Port Hedland
Pre-tax Real	11.1%	11.2%	9.9%	8.5%	10.3%	8.2%	10.3%	8.9%
Pre-tax Nominal	13.9%	14.0%	12.6%	11.3%	13.1%	10.9%	13.1%	11.6%

1 Introduction

To encourage efficient use of port infrastructure, the Department of Transport ("the Department") is seeking to standardise the approaches used by individual port authorities to:

1. Value their asset base; and
2. Determine an appropriate target rate of return on the asset base.

The Department of Transport commissioned PricewaterhouseCoopers (PwC) to develop a Revenue & Pricing Framework to achieve this objective. The weighted-average cost of capital (WACC) was identified as an appropriate target rate of return.

The Department has requested that the Western Australian Treasury Corporation (WATC) highlight the practical issues of applying the WACC framework to all port authorities, and to recommend a simple and practical methodology for calculating a WACC for each authority. While the valuation of the asset base falls outside the scope of this engagement, commentary on the treatment of gifted assets was also sought from WATC.

We emphasise that the objective of this report is to illustrate how a WACC can be estimated for a *commercial benchmark port* of a similar nature to each of those controlled by the eight port authorities. This is the approach used by regulators of monopolies throughout Australia. Accordingly, the actual capital structure of each port should be largely ignored as it may be partly driven by factors outside the control of the port, such as historical political decisions. However, any port-specific attributes that could influence financial performance should ideally be captured.

In Section 2, we provide an overview of WACC and the parameters that need to be estimated for a commercial benchmark port.

The WACC parameters are then segregated into 'straightforward' and 'problematic' groups in Sections 3 and 4, respectively, where the estimation issues in each case are discussed. Section 5 outlines an integrated framework for resolving the more complicated parameter set, namely the optimal capital structure and the associated credit rating.

In Section 6, we calculate preliminary real and nominal pre-tax WACC values for each port authority using data available as at the end of June 2013. The WACC estimates are only indicative as some key inputs have to be finalised by the Department.

To better understand the issues faced by each port in achieving commercial return targets, WATC has interviewed a representative from each port authority. In Section 7, we summarise the key findings from these interviews that relate to this project.

In Section 8, we briefly discuss the treatment of gifted assets, before concluding the report in Section 9 with a summary of the main issues identified in using a WACC framework for establishing a target rate of return for the ports.

2 Weighted-Average Cost of Capital

The weighted-average cost of capital is the most commonly used methodology for determining a company's cost of capital. This is due in part to the intuitive nature of the formula that a firm can be financed from two sources of funding, that is, debt and equity. The 'vanilla' WACC[1] is given by:

$$\text{WACC} = r_e \frac{E}{V} + r_d \frac{D}{V}$$

where

r_e	is the required rate of return on equity;
(E/V)	is the proportion of equity (E) relative to the firm's total value (V);
r_d	is the required rate of return on debt;
(D/V)	is the proportion of debt (D) relative to V; and
V	is given by D + E.

The debt and equity weights are typically chosen to reflect the target capital structure for the firm, regardless of the actual gearing.

The return required by debt investors is generally assumed to be readily observable in the corporate bond market; however, in the Australian context, the corporate bond market is quite thin and illiquid. There is a lack of Australian data even for investment-grade bonds, particularly since the Global Financial Crisis (GFC), making the estimation of r_d more difficult than standard textbook expositions suggest.

The return demanded by equity investors in the firm is usually estimated via the *Capital Asset Pricing Model*, which is regularly used by firms, regulators and consultants throughout Australia. The expected return on equity is assumed to equal the risk-free rate plus a risk premium:

$$r_e = r_f + \beta_e[E(r_m) - r_f]$$

where

r_e	is the required return on equity given the firm's systematic risk;
r_f	is the risk-free rate, estimated by the Commonwealth Government bond rate;
β_e	is the firm's equity beta or risk factor relative to the market;
$E(r_m)$	is the expected return on a market portfolio; and
$[E(r_m) - r_f]$	is the equity market risk premium (MRP) or the expected return above the risk-free rate from holding a market portfolio.

[1] The term 'vanilla' indicates that the WACC has not been adjusted for tax, expected inflation or franking credits.

The equity beta (β_e) depends on the leverage of the firm; hence the beta estimated from market data corresponds to that of a 'levered' firm holding its particular portion of debt and equity. As the returns of a firm holding debt are more risky than the returns of a firm holding no debt, the effect of debt should be removed to determine the true systematic risk of the firm. The measure of systematic risk for a firm with no debt is called the asset (unlevered) beta (β_a), which can be derived using the following expression:

$$\beta_a = \frac{\beta_e + \beta_d \frac{\mathrm{D}}{\mathrm{E}}(1 - t_c)}{1 + \frac{\mathrm{D}}{\mathrm{E}}(1 - t_c)},$$

where β_d is the 'debt beta', a measure of the systematic risk of debt securities.[2] For investment-grade firms (Baa2/BBB and higher[3]), β_d is a very small value and is often assumed to be zero. When re-levering the asset beta using the target capital structure, we use the expression

$$\beta_e = \beta_a + (\beta_a - \beta_d)\frac{\mathrm{D}}{\mathrm{E}}(1 - t_c).$$

The post-tax and pre-tax nominal WACCs, adjusted for franking credits, are given by:

$$\mathrm{WACC}_{\text{post-tax nominal}} = \mathrm{r_e}\frac{\mathrm{E}}{\mathrm{V}}\left[\frac{1-\mathrm{t_c}}{1-\mathrm{t_c}(1-\gamma)}\right] + \mathrm{r_d}\frac{\mathrm{D}}{\mathrm{V}}(1 - \mathrm{t_c}),$$

where

$\mathrm{t_c}$ is the effective company tax rate, and

γ is the value of franking credits,

and

$$\mathrm{WACC}_{\text{pre-tax nominal}} = \mathrm{r_e}\frac{\mathrm{E}}{\mathrm{V}}\left[\frac{1}{1-\mathrm{t_c}(1-\gamma)}\right] + \mathrm{r_d}\frac{\mathrm{D}}{\mathrm{V}}.$$

Gamma (γ) refers to the value that investors attribute to franking credits when determining their required rate of return on equity. Gamma is important when considering returns for Australian firms as Australia has adopted an *imputation tax system*, as opposed to a classical tax system.

The pre-tax nominal WACC can be adjusted for expected inflation using the Fisher equation to yield a pre-tax real WACC:

[2] Note that β_d may be over-estimated if calculated directly from bond yields (using CAPM) as the yields incorporate specific firm risk, as well as systematic risk.
[3] Throughout the report, credit ratings will be stated either as a Moody's rating (e.g., Baa2) or as a Moody's/Standard & Poors pair (e.g., Baa2/BBB). See Appendix A for a joint listing of the credit ratings.

$$\text{WACC}_{\text{pre-tax real}} = \frac{1 + \text{WACC}_{\text{pre-tax nominal}}}{(1 + \pi^e)} - 1,$$

where π^e is expected inflation. A similar relationship holds for the post-tax real WACC.

As the E/V and D/V weights vary, the WACC value will change. The 'optimal' WACC value for each port can be defined as the minimum WACC for all available capital structures. This WACC value, when used as a discount factor for future expected cashflows, maximises the value of the port.

The following two sections outline WATC's suggested approach to determining each of the parameters that enter into the WACC equations.

3 Cost of Capital Parameters I

In this section, we discuss the WACC parameters that can be straightforwardly estimated.

3.1 Risk-Free Rate

The risk-free rate is the rate of return an investor receives from holding an asset with certainty of payments. The standard commercial and regulatory practice continues to regard Commonwealth Government Securities (CGS) yields as the best proxy for the risk-free asset.[4]

In determining the *current* risk-free rate, we have followed market practice and taken the average of the ten-year Commonwealth bond rate over the last 20 trading days of June 2013. The effective annual risk-free rate is calculated as 3.56% per annum.[5] This rate is a nominal rate and thus incorporates *expected* inflation. Table 1, below, gives the Commonwealth ten-year bond rate averaged over different time periods up to 30 June 2013.

20 Days	1 Year	2 Years	3 Years	5 Years	10 Years
3.56%	3.26%	3.65%	4.22%	4.66%	5.21%

Table 1 *Average annualised Commonwealth ten-year bond rates.*

We note that the ten-year Commonwealth bond rate can vary considerably over time, and that prevailing rates are near historical lows. Having a target rate of return that is based on a volatile foundation rate may not be in the best interests of the port or its users.

One way to minimise this volatility is to use a long-term trailing average of the risk-free rate. As the risk-free rate enters both the debt and equity components of the WACC, this would lead to more stable return targets over time, with less potential for volatile user charges. A five-year or ten-year trailing average of the risk-free rate could be chosen. Note that the ports have long-term assets which would normally be funded with long-term debt, and the planning horizon for capital expenditure is five years; this would favour the use of a longer-term averaging period. Note also that this issue is currently a topic of much debate for Australian regulators.[6] Ultimately the decision on the averaging period involves weighing up the strict application of corporate finance theory (to provide a market-sensitive hurdle rate) against the desire for stable prices for customers. The Department has indicated a preference for a ten-year averaging period. The calculations later in this report are based on this assumption.

[4] ERA 2012, *Final decision on proposed revisions to the Access Arrangement for Western Power*.
[5] The equivalent nominal semi-annual risk-free rate is 3.53% p.a.
[6] See ERA website: http://www.erawa.com.au/access/gas-access/guidelines/.

3.2 Equity Market Risk Premium

The Equity Market Risk Premium (MRP) is the return demanded by equity investors over and above the risk-free rate (in this case the average ten-year Australian Commonwealth Government bond rate). As is commonly used in Australia, particularly in regulatory arenas, WATC recommends setting the MRP equal to 6.00% (Gray & Hall, 2006).[7]

3.3 Imputation Tax Credits (Gamma)

Gamma (γ) can be defined as the market value of each dollar of franking credits created by a firm.[8] If a franking credit does not have value to the investor that receives it, gamma is equal to zero. If the franking credit can be fully utilised as a credit against the investor's tax liability, then the gamma value is one. In general, the higher the gamma value, the lower the required return on equity.

In determining an appropriate gamma value for a commercial port, WATC has considered recent determinations by the Australian Competition Tribunal (supported by a study[9] performed by Professor Stephen Gray) which found that there is no support for the adoption of a gamma estimate above 0.25.[10,11] Furthermore, Professor Gray suggests that internal consistency and market practice indicate that the lower bound of any reasonable range for gamma should be zero.[12]

For a government trading enterprise, it is questionable whether gamma should be non-zero as the shareholder in this case (i.e., the Government) does not benefit from franking credits. However, when seeking to determine commercial target rates of return, consideration should be given to the case where the business was fully commercialised with private shareholders. For example, the recent WACC determination by the Economic Regulation Authority (ERA) for Western Power used a gamma value of 0.25.[13] It should be noted that a higher gamma value leads to a lower return on assets allowance for Western Power.

In summary, regulatory precedent and academic research support a range of values for gamma from 0.0 - 0.25. Given the stance taken by Australian regulators, it is not unreasonable to adopt a value of 0.25 for gamma.

[7] Gray S. and J. Hall, 2006, *The relation between franking credits and the market risk premium*, Accounting and Finance, Vol. 46, No. 3, pp. 405-428.
[8] SFG Consulting 2007, *The impact of franking credits on the corporate cost of capital: Empirical evidence, Report prepared for Investor*, March, p. 4.
[9] SFG Consulting 2011, *Final Report to the Australian Competition Tribunal*, March.
[10] Australian Competition Tribunal 2010*, Application by Energex Limited (Distribution ratio (Gamma)) (No 3).*
[11] Australian Competition Tribunal 2011, *Application by Energex Limited (Gamma) (No 5).*
[12] SFG Consulting 2011, *Regulatory estimates of gamma in light of recent decisions of the Australian Competition Tribunal – Report prepared for DBP*, 20 July.
[13] ERA 2012, *Further Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network,* 29 November.

3.4 Company Tax Rate

A company tax rate is required in the WACC formula and for de-levering peer company equity betas. Foreign equity beta estimates should be de-levered using an appropriate tax rate. WATC has applied a statutory rate of corporate income tax of 30% for Australian companies.

3.5 Expected Inflation

The expected inflation rate is not an explicit parameter within the WACC calculation; however, it is used when deriving a *real* WACC estimate. There are a number of approaches that are reasonable for estimating expected inflation over the long term. Note that the term of the expected inflation estimate should coincide with the term of the risk-free rate.

The first approach is to simply use the mid-point of the Reserve Bank of Australia's (RBA) target inflation band of 2-3%, i.e., to assume that long-term inflation will average 2.50%. This approach was recently used by the Queensland Competition Authority (QCA) for water and wastewater utilities.[14]

Alternatively, the Australian Energy Regulator (AER) proposes that the method that is likely to result in the best estimate of inflation over a ten-year period is to apply the RBA's short-term inflation forecasts (currently extending over two years) and to adopt the mid-point of the target inflation band (2.50%) for the remainder of the horizon of interest,[15] thus embedding all known information into the estimate. Based on the inflation forecasts published by RBA,[16] reproduced below in Table 2, the ten-year forecast of annual inflation using this method is 2.48%.

	Jun 2013	Dec 2013	Jun 2014	Dec 2014	Jun 2015 – Jun 2023
CPI Inflation	2.25%	2.00%	2.50%	2.50%	2.50%

Table 2 *Forecast CPI inflation over a ten-year horizon. Source: RBA.*

The Independent Pricing and Regulatory Tribunal (IPART) has used inflation swap data for estimating the expected inflation.[17] Finally, the ERA has recently used the implied inflation rate between nominal and inflation-linked government bonds.[18]

For pragmatic reasons – the desire to have stable return targets and to provide consistency across the ports when reporting actual returns on assets in real terms – WATC recommends that the mid-point of the RBA's target band be used as the long-term expected inflation rate, i.e., 2.50%.

[14] QCA 2012, *Final Report: Sunwater irrigation price review 2012-17*, Volume 1, May, p. 201.
[15] AER 2008, *NSW DNSPs draft distribution determination 2009-10 to 2013-14*, 21 November, 226-228.
[16] RBA 2013, *Statement on Monetary Policy – May 2013*.
[17] IPART 2012, *Review of prices for Sydney Water Corporation's water, sewerage, stormwater, drainage and other services, From 1 July 2012 to 30 June 2016,*p.205.
[18] ERA 2012, *Final decision on proposed revisions to the Access Arrangement for Western Power*.

4 Cost of Capital Parameters II

In this section, we discuss the WACC parameters for the benchmark ports that are more problematic to estimate. The capital structure, the credit rating, the equity beta, the debt beta, and the debt risk premium are all inter-related. For example, the debt risk premium (DRP) depends on the credit rating which in turn depends on the capital structure; however, the optimal capital structure depends on the DRP and the credit rating as well.

Our proposed solution for addressing this conundrum is to develop a simple model of how each of these parameters – credit rating, debt risk premium, equity beta, debt beta – vary as a function of the capital structure. The capital structure that has the lowest (optimal) WACC will then identify the final benchmark credit rating, etc. Before describing the model in detail we first discuss each of the parameters and the issues that have led us to this solution.

4.1 Credit Rating

The credit rating of an entity affects the debt risk premium that investors require on debt issued by that entity. In addition, the credit rating is inextricably linked to the capital structure of the firm, i.e., firms with higher debt levels may be nearer financial distress (depending on the industry). Lower credit quality can also influence the equity beta value (through the debt beta, discussed in Section 4.3).

The appropriateness of using an *identical* Baa2/BBB credit rating for all ports was initially considered. However, not all ports are the same – the scale and geographical location of the port, the customer base, and the business model all influence the risk of a port business. Many of these factors are beyond the influence of the ports but will still affect their capacity to achieve performance targets. Hence, it is likely that the assumption of Baa2/BBB could understate the true risk of some of the ports, thereby understating the true required return if these ports were running commercially. To obtain a target return for a commercially-operating port of a similar nature, we need to obtain an appropriate credit rating for each specific case.

Once it is recognised that each port should be individually assessed to determine an appropriate credit rating, we then require a framework for differentiating the risk of each port. To determine a 'shadow' credit rating for each benchmark port, WATC has relied on a recent publication by Moody's Investor Services.[19] The rating methodology assesses a number of qualitative and quantitative features:

- Market position/scale;
- Diversity of Customer Base;
- Capital Programme, and Management attitude to financial risk and financial profile;
- Nature of asset ownership; and
- Key credit metrics.

Numerical scores for each port are attributed to each factor, with the final total credit score mapped to a credit rating. WATC has implemented Moody's methodology and asked a representative from each

[19] Moody's Investor Services 2013, *Rating Methodology: Privately Managed Ports Companies,* May 31.

port to self-rate the port for each qualitative factor. The questionnaire is reproduced in Appendix B and the self-rating responses for each port are shown (in black) in Table 3, below.[20] To ensure consistency in assessing the attributes of each port, the Department has moderated some responses. Any changes are shown in red text immediately below the self ratings.

One of the difficulties faced in determining an *overall* credit rating for each port is that the capital structure of the benchmark firm has not been specified. This is important because a firm with no debt will have superior credit metrics (e.g., interest coverage, debt service coverage ratio) to the same firm with high debt levels. The credit metrics account for 40% of the final credit score, so they cannot be ignored.

As our objective is to determine the optimal rate of return for a benchmark port (of a similar nature), we allow the credit/financial metrics to vary between the highest investment grade response (Aaa) and the lowest investment grade response (Baa2) to provide a range of potential ratings. The last two columns of Table 3 present this range of possible *overall* credit ratings for each port, incorporating a weighted average of the qualitative factors of the specific port and the assumed range of financial metrics for the benchmark port.

	Individual Survey Question Responses									Overall Ratings	
Port	1a	1b	1c	2a	2b	3a	3b	3c	4a	Low	High
Albany	Ba	Baa	A	Caa	Ba	Aaa	Baa	Ba	Ba	**Ca**	**Caa2**
	B	-	Baa	B	-	-	Aaa	Aaa	-	**Ca**	**Caa2**
Broome	B	Baa	Baa	B	Baa	Aaa	A	Aaa	Aaa	**Ca**	**B1**
	-	Ba	-	-	-	-	Aaa	-	Aa	**Ca**	**B2**
Bunbury	Baa	Aaa	A	A	A	Aaa	Aa	Aa	Aaa	**Ba1**	**Aa3**
	Ba	A	Baa	-	-	-	Aaa	Aaa	Ba	**Caa1**	**Baa3**
Dampier	A	Baa	Aa	Aa	A	A	A	Aaa	Ba	**B1**	**A3**
	-	Aaa	-	-	-	Aaa	Aaa	-	-	**Ba2**	**A2**
Esperance	Ba	Baa	A	Ba	Ba	Aaa	Aaa	A	Ba	**Ca**	**Ba3**
	-	A	-	Baa	-	-	-	Aaa	-	**Caa2**	**Ba1**
Fremantle	A	Aaa	Aa	A	Aa	A	Aa	Aaa	Aaa	**Baa2**	**Aa1**
	-	-	-	-	-	-	Aaa	-	-	**Baa2**	**Aa1**
Geraldton	Ba	Baa	Baa	Baa	Baa	Aaa	Baa	Aa	Ba	**Ca**	**Ba3**
	-	A	-	-	Ba	-	Aaa	Aaa	-	**Caa3**	**Ba2**
Port Hedland	Ba	Aaa	Aa	Aaa	Ba	Aaa	Aaa	Aaa	Ba	**Caa1**	**Baa3**
	A	-	-	Aa	-	A	-	-	-	**B1**	**A3**

Table 3 *Port Authority responses (in black) to the Moody's 'Privately Managed Port Companies' credit rating survey. Note that some respondents found the available choices did not reflect their port; their comments are included in Appendix C. The moderated changes by the Department of Transport are indicated in red. The lowest overall credit rating is determined by setting all credit metrics to Baa2; the highest overall credit rating is determined by setting all credit metrics to Aaa.*

[20] Port representatives were not asked to complete the Moody's survey questions relating to credit/financial metrics.

4.2 Target Capital Structure

The actual proportion of debt and equity for each business is dynamic and depends on a number of business-specific factors, but the firm should have a target capital structure. Ideally, the target capital structure should minimise the WACC and maximise the value of the firm. Observing that regulators do not allow their benchmark entities to have more than 60% debt, we place one constraint on the gearing of the port(s) by restricting the D/V ratio to be no greater than 60%.

As highlighted repeatedly in this report, the capital structure of the benchmark port is inextricably linked with the other parameters we are seeking to estimate. Section 5 will outline in detail how the target structure can be identified.

4.3 Debt Beta

Debt beta (β_d) is a measure of the systematic risk of debt securities. The value of debt beta is dependent on the maturity of the debt instrument and the credit rating of the firm. Regulatory decisions in the early 2000s allowed a small debt beta value (about 0.1), but the values proposed by stakeholders were quite subjective and varied considerably.[21] More recent regulatory decisions (in the energy, water and rail industries) do not even discuss a debt beta, implicitly assuming that it is zero. We presume that the reason for the omission is principally because the debt beta is insignificant for investment-grade firms, hence it can be ignored.

For the purposes of determining the WACC of a port, however, if the port is rated as sub-investment grade then the debt beta may become significant. Table 4, below, reproduces data showing how debt beta varies with a firm's credit rating. It should be mentioned that these values have been estimated in a US context; we are not aware of a similar study in an Australian context.

Note also that the debt beta should correspond to the *target* firm. In other words, the credit rating of the benchmark firm will govern the appropriate debt beta.

A2/A and above	Baa2/BBB	Ba2/BB	B2/B	Caa2/CCC
< 0.05	0.10	0.17	0.26	0.31

Table 4 *Average debt betas by credit rating. Source: Berk & DeMarzo (2011), Corporate Finance, Second Edition, Prentice Hall, p. 389.*

For lower ratings such as Ca/CC, we need to extrapolate the debt beta values somehow. A simple way of doing this is to add the last margin (0.05) to the last debt beta value, giving 0.36 for the lower credit grade. The sensitivity of the final WACC outcome to this assumption needs to be tested.

[21] Queensland Competition Tribunal 2005, *Dalrymple Bay Coal Terminal Draft Access Undertaking: Final Decision,* April, p. 151.

4.4 Equity Beta

4.4.1 Overview

When considering a proxy beta for a firm, it is important to understand what beta is describing or measuring. There are two types of risks when investing in a firm: market risk (also known as systematic or un-diversifiable risk) and unique risk (also known as specific, non-systematic, residual or diversifiable risk).

Unique risk refers to risk associated specifically with the business (or asset). An example would be the loss of a company patent, or the entry of a new competitor. From an investor's point of view, company specific risk can be diversified away by investing in other assets and hence an investor will not require any additional return for accepting this risk.[22] Therefore, r_e (the return demanded on equity from the investor) does not have any relationship to the unique risk of the firm. In the case of ports, attributes such as geographical location can be considered to be specific risk.[23]

Market risk refers to the risk that cannot be diversified away. In other words, if an investor holds a representative portfolio of market assets to diversify away the company specific risk associated with each asset, there will still be some risks that will affect the portfolio as a whole, that is, the market. These include demand risk (relating to the general level of economic activity), unexpected inflation, unexpected changes to interest rates or foreign exchange rates, unexpected obsolescence and market shocks. These risks affect all market participants, however, some will be more (or less) affected than others due to the industry sector in which the company operates and the degree to which the firm is susceptible to market changes.

Operating leverage (the proportion of operating costs that are fixed) and financial leverage (the gearing level) also increase a firm's market risk. For the ports, attributes such as scale (impacting operating leverage) and the business model (affecting exposure to market factors) will affect the port's market risk.

It is the non-diversifiable market risk, and the degree to which a company is susceptible to it, for which an investor demands a premium. If we consider an investor who already holds a representative market portfolio, the question arises as to how much *additional* return above the risk-free rate would be required to invest in a particular firm. The risk-free rate is used as a base as it is the return that an investor can receive by taking on no risk (or almost no risk). As stated in Section 3, in Australia the risk-free asset is generally taken to be Commonwealth bonds. Any risk/return trade-off will be benchmarked to this measure.

Beta represents the correlation or relatedness between the return of a company and that of the broader equity market. It describes the degree of market risk associated with a company's return in

[22] When referring to Government businesses, the investor/equity holder is the Government.
[23] In principle, an investor could invest in a number of different ports.

relation to the market's return as a whole. Companies with a beta of one carry the same systematic risk as the market and would be expected to achieve, on average, the market return. Companies with a beta less than one have lower market-related risk to their returns, while companies with a beta greater than one have, on average, greater market-related risk to their returns.

4.4.2 Comparators

For companies listed on the Australian Stock Exchange it is possible to directly calculate their betas based on stock market data. For unlisted entities, such as Government businesses, this is not possible. A beta for a particular Government organisation can often be estimated by using proxy data from comparable listed companies.[24]

One approach for estimating beta for a port is to:

1. Select a group of comparable firms (ports) that have publicly available equity betas;
2. Obtain the observable equity betas and gearing levels for each of the comparator firms;
3. Convert the equity betas of each of the individual comparator firms to asset (unlevered) betas;
4. Calculate an average asset beta from the group of comparator firms;
5. Re-lever the estimated beta by using the target gearing of the relevant entity.

In Australia, however, there are no publically-listed port companies to act as peers for estimating beta. The reality, though, is that few ports are alike, so even if there were listed ports available as comparators, it is unlikely that they would be a strong match for all of the WA ports.

Another potential secondary source of data is that available from foreign port companies. When considering foreign comparators for cross-checking purposes within the regulated energy market, the Australian Energy Regulator (AER) has highlighted a number of issues that could lead to biased estimates including:

- differences in market gearing;
- differences in cross-sectoral weights; and
- differences in regulation, geography, business cycles, and weather.

AER concluded that one should exercise "extreme caution when examining foreign beta estimates for the purposes of setting a benchmark efficient equity beta."[25]

Alternatively, one can also consider previous regulatory decisions in Australia. The problem with using this information is that, once again, the decisions are typically for a generic port with different risks to those of the WA ports; for this exercise we need to be able to differentiate the risks of the ports. Finally, one can consider listed Australian companies involved in port-related activities such as logistics and stevedoring.

[24] New South Wales Treasury, *Commercial Policy Framework: Guidelines for Financial Appraisal*, July 2007, p. 16.
[25] AER 2008, *Electricity transmission and distribution network service providers – Review of the weighted-average cost of capital (WACC) parameters: Explanatory statement*, December, p.197.

It is clear that there is no perfect method for accurately estimating the beta for each WA port. The following discussion outlines WATC's recommended approach.

4.4.3 Asset Beta

As stated above, each WA port will have a different exposure to systematic risk. By examining the range of betas that arise from firms involved in port-related activities, we can infer the potential range of asset betas that the WA ports could take. The range of asset betas for listed companies involved in stevedoring, logistics, rail and marine activities is illustrated in Figure 1. Using these data the Department, in conjunction with WATC, has proposed an asset beta range of 0.5-1.1.

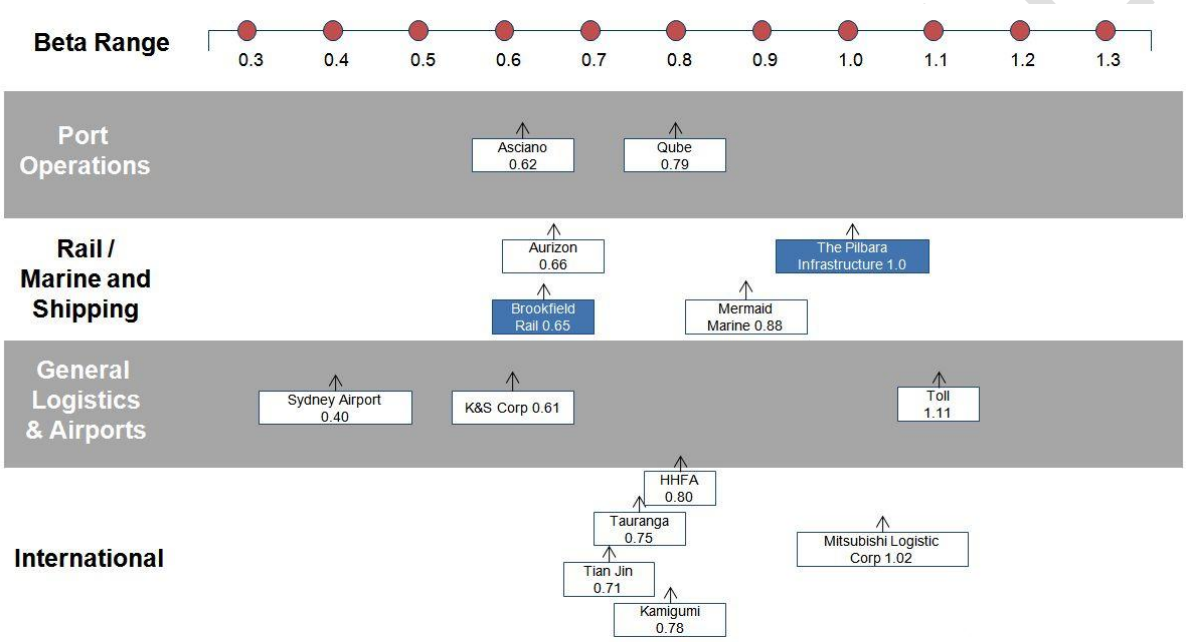

Figure 1 *Asset beta values for selected companies involved in port-related activities. The blue labels indicate recent regulatory decisions by the ERA.*[26]

The position of each WA port along this spectrum of beta values (0.5-1.1) is governed by the port's exposure to market risk. To determine this exposure, we can use the information gathered from the responses to the Moody's survey. Some of the questions relate to market risk factors (questions 1a, 1b, 2a and 2b) allowing us to construct a 'beta risk score' from the survey responses; see Appendix D for details. The lowest possible 'beta risk score' can be mapped to the lowest asset beta value (0.5), while the highest possible 'beta risk score' can be mapped to the highest asset beta value (1.1). As each port will most likely have an intermediate score, its estimated asset beta will lie at an intermediate point on our asset beta range. The end result is that ports with higher market risk factors will have a higher asset beta, which is precisely the outcome we require. The estimated asset betas for each port are tabulated in Table 5.

[26] ERA 2013, *Determination on the 2013 Weighted Average Cost of Capital for the Freight and Urban Railway Networks*, 9 July. Available at http://www.erawa.com.au/cproot_download/11490/2/Determination%20on%20the%202013%20Weighted%20Average%20Cost%20of%20Capital%20for%20the%20Freight%20and%20Urban%20Railway%20Networks.pdf.

Port	Albany	Broome	Bunbury	Dampier	Esperance	Fremantle	Geraldton	Port Hedland
Asset Beta	0.93	0.94	0.77	0.63	0.83	0.63	0.83	0.66

Table 5 *Estimated asset betas for each port authority.*

4.4.4 Re-levering

Once we have the asset beta for a port, we need to re-lever using the target capital structure. However, as noted in the introduction of this section, the ideal capital structure will depend on the credit rating. For any given capital structure, we can compute the equity beta (assuming that we also know the debt beta for this leverage value).

4.5 Debt Risk Premium

For the purposes of estimating a debt risk premium for a commercial port, we must ignore the fact that the WA ports may borrow with the State government's credit rating. This will result in a higher debt risk premium and, possibly, a higher final WACC target. In the regulatory space, this may give the firm a 'free kick', in that its actual cost of debt is less than its regulated return on debt.

Corporate bond yields at a given maturity primarily vary according to the credit rating of the firm, with additional variation governed by other idiosyncratic factors. Bloomberg provides Fair Value Curves (BFVC) which interpolate the observed bond yields within each credit grade. The BFVCs as at 28 June 2013 are shown in Figure 2, below. The DRP at a given maturity can be found by subtracting the Commonwealth (risk-free) yield from the appropriate BFVC. Note that some curves are shorter than others due to the lack of issuance at longer maturities in particular credit grades. This has been an ongoing issue since the GFC and has led to much debate in regulatory circles about the most appropriate method for estimating the DRP for longer maturities.

The simplest approach in this instance is to simply maintain a constant spread over the Commonwealth curve from the yield with the longest maturity. For example, if the 7-year spread over the risk-free rate is 300 basis points (bp), then the 10-year DRP is also assumed to be 300 bp (3.00%).

Again we have a problem with lower-rated ports. If a port is rated Ca/CC, then we need to estimate a corresponding DRP. We have found little guidance from US data for lower-rated credits. As discussed in the case of the debt beta, we can assume a reasonable value, but then examine the sensitivity of the final WACC to this assumption to gain confidence that it is not having a significant effect on the final WACC results. To maintain a large spread that will penalise low-rated debt issuance, we have assumed that the DRP for Ca/CC is no lower than 7%, but at least 4% more than the DRP for Baa2/BBB debt. Mathematically, we have used the following function:

$$\text{DRP Ca/CC} = \max(\text{DRP Baa2/BBB} + 4.00\%, 7.00\%).$$

Intermediate ratings (e.g., Baa1/BBB+, Aa3/AA-) can be estimated via straight-line interpolation.

If the risk-free rate is to be averaged to reduce volatility, it is appropriate to also average the DRP over the same time horizon. Again, the Department has expressed a preference to average over a ten-year horizon.

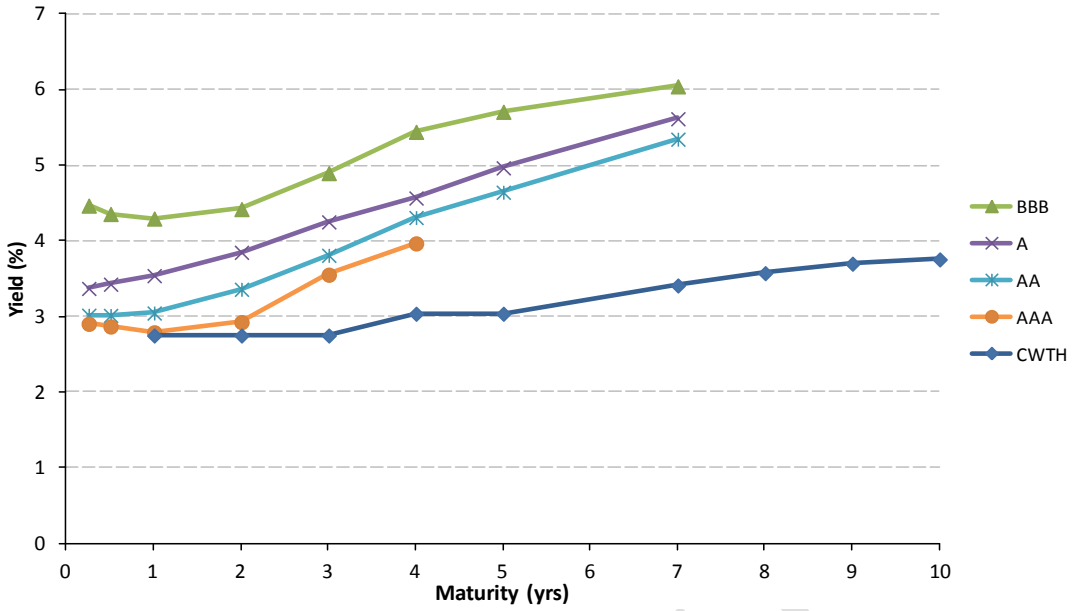

Figure 2 *Bloomberg Fair Value Curves for various credit ratings. Source: Bloomberg.*

4.6 Summary of Input Parameters

The following table summarises the inputs as currently proposed by the Department of Transport.

Model Input	Assumption
Risk-free rate - Maturity	10 years
Risk-free rate – Averaging period	10 years
Equity market risk premium	6.00%
Gamma	0.25
Expected inflation	2.50%
Company tax rate	30%
Asset beta range	0.5-1.1
Port asset betas	As per Table 5
Debt betas	As per Table 4
Capital Structure	Determined from optimisation
Benchmark credit Rating	Determined from optimisation
Debt risk premium	Determined from optimisation

5 Recommended WACC Framework

Our recommended methodology for simultaneously determining all the parameters described in Section 4 is as follows:

1. Using the Moody's survey, determine the *range* of potential final overall credit ratings for the benchmark port by:
    a. scoring the qualitative risk factors as per the survey responses;
    b. assuming that the financial metrics of the benchmark port can vary from the best investment grade level (Aaa) to the lowest investment grade level (Baa2);
    c. taking a risk-weighted average of these factors to produce the highest and lowest potential overall credit ratings.
2. Map the allowed 0% to 60% debt-to-value ratios to the highest and lowest overall credit ratings, respectively, from the Moody's survey.
3. Use a subset of the Moody's survey questions to determine the asset beta for the port.
4. Calculate the debt beta as the gearing varies using (2).
5. Calculate the equity beta for each gearing value.
6. Calculate the debt risk premium as the gearing varies using (2).
7. Calculate the WACC for each gearing/rating.
8. Find the gearing/rating that minimises the WACC.

The methodology can be illustrated visually as in Figure 3.

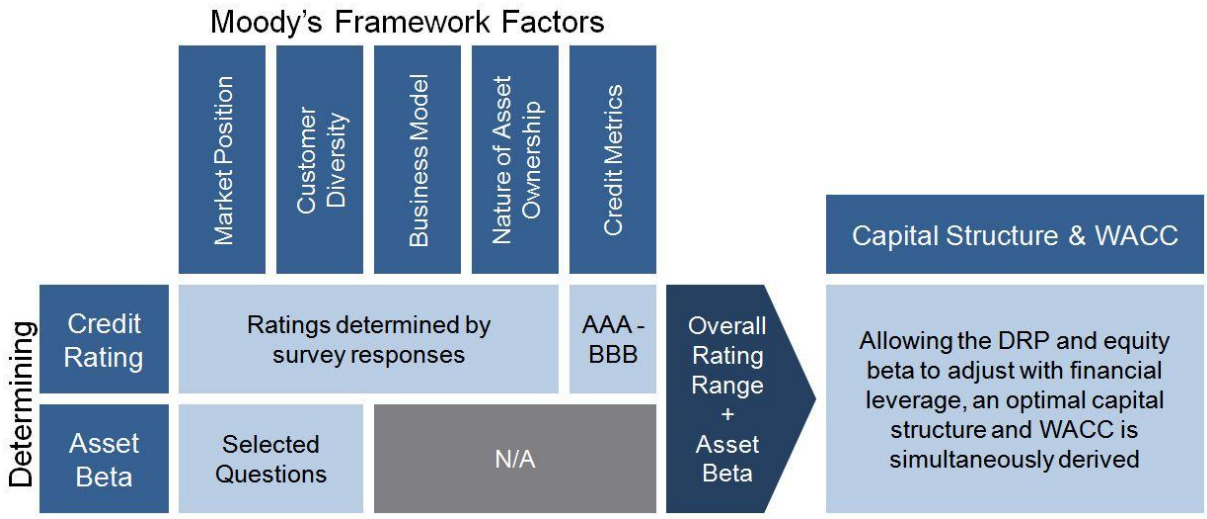

Figure 3 *Visual representation of the port WACC estimation framework.*

To understand how the various parameters can be mapped to the capital structure, consider an example port which has an asset beta of 0.8 and a potential credit rating range of Ba2/BB – Aa2/AA, depending on the quality of its credit metrics. Figure 4 illustrates the mapping from the gearing level to the value of the DRP.

With zero debt, the port will have the highest rating allowed (Aa2/AA) given its score for its qualitative attributes. At 60% D/V, the port will have the lowest allowed rating (Ba2/BB). The DRP at each 5% increment in D/V is estimated by straight-line interpolation between the observed BFVC points.[27] We use the same approach for interpolating the debt beta values. Finally we can calculate the equity beta and the WACC value for each incremental gearing ratio.

Figure 4 *Example mapping from gearing (D/V) to debt risk premium and equity beta. The credit ratings at the end points are dependent on the qualitative risk assessment of the port ascertained from the Moody's survey.*

Once we have the WACC as a function of leverage, we can easily find the minimum WACC value. We can then immediately identify the optimal capital structure for the benchmark port, as well as the final shadow credit rating; see Table 6 and Figure 5 for an example calculation.

Leverage (D/V)	D/E	Debt Beta	Equity Beta	Re	DRP	Rd	Nominal Pre-tax WACC	Real Pre-tax WACC	Nominal After-tax WACC	Real After-tax WACC		Final Rating
-	0.00	0.05	0.80	10.02%	1.44%	6.67%	12.93%	10.18%	9.05%	6.39%	-	
5%	0.05	0.05	0.83	10.19%	1.56%	6.78%	12.83%	10.08%	8.98%	6.32%	-	
10%	0.11	0.05	0.86	10.37%	1.67%	6.89%	12.74%	9.99%	8.92%	6.26%	-	
15%	0.18	0.05	0.89	10.58%	1.78%	7.01%	12.65%	9.91%	8.86%	6.20%	-	
20%	0.25	0.05	0.93	10.81%	1.89%	7.12%	12.58%	9.84%	8.81%	6.15%	-	
25%	0.33	0.06	0.97	11.06%	2.02%	7.24%	12.51%	9.77%	8.76%	6.10%	-	
30%	0.43	0.08	1.02	11.33%	2.14%	7.37%	12.44%	9.70%	8.71%	6.06%	-	
35%	0.54	0.09	1.07	11.64%	2.27%	7.49%	12.38%	9.64%	8.67%	6.02%	-	
40%	0.67	0.10	1.13	11.98%	2.39%	7.61%	12.32%	9.58%	8.63%	5.98%	1	Baa2
45%	0.82	0.12	1.19	12.37%	2.70%	7.93%	12.35%	9.61%	8.64%	5.99%	-	
50%	1.00	0.14	1.27	12.82%	3.02%	8.24%	12.39%	9.65%	8.67%	6.02%	-	
55%	1.22	0.15	1.35	13.35%	3.33%	8.56%	12.46%	9.71%	8.72%	6.07%	-	
60%	1.50	0.17	1.46	13.99%	3.65%	8.87%	12.54%	9.80%	8.78%	6.13%	-	

Table 6 *Example WACC determination for a port. The lowest real pre-tax WACC is 9.58% which occurs with leverage (D/V) of 40%, giving a final port credit rating of Baa2/BBB.*

We emphasize that the credit rating identified by the model is for an optimal benchmark port and is not an actual shadow credit rating of the port being considered.

[27] As the credit metrics are linked to the level of gearing, we have made the assumption that the credit rating deteriorates linearly with rising debt levels.

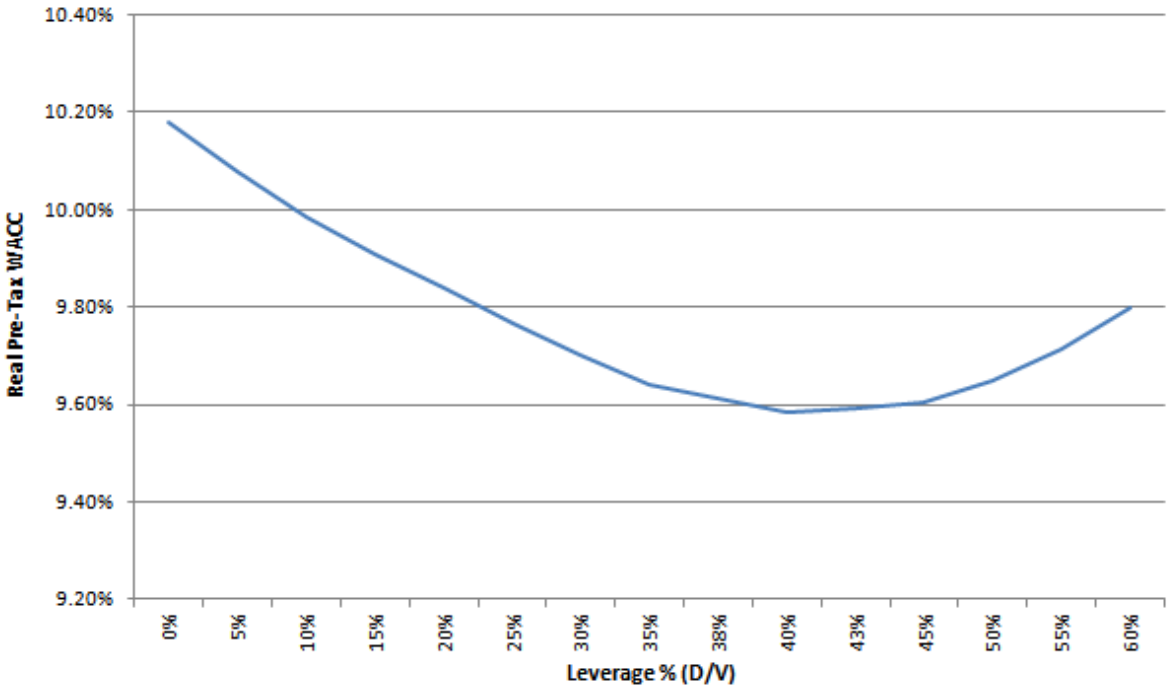

Figure 5 *Example WACC determination for a port. Plot of the real pre-tax WACC for varying capital structures.*

6 WACC Estimates

Representatives of each port have been asked to complete the Moody's survey, which allows us estimate a WACC value for their port. The moderated responses are shown in Table 3 in Section 2. As mentioned in Section 3, the preferred averaging period for the risk-free rate and debt risk premium is ten years. The estimated real and nominal pre-tax WACCs using this averaging assumption are presented in Table 7, below.

Port WACCs	Albany	Broome	Bunbury	Dampier	Esperance	Fremantle	Geraldton	Port Hedland
Pre-tax Real	11.1%	11.2%	9.9%	8.5%	10.3%	8.2%	10.3%	8.9%
Pre-tax Nominal	13.9%	14.0%	12.6%	11.3%	13.1%	10.9%	13.1%	11.6%

Table 7 *Estimated WACCs for each port authority using a ten-year averaging assumption for the risk-free rate and debt risk premium.*

We observe that the magnitudes of the WACC estimates reflect the expected risk of each port. Albany and Broome are the riskiest ports, requiring the highest return for a commercial investor. This outcome is obviously driven by the rating survey responses. These ratings are the key inputs to the model and any inconsistency in scoring will lead to unexpected WACC outcomes.

It should be noted that the averaging period for the risk-free rate has a significant effect on the magnitude of the WACC. When the longer averaging period is used, the WACC is almost 3% higher for all ports than if the current risk-free rate was used. As discussed in Section 3.1, the shorter averaging period will be more responsive to prevailing market conditions.

Sensitivity testing of the low-credit-rating assumptions for the debt risk premium and the debt beta shows that the final WACC values are relatively insensitive to changes in these values.

When reporting performance, an appropriate financial ratio in nominal terms is[28]

$$\text{Nominal Return on Assets} = \frac{\text{EBIT}}{\text{Average Assets}}.$$

The corresponding ratio in real terms is calculated as follows:

$$\text{Real Return on Assets} = \frac{1 + \text{Nominal Return on Assets}}{(1 + 0.025)} - 1,$$

where the denominator uses the mid-point of the RBA's target inflation band (2.50%), thereby avoiding the need to continually re-estimate this parameter.

[28] 'Average Assets' is the average of the start- and end-period asset bases.

7 Issues raised by Port Authorities

WATC has interviewed representatives from each of the port authorities throughout the course of this engagement. The key issues identified are as follows:

- A number of port authorities have long-term non-commercial contracts/State agreements which preclude them from achieving commercial returns. Once amalgamations of the port authorities occur, this problem could be exacerbated in some instances.
- There is some limited competition amongst some WA port authorities. In addition, Broome is exposed to competition from Darwin and its users are price-sensitive. The WACC approach to determining a target rate of return does not account for aggressive competitive behaviour by nearby ports.
- In the cases where particular ports have underperforming assets due to contractual obligations or a weak customer base, the only way that these ports could achieve their target returns is to write down or impair the asset base to its true economic value, which may be significantly lower than the replacement cost. The correct application of the deprival method of asset valuation should account for this concern through the economic valuation arm.
- Some ports have land which is not included in the asset base. The preference is to include land if it is being used for revenue generation through port activities.
- When the Moody's survey was discussed as a foundation for WATC's WACC framework (in the later interviews), interviewees were supportive of the approach.
- The return targets will need to be reviewed following the port amalgamations.

8 Gifted Assets

The revenue model for regulated monopolies is based on the 'NPV=0' Principle. The purpose of the principle is to provide fair pricing for recovery of the cost of serving users. The principle prevents 'rent seeking' by monopolies, i.e., deriving income in excess of the cost of production, by setting a revenue cap. For the ports, a revenue *cap* is not being set; the objective is to establish a commercial *target* rate of return.

If $100 is invested today, then the sum of the return *on* capital (on the depreciating asset) and the return *of* capital (depreciation) over the asset lifetime is equal to $100 in today's dollars (so long as the discount rate equals the WACC). The regulated monopoly is only permitted to recover its initial investment and not a cent more. In terms of accounting treatment for the initial investment, the firm 'credits' its bank account and 'debits' its fixed asset account. When the asset has to be replenished at the end of its useable life, the firm will have to draw on its own funds.

Regulators have two approaches for dealing with gifted assets.

First, as the firm has not invested the capital related to the asset, the firm should not be permitted to receive a return on the gifted asset, nor a return of that asset through depreciation charges. In terms of accounting treatment, the asset is still recognised on the balance sheet, but the asset is also recognised as revenue in the year in which it is gifted. This approach is endorsed by PwC in their *Revenue and Pricing Framework* report, and is used for regulated monopolies such as Western Power.

The alternate approach is to subtract the recognised (prepaid) revenue of the gifted asset from the allowed regulated revenue in the first year, and to then add the gifted asset to the asset base for subsequent return on asset and depreciation revenue allowances; see Figure 7. Water Corporation has used this method in the past for treating its developer contributions.

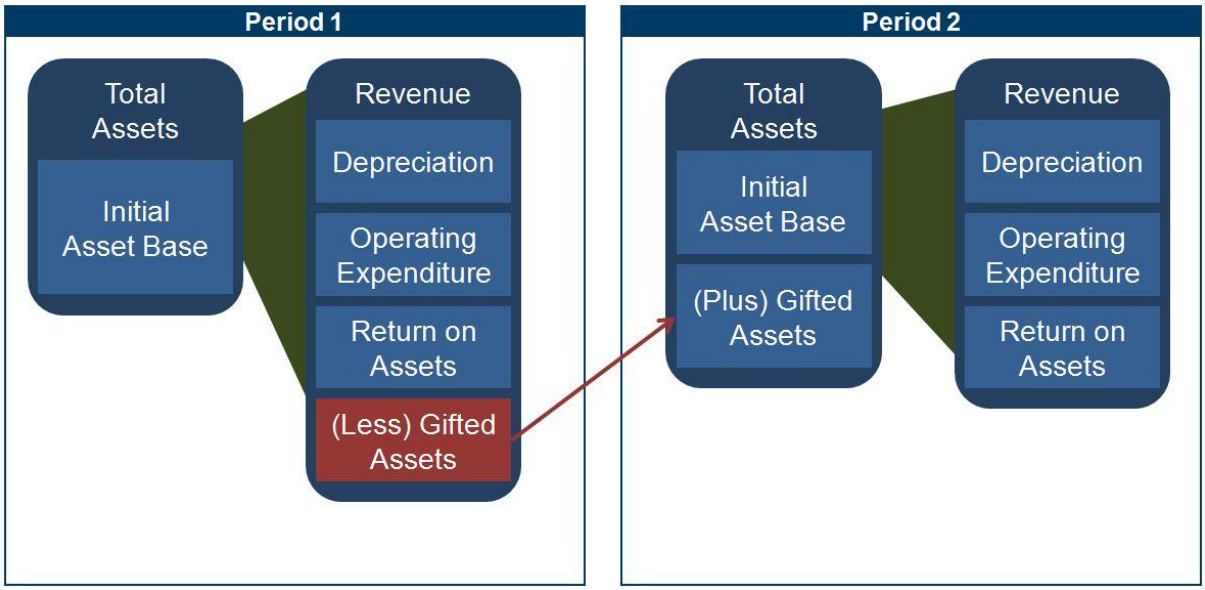

Figure 7 *Alternate treatment of gifted assets.*

These approaches are equivalent in NPV terms, although the revenue path (and potentially the customer price) is more volatile in the short term for the latter case. For both approaches, the onus is

on the firm to draw on its own funds to replenish the asset. Expert advice should be sought regarding the tax implications of each approach.

As identified by PwC, this issue is further complicated when there is the potential for third-party port users to benefit from the asset, despite making no capital contribution. In general, the party gifting an asset should not be charged, while third-party users should be required to pay a pro-rata return on asset and depreciation charge as they did not finance the assets. In this instance, the 'token' mechanism suggested by PwC is a way to incorporate the gifted asset into the asset base without penalising the gifting party.

Regardless of the treatment, the ports should be able to recover operating and maintenance expenses attached to the asset from all users to ensure continued service provision. If the port is able to negotiate a commercial agreement to recover further charges, then the port should not be restricted from doing so.

9 Summary

WATC has developed a systematic practical framework for estimating commercial rates of return for the WA port authorities. The foundation of the risk assessment is Moody's *Privately Managed Port Companies* credit rating model which allows one to differentiate the risk profiles of all ports. The WACC outputs are driven by the credit scores for each port, so it essential that these inputs are moderated to ensure consistency of assessment. Once consistent assessment is achieved, the WACC framework developed herein is expected to provide sensible outputs.

The lack of observable Australian benchmarks for a number of the WACC inputs (e.g., no sub-investment grade debt risk premia, no listed ports), has necessitated the introduction of a number of assumptions. Sensitivity testing of the more subjective inputs has shown that the WACC estimates are quite robust.

If the Department accepts the proposed framework, then final decisions need to be made on the input parameters. For example, the averaging period for the risk-free rate is a particularly important decision; the longer the averaging period, the less volatile the target rate of return. The stability of port user charges should be considered when making this decision. In addition, the risk-free rate is currently near its historical low, so the WACCs estimated using the short-term average are also expected to be at an historical low point.

The main outcome of using the WACC as a return target is that ports with a higher risk assessment will be expected to achieve a higher return on their assets. This is a commercial reality; investors require higher returns for taking on more risk. If the Department was expecting the smaller ports to have a lower hurdle rate, then a WACC-based framework will not provide such an outcome.

In addition, the revenue-raising power of many of the WA port authorities' is restricted by long-term non-commercial contracts or weak customer bases. The only way these ports will be able to achieve their return target is if their asset bases are re-valued/impaired to reflect their true economic value, or if the ports are subsidised by government.

WATC supports the exclusion of gifted assets from the asset base unless they are to be used by third parties. This implies that land vested by the State should be included in the asset base.

Appendix A – Credit Ratings

The following table shows the correspondence between the long-term credit ratings of Moody's and Standard & Poors. Source: Wikipedia, *Bond Credit Rating*. Available at: http://en.wikipedia.org/wiki/Bond_credit_rating.

Moody's	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	Caa3	Ca	C
Standard & Poors	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	CCC+	CCC	CCC-	CC/C	D

Appendix B – Moody's Private Port Companies Factor Grid

Source: Moody's Investor Services 2013, *Privately Managed Port Companies,* 31 May.

Factor 1 Market Position Weighting: 25%								
	Aaa	Aa	A	Baa	Ba	B	Caa	Sub-factor % of Factor
Port Size / No. of Ports Owned	Very Strong geographic diversification - a large number of deep sea ports with many international routes. *No single terminal makes up more than 20% of company's EBITDA*	Between 5 and 10 ports with strong diversification of deep sea routes and broad range of cargos. *No single port contributes more than 40% of group EBITDA. OR geographically concentrated port areas with very large volumes (>15 million TEUs or equivalent) and which have multiple terminals mitigating single site risk*	Either a single terminal of more than 5 million TEUs/>100 million tons total cargoes, or up to five terminals with strong deep sea bias (>75% international trade)	Single port but with strong level of deep sea routes, OR a number of small ports all based in the same economic area with short sea operations. One million TEU container movements / 30 million tons bulk goods	Single large port with some deep sea route operations with weak but dominant operator that could significant alter volumes	Modest single port with a variety of short sea services.	Small port with dominant short sea operator / ferry and minor Marina services	40%
Quality of Service Area and Connections	Port forms an essential part of the local economy and has an effective monopoly on port services for the region, or is a major transshipment hub. Excellent road, rail and pipeline connections or strong positioning on major sea routes	Assets have very strong road and rail connections to highly populated areas / strong industrial areas with strong record of imports and exports. Within 50 miles of major city > 5million population	Assets have good road and rail connections to moderately strong economic areas	Assets have adequate connections or serve a modest economic area. Good road and rail links able to support significant volumes	Assets have limited connections to major centres, reliant on a limited local economy, OR the port is specifically built as an export route for commodity products e.g. Oil, Timber, Ore or Coal produced by a single concession or mine	Single route port - usually localised ro-ro operations	Port offers only small marina or local services	30%

Factor 1 Market Position Weighting: 25%								
	Aaa	Aa	A	Baa	Ba	B	Caa	Sub-factor % of Factor
Operational Restrictions	Port is able to accept any current type of ship including post- and superpost-panamax, and turnaround a number of these ships at once. No volume restrictions on the land side	Port able to accept any size of ship, but with limitations to the number of ships at any one time, either due to limited quay space or limited landside infrastructure, but with room to expand	Limitations on ship size to Post Panamax (8,000 TEUs) but with good capacity. Some limitations on operations of port (operating hours / landside infrastructure not scaled to port)	Multi modal but limited to short sea operations and feeder services. Able to accommodate up to Panamax only	Limited to short sea Ro-Ro with limited other forms of load and unload	Port specifically built for one type of vessel	Very restricted port able to take only small vessels	30%

Factor 2 Diversity of Customer Base Weighting: 10%	Aaa	Aa	A	Baa	Ba	B	Caa	Sub-factor % of Factor
Exposure to volume variation	Revenues 100% supported by long-term take or pay contracts or substantially comprise fixed payments with no volume linkage. Mostly bulk or oil with significant landside commitment. Revenues include all conservancy and pilotage fees	Stable cargo throughput by tonnage with long-term take or pay contracts accounting for 80% of revenues. Limited uncontracted volumes or 80% or more of revenue comprises other substantially fixed payments	Limited exposure to volume variations - approximately 2/3 of revenues on take or pay contracts or comprises substantially fixed payments. Limited uncontracted volumes or 2/3 or more of revenue	Moderate exposure to volume variation, with approximately 50% of volumes contracted or comprises substantially fixed payments. High levels of container, and ro-ro traffic. High number of calls from major shipping lines, with strong container transhipment volumes	High exposure to volume variations - largely container based or similar uncontracted volumes. Regular line calls from large shipping companies	Very High levels of exposure to volume variation with very low level of contracts. Cargoes mostly container or RO-RO with historic linkage to GDP movement. Irregular calls by major shipping lines	Extremely unpredictable volumes. No regular calls from shipping lines	50%
Dominance of Customers	Top 10 customers should not exceed 5% of revenues	Top 10 customers should not exceed 10% of revenues	50% < Top 10 < 25%	Top 10 >50%	Top 3 > 50%	Single customer - port specifically built for one operation		50%

Factor 3 Capital Programme, Stability of Business Model and Financial Profile Weighting: 15%	Aaa	Aa	A	Baa	Ba	B	Caa	Sub-factor % of Factor
Scale and Scope of Capital Expenditure Programme	No expansion capex planned - maintenance capex only (typically about 3% of revenues)	Annual expansion capex of up to 5% of revenues not including maintenance capex	Annual expansion capex of 5 -10% of revenues not including maintenance capex	Annual expansion capex of 10 to 15% revenues not including maintenance capex	Annual expansion capex of between 15% and 30%	Major expansion project sized at more than 30% of revenues. Likely to be a major port upgrade / reprofiling	Significant project that will completely change the profile of operations. >40% of revenues	33%
Management attitude to financial risk	Covenants prohibit all corporate activity OR corporate activity is outside of management mandate. No additional indebtedness allowed without debt holder's consent	Covenants largely limit corporate activity, with the exception of certain defined permitted investments OR Legal status dictates that investment and related debt raising is restricted to capex for existing ports only	Strong track record of no material corporate activity and stated intention to refrain from M&A and /or major investments. Financial covenants in principal debt instruments limit management ability to materially increase leverage	Moderate risk of corporate activity which may impact credit metrics for 18-24 months only. Conservative financial strategy, unlikely to compromise minimum financial parameters	Track record of repetitive, sizeable transactions. Limited track record of consistent financial policies; likely to target high leverage	Highly likely to conduct frequent and very large opportunistic investments. Track record of aggressive financial policies and very high leverage; likely to pay out creditors' financial cushion ahead of business pressures		33%
Proportion of Revenues from Non-Core Activities	0% (Exclusive focus on core owned ports' activity) OR Debt Covenants prohibit all other businesses	Up to 5% of revenues from non-core activities OR debt covenants largely prohibit all other businesses with the exception of certain defined and low risk permitted businesses	Between 5 and 10% of revenues from non-core activities OR debt covenants largely prohibit all other businesses with the exception of certain defined and low risk permitted businesses	Between 10 and 15% of revenues are generated by non-core activities. May be additional restrictions in debt covenants	Between 15 and 25% of revenues are generated by non-core business	>25%. A material proportion of revenues are generated by business which are not directly related to the operation of the port. These include shipping, freight forwarding, road haulage, and long-distance rail haulage		33%

Factor 4 Nature of Asset Ownership Weighting: 10%	Aaa	Aa	A	Baa	Ba	B	Caa	Sub-factor % of Factor
Ownership and Control of Assets	All key port assets held outright in perpetuity (freehold) and controlled by port management	All key assets controlled by port management and held under long term property leases with very limited Grantor termination rights	All key port assets controlled by port management and held under a Concession Agreement with finite life (albeit long-term) with limited Grantor termination rights (e.g. for insolvency only)	All key port assets controlled by port management and held under a Concession Agreement with a finite life. Grantor termination rights for under-performance or failure to meet certain financial parameters	Certain key assets held and managed by third parties (e.g. Stevedoring services, container / oil / bulk terminal operations etc.), others held in perpetuity, leased or under concession	Key assets held under a short term operating lease or licence type arrangement	The port is in default under a lease or concession arrangement likely to lead to the termination of that contract	100%

Factor 5 Key Credit Metrics Weighting: 40%	Aaa	Aa	A	Baa	Ba	B	Caa	Sub-factor % of Factor
Cash Interest Coverage	Over 8.0x	6.0x to 8.0x	4.5x to 6.0x	3.0x to 4.5x	2.25x to 3x	1.5x to 2.25x	Less than 1.5x	25%
FFO/Debt	Over 40%	25% to 40%	15% to 25%	10% to 15%	6% to 10%	3% to 6%	Less than 3%	25%
Moody's DSCR	Over 8.0x	6.0x to 8.0x	4.5x to 6.0x	3.0x to 4.5x	2.0x to 3.0x	1.5x to 2.0x	Less than 1.5x	25%
RCF / Capex	>3.5X	2.5x to 3.5x	1.5x to 2.5x	1.0x to 1.5x	0.5x to 1.0x	Less than 0.5x	Less than 0.5x	25%

Appendix C – Survey issues from Port Authorities

The following responses were received from port representatives when completing the Moody's survey. The responses relate to the suitability of the Moody's credit risk framework in capturing the risk of the particular port's operations.

Broome

- Q1b. No rail link but good road links.
- Q1c. Nothing fits our Port. Able to accommodate vessels up to 40,000GWT. But we can't accommodate Panamax. We have over 1200 vessel visits a year ranging from Pearling & Fishing vessels, cruise ships from 20PAX to 2000PAX, Oil & Gas (O&G) supply vessels, seismic vessels, Jack Up Rigs, Navt & Customs vessels, Fuel Tankers and Live cattle cruise ships.
- Q2a. We have no contracts in place. We are not an export oriented Port. 60% of our revenue is based on O&G exploration on the Browse Basin. No medium to long term guarantee when exploration will start or finish. Also changes in government regulations can stop O&G exploration and live cattle exports. We do not have any Ro-Ro and very little container traffic.
- Q3a. Wharf refurbishment and other Projects planned will be 100% of annual revenue.

Bunbury

- Q1a. Although the BPA meets the first category, the BPA does not export or import containers, out total trade is 15MT bulk.
- Q1b. OK.
- Q1c. This was the closest option, although the Port is limited to Panamax vessels and does not import or export containers.
- Q2a. BPA has no take or pay contracts. All current contracts either on Port Lease, Port Services Agreement or State Agreements. In the event that Perdaman Chemicals & Fertilisers (PCF) exports Urea, this will be on a take or pay contract.
- Q2b. OK.
- Q3a. BPA has future capex planned from internal funds, at this stage only for maintenance capex. The State Government has limited internal funds capex on expansion projects, and has a preference for privately funded arrangements.
- Q3b. Closest.
- Q3c. No definition of Non-core activities. The BPA has assumed non-core to be interest earned on investments.
- Q4. Closest response – and would be the most accurate if the term "freehold" was removed. The BPA has 469hA of land which is mainly Crown Land. The "owned" assets include freehold land, shiploader and channel infrastructure.
- Generally speaking, the options seemed largely based on container ports rather than bulk ports.

Appendix D – Beta Risk Score

The Moody's credit risk framework presented in Appendix B can be used to ascertain a port's exposure of systematic risk. Questions 1a, 1b, 2a and 2b have been identified as being most appropriate for this purpose, with the justification in each case outlined below. The score weightings are based on Moody's weights for the full credit assessment (i.e., 10%, 7.5%, 5% and 5%, respectively), re-normalised to add up to 100%. The higher the beta risk score for a port, the closer it is mapped to the upper end of the asset beta range (1.1).

Q1a. Port Size/Number of Ports Owned.

Port size or scale relates to *operating leverage* – the proportion of costs that are fixed. Smaller ports are expected to have a greater proportion of fixed costs and, hence, a higher beta. Accordingly, responses relating to scale are appropriate for the estimation of beta.

However, it can be argued that geographical location is an idiosyncratic factor which can be diversified by owning multiple ports. CAPM theory states that an equity investor does not require a return for this specific risk; consequently it should not be included in an assessment of systematic risk (beta).

This concern is resolved by noting that neither of the top two responses relating to port diversification will apply to the WA ports – neither currently nor post-amalgamations. Hence, all responses will only relate to port scale, and not port diversification. For this reason, this question can be included in the assessment of systematic risk.

Q1b. Quality of Service Area and Connections.

The nature of the surrounding infrastructure relates to the potential of the port to generate revenue. While not providing a floor on profitability during economic downturns, a lack of supporting infrastructure effectively provides a cap on profitability during economic upturns. The port is unable to take on additional customers to diversify its *demand risk*, which means it has a greater exposure to market risk. Note that the diversification of demand risk is different to the diversification of specific risk (for which no return premium is required).

Q2a. Exposure to Volume Variation.

The exposure to volume variation indicates how strongly the port is exposed to market fluctuations. Ports with take-or-pay contracts have reduced revenue risk and lower systematic risk.

Q2b. Dominance of Customers.

A port with fewer users is more sensitive to economic downturns. If one customer experiences financial problems, then the port in this instance will be more exposed. By having more customers, the port can reduce its demand risk.