Synergies
ECONOMIC CONSULTING

The Rate of Return to Apply to ARTC's Interstate Network

A report prepared for the 2018 Interstate Access Undertaking (IAU) lodgement

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Executive Summary

Synergies has been engaged by the Australian Rail Track Corporation (ARTC) to estimate the weighted average cost of capital (WACC) for its 2018 Interstate Access Undertaking (IAU). The following sections provide an overview of the various WACC parameters and Synergies' proposed approach, before presenting our overall estimate of ARTC's WACC.

Capital structure

We have proposed a gearing level of 52.5% for ARTC. While the gearing level of the comparator set is lower in comparison, 52.5% was the value adopted for the ARTC HVAU draft decision in 2017, and is supported by other Australian regulator precedent in the vicinity of 50%.

Return on equity

Risk free rate

The risk free rate (as at 31 January 2018) has been estimated to be 2.78% (annual effective rate). This estimate has been based on a 20 day average of the yield on 10 year Commonwealth Government bonds.

Beta

An asset beta for ARTC of 0.80 has been estimated based on a comparator set comprised of North American Class I railroads and Aurizon. This is in line with the approach adopted by the ACCC in the 2008 IAU, and is also largely consistent with the methodology employed in ERA rail decisions. Our quantitative analysis has been supported by a qualitative first principles analysis, which identifies key determinants for systematic risk for ARTC. Using the gearing estimate of 52.5%, an asset beta of 0.80 translates to an estimated equity beta of 1.675.[1]

[1] The Monkhouse formula was used for de-levering and re-levering purposes.

Market risk premium

We have proposed a market risk premium (MRP) of 7.69%.[2] This has been derived from an equal weighting of the Ibbotson and Wright MRP methodologies. The Wright methodology assumes that the overall return on equity remains stable over time, and does not fluctuate in-step with the risk-free rate. A number of regulators, including the ERA and QCA are now having increasing regard to the Wright methodology in their determinations.

Return on debt

To generate an estimate for the return on debt, we have adopted the methodology used by the ACCC in the 2017 HVAU draft decision. An average of adjusted bond yield estimates from the RBA and Bloomberg results in a DRP of 1.73%. In line with the most recent ARTC precedent, we have assumed a level of 0.095% for debt raising costs. With a risk free rate of 2.78%, this leads to an estimated return on debt of 4.61%

Gamma

For our estimate of gamma, we have adopted a value of 0.25 based on extensive evidence from academic literature and financial practice. However, we understand that ARTC proposes to follow the current regulatory precedent of the ACCC, AER and ERA, and adopt a gamma value of 0.4. This being said, we note that IPART in its recent draft methodology review proposes to remain with a gamma of 0.25.

[2] The MRP estimate depends on the utilisation rate (or theta), a term in the gamma calculation. Our MRP estimate assumes a theta of 0.35, consistent with a distribution rate of 0.7 and a gamma of 0.25. If a theta of 0.57 is assumed (consistent with a distribution rate of 0.7 and a gamma of 0.4), the estimated MRP would be 7.78%.

Synergies' proposed WACC estimate

Based on the parameter estimates listed above, the estimated WACC for ARTC is provided below.

Proposed WACC

Parameter	2008 IAU	2018 Estimate
Risk free rate	6.39%	2.78%
Capital structure (debt to value)	50%	52.5%
Debt risk premium	2.85%	1.73%
Debt raising costs	0.125%	0.095%
Market risk premium	6.00%	7.69%
Gamma	0.5	0.25
Tax rate	30%	30%
Asset beta	0.65	0.80
Debt beta	0.00	0.00
Equity beta	1.292	1.675
Return on equity	14.14%	15.66%
Return on debt	9.37%	4.61%
Post-tax nominal (vanilla) WACC	**11.76%**	**9.86%**
Pre-tax nominal WACC	**13.00%**	**12.02%**

Source: Synergies calculations

Contents

Figures and Tables

1 Introduction

Synergies has been engaged by the Australian Rail Track Corporation (ARTC) to estimate the weighted average cost of capital (WACC) for its 2018 Interstate Access Undertaking (IAU). This WACC update is being conducted at a time of substantial uncertainty for the rail industry, especially for intermodal services. Most significantly, Aurizon announced in August 2017 that it would be exiting its intermodal business. The exact implications of this for ARTC are yet to become clear, but volume risk is likely to be a key concern. Above all, these developments serve to highlight the significant competitive pressures from road, which elevate ARTC's risk profile.

The remainder of this report is structured as follows:

- Chapter 2 – WACC formulation
- Chapter 3 – assumed capital structure for ARTC
- Chapter 4 – estimates the return on equity (comprising risk-free rate, beta and market risk premium)
- Chapter 5 – estimates the return on debt
- Chapter 6 – presents evidence on the appropriate determination of gamma
- Chapter 7 – concludes by presenting our WACC estimate for ARTC
- Attachment A – First principles analysis
- Attachment B – Beta diagnostics
- Attachment C – ERA regulatory precedent on beta for rail entities
- Attachment D – Supplementary evidence on the market risk premium

2 WACC formulation / approach

2.1 Post tax nominal WACC

The approach most commonly applied to estimate WACC in Australian regulatory regimes is the post-tax nominal 'vanilla' WACC. In other words, the rate of return estimate is expressed as a weighted sum of the returns on equity and debt in inflation-adjusted and after-tax terms. Under the post-tax nominal 'vanilla' WACC formula, tax is modelled as a cost in the cash flows rather than forming part of the WACC calculation It is expressed as follows:

$$\text{Nominal post-tax WACC} = R_e \frac{E}{E+D} + R_d \frac{D}{E+D}$$

Where:

Re = post-tax return on equity

Rd = post-tax return on debt

D = proportion of debt (gearing) within the assumed capital structure

E = proportion of equity within the assumed capital structure

2.2 Pre-tax nominal WACC

The WACC formula can also be expressed in pre-tax nominal terms. The pre-tax nominal formulation adjusts for taxation and dividend imputation in the WACC formula rather than the cash flows of the business. It is expressed as follows:

$$\text{Nominal pre-tax WACC} = \frac{R_e}{\left(1 - t_c\left[1-\gamma\right]\right)} * \frac{E}{E+D} + R_d \frac{D}{E+D}$$

Where:

Re = pre-tax return on equity

Rd = pre-tax return on debt

D = level of debt within the capital structure

E = level of equity within the capital structure

t = corporate tax rate (assumed to be 30%)

γ = gamma (value of imputation credits)

2.3 Estimating the return on equity

2.3.1 Sharpe-Lintner CAPM

To date, the model that Australian regulators (including the ACCC) have applied to estimate the return on equity is the Sharpe-Lintner Capital Asset Pricing Model (SL CAPM). According to the CAPM framework, risk can be divided into two components, being systematic (or non-diversifiable) risk and non-systematic (or diversifiable risk). Systematic risk refers to those risks that will tend to impact the whole market and cannot be avoided by investors through diversification.[3] It is only these risks that are assumed to be compensated by the WACC.

The SL CAPM is expressed as follows:

$$Re = R_f + \beta_e * [E(R_m) - R_f]$$

Where:

Rf = the risk-free rate of return

E(Rm) = the expected return on the market

[E(Rm) – Rf] = the market risk premium

βe = equity beta (measures systematic risk)

The equity beta measures systematic business risk, as well as the financial risk of a company. This can be contrasted with the asset beta, which reflects only the business risk of a company's assets (and in turn cash flows) and can be calculated by de-levering the observed equity beta. A company's equity beta is calculated by taking the asset beta (observed from a comparable set) and then "re-levering" the asset beta by applying the company's assumed capital structure to finally arrive at an estimated equity beta measurement for the company.

2.4 Estimating the return on debt

The return on debt has been estimated following the methodology set out by the ACCC in its 2017 HVAU draft decision. This involves an 'on the day' estimated calculated by averaging 10 year BBB bond yield estimates from the RBA and Bloomberg, which are favoured on the basis of their transparency and robustness. Combining estimates from these two data sources will, in our opinion, form the best estimate of the prevailing return on debt.

[3] Non-systematic risk, on the other hand, refers to risks that are unique to a particular firm or project. As non-systematic risks can be eliminated by diversification, investors cannot expect to receive any compensation for these risks via a higher rate of return. Instead, they will tend to be modelled in the cash flows.

3 Capital structure

3.1 Objective

The purpose of this section is to identify an appropriate long-term target gearing ratio for ARTC based on domestic and international entities with comparable risks, and having regard to relevant regulatory precedent.

In a perfect capital market, finance theory provides that the valuation of a firm is unaffected by its capital structure. However, in practice, the assumptions underpinning a perfect capital market do not hold and as such capital structure can have valuation impacts. Clearly, this is relevant to a consideration of the capital structure applying to ARTC.

The assessment of capital structure (or gearing) in the WACC calculation is therefore based on an assessment of an 'optimal' long-term target capital structure for ARTC given its risk profile and the industry within which it operates. In practice, we see numerous and sometimes disparate factors affecting the capital structure adopted by firms within the same industry (for example, different financing strategies, investment needs, owner preferences, tax treatments).

Of all of the WACC parameters, determining the optimal benchmark capital structure is especially imprecise. In theory, we would expect to observe the gearing levels of firms in the same industry to cluster within a range, although in practice this range could be quite wide. The capital structure assumption is similarly based on establishing what the maximum efficient long-term gearing level for the business might be. It is not based on the firm's actual gearing. This also ensures that the firm is not rewarded for maintaining an inefficient capital structure.

Over time, we tend not to observe material changes in benchmark gearing levels, particularly in a regulated context. We begin by looking at evidence from comparable entities followed by relevant regulatory precedent.

3.2 Comparable listed companies

Firstly, we examined the average gearing levels from a comparator set of listed North American Class I railroads (as well as Aurizon Holdings). The debt-to-value ratios over 5 and 10 year timeframes are presented in Table 1. The observed gearing levels over five years range from 12% to 32%, with an average of 20% and a median of 21%. The average and median over 10 years are slightly higher, at 23% and 24%, respectively.

Table 1 Comparable companies gearing summary

Company	5 year estimates	10 year estimates
CSX Corporation	24%	27%
Genesee & Wyoming Inc.	32%	29%
Kansas City Southern	16%	24%
Norfolk Southern Corporation	23%	24%
Union Pacific Corporation	13%	16%
Canadian National Railway Company	12%	15%
Canadian Pacific Railway Limited	19%	25%
Aurizon Holdings	23%	20%
Average	**20%**	**23%**
Median	**21%**	**24%**
Minimum	**12%**	**15%**
Maximum	**32%**	**29%**

a Aurizon Holdings was listed only in 2010 – data presented in the 10-year estimate column is for the previous 7 years only.
Note: The gearing estimates presented here are expressed in terms of debt-to-value ratios.
Source: Bloomberg, Synergies calculations

3.3 Regulatory precedent

Consistent with the other WACC parameters, Australian regulators apply a benchmark capital structure (gearing) that would apply to an efficient benchmark entity in the same industry with the same risk profile. This is reflected in relatively stable gearing ratios once established.

Under this benchmark approach, the regulated entity's actual gearing level is given limited weight. This is consistent with the objective of incentive regulation, which bases costs on efficient benchmark targets. The gearing assumption also influences the notional credit rating assumption used to estimate the return on debt.

Table 2 shows recent regulatory decisions relating to the regulated Australian transport sector. The highest observed gearing assumption is 60% (debt to total value) for Dalrymple Bay Coal Terminal, Australia's most heavily regulated port asset. In contrast, for rail entities, gearing assumptions have generally been lower, including the lowest of 20% for the dedicated iron-ore terminal operated by The Pilbara Infrastructure.

Table 2 Recent Australian regulatory gearing decisions for transport entities

Company	Regulator	Year	Gearing Ratio
Aurizon Network	QCA (Rail)	2017	0.55
Dalrymple Bay Coal Terminal	QCA (Ports)	2016	0.60
Public Transport Authority - urban	ERA (Rail)	2015	0.50
ARC Infrastructure (formerly Brookfield rail) - freight	ERA (Rail)	2015	0.25
The Pilbara Infrastructure	ERA (Rail)	2015	0.20
V/Line	ESC (Rail)	2012	0.50
Pacific National	ESC (Rail)	2012	0.50
Vic Track	ESC (Rail)	2012	0.50
Metro Trains Melbourne	ESC (Rail)	2011	0.55
ARTC (Hunter Valley Coal Network)	ACCC (Rail)	2011 & 2017	0.525
Queensland Rail	QCA (Rail)	2010	0.55
ARTC Interstate Rail Network	ACCC (Rail)	2008	0.50

Source: Synergies database.

The basis of Australian regulator's gearing assumption is generally an analysis of internationally comparable companies, an approach we have adopted in our report.

In its 2008 decision for ARTC's interstate freight network, the ACCC accepted ARTC's proposed gearing ratio of 50 per cent. The gearing levels of the sample of firms examined at the time were generally higher in the pre-GFC environment than currently observed.

For ARTC, we consider the two most relevant regulatory gearing assumptions are for:

- ARTC's interstate freight network, which was assigned 50 per cent gearing in 2008.
- ARTC's Hunter Valley Coal Network, which currently has gearing of 52.5 per cent.

3.4 Conclusion

Having regard to the evidence from comparable listed entities as well as from regulatory precedent, we consider that a gearing level of 52.5% is appropriate. The considerations that inform this view are as follows.

- There is comprehensive support in the Australian regulatory context for gearing in the vicinity of 50%.
- 52.5% is ARTC's gearing level for the HVCN.

4 Return on equity

This chapter presents the way in which we have estimated the various parameters in the SL CAPM model.

The three parameters requiring estimation in this model are as follows:

- Risk free rate
- Beta
- Market risk premium

Our approach is discussed in the following sections.

4.1 Risk free rate

The risk-free rate is used in estimating both the return on equity and debt. Currently, the ACCC calculates the risk-free rate based on a 20 day averaging period of the yield to maturity on 10 year Commonwealth Government bonds, and this is the approach that we adopt. Our estimate is based on data from the RBA.

There are three key considerations when determining an appropriate estimate:

- the proxy used
- the term to maturity
- the averaging period.

4.1.1 Proxy

The Commonwealth Government bond yield is most commonly used as a proxy for the risk-free rate in Australia, including by the ACCC.

Concerns have been expressed as to whether it remains the best proxy during highly volatile or uncertain market conditions, where a 'flight to quality' is often observed reflecting increased demand for Commonwealth Government bonds as a safe haven for investors, resulting in a compression of the yield.

However, we consider the Commonwealth Government bond yield remains the best proxy for the risk-free rate in an Australian context. In our view, the downward compression of WACC values that have emerged due to its application in recent years relate more to the rigidity of Australian regulators estimation of the market risk premium than to the risk-free rate itself.

4.1.2 Term to maturity

In an Australian context, the term to maturity most commonly applied for investors in infrastructure with long economic lives is ten years. This is consistent with the long-term forward-looking horizon over which it is assumed investors are forming their return expectations under the SL CAPM.

In Australia, the ten year bond is the longest liquid maturity currently available. This is also the most commonly used proxy for the risk-free rate in regulatory decisions, including by the ACCC. We have therefore assumed a ten year term to maturity, balancing the liquidity of available long term bond instruments in the Australian market, and ARTC's long-term investment horizon.

4.1.3 Averaging period

The length of averaging period for the risk-free rate will depend amongst other things on whether a contemporary rate reflecting current market expectations is preferred to a longer-term average rate that will also incorporate the effects of historical market expectations.

In general, Australian and International corporate finance, academic and regulatory practice uses short averaging periods close to the commencement of each regulatory period.

This is intended to mitigate problems that may occur if there is a spike in yields on the day that the rate is applied. It is therefore common practice to average the rate over a short horizon, which typically ranges from between ten and forty days, noting that over such a short horizon the choice of averaging period is likely to be of little consequence. The Independent Pricing and Regulatory Tribunal (IPART) in NSW is the only Australian regulator that takes into consideration longer term averages, which it does in conjunction with short term estimates.

Our estimates are produced over a twenty-day period to 31 January 2018. As the quoted rates are semi-annual, we have converted them to annual effective rates[4]. The resulting estimate is 2.78%.

4.2 Beta

There are three key sources of information for the assessment of an entity's systematic risk, namely:

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

- Benchmark results from comparable entities
- First principles analysis
- Regulatory precedent.

In undertaking an empirical analysis of beta estimates, reference needs to be made to an appropriate set of listed comparators for whom equity betas can be estimated. Using share price information for these companies, their equity betas are estimated using regression analysis. As the companies will have different gearing levels (and hence different levels of financial risk), these equity betas must be 'de-levered' to produce an asset beta. This approach is generally applied for the assessment of asset betas under the SL CAPM.

The comparator analysis will typically produce a range of estimates for beta, necessitating an assessment of where ARTC's asset beta might sit relative to these other comparators. This assessment is facilitated by a first principles analysis, which is a qualitative assessment of ARTC's systematic risk profile. This approach analyses the key factors that impact the sensitivity of the firm's returns to movements in the economy or market.

Accordingly, in practice, we see a first principles analysis helping to inform where a particular firm is likely to sit in the range generated from an empirical assessment. Accordingly, we turn first to an empirical assessment of rail-related betas and then a first principles assessment of ARTC.

Finally, we consider relevant regulatory precedent.

4.2.1 Comparable companies analysis

There are relatively few comparable listed businesses to ARTC operating in Australia and consequently it is necessary to rely on international comparators. This is the approach commonly adopted by regulators in the transport and telecommunications sectors.

The first step in a comparable companies analysis involves identifying an appropriate set of listed companies. Freight railroads (in particular, North American Class I railroads) are considered a primary comparator set due to their freight-focussed business model, strong market position and below rail infrastructure services. Aurizon Holdings is also added to this sample.

Overall, and notwithstanding the differences noted above, the international sample collectively includes companies with sufficiently comparable systematic risks that will enable a robust beta estimate to be developed for ARTC.

4.2.2 Beta estimation

Betas have been estimated based on five years of monthly returns, regressed against the relevant domestic share market index using Ordinary Least Squares. We also eliminated any firms with:

- a t-statistic of less than 2 (this is considered particularly important)
- an R^2 less than 0.1.

The resulting equity betas from this procedure were de-levered to produce an asset beta using the Monkhouse approach, which is applied by the ACCC:

$$\beta_e = \beta_a + (\beta_a - \beta_d) * \left\{1 - \left[\frac{R_d}{(1+R_d)}\right] * [T_c * (1-\gamma)]\right\} * \frac{D}{E}$$

Where:

β_a = beta of assets

β_d = beta of debt

R_d = the cost of debt capital

T_c = corporate tax rate

γ = gamma

D/E = value of debt divided by the value of equity.

The ACCC typically adopts a debt beta of 0.

4.2.3 Results

The average asset beta across the full sample of comparable companies was 0.85, based on a 5 year sample, while the median was also 0.85. We consider a 5 year sample is likely to provide a robust contemporary beta estimate based on a relatively short historical data set that is reflective of contemporary market conditions.

As the period of the analysis lengthens a richer data set emerges but the contemporary relevance of the estimates diminishes. Longer sample periods risk incorporating data on market conditions that is less likely to be relevant to contemporary beta estimates. However, as a robustness check, we have also generated 10 year estimates. The average asset beta over 10 years is 0.78, while the median is 0.89.

Table 3 Comparable companies asset beta summary

Company	5 year estimates	10 year estimates
CSX Corporation	0.96	0.95
Genesee & Wyoming Inc.	1.16	0.96
Kansas City Southern	0.70	0.96

Company	5 year estimates	10 year estimates
Norfolk Southern Corporation	0.99	0.88
Union Pacific Corporation	0.73	0.91
Canadian National Railway Company	0.75	0.41
Canadian Pacific Railway Limited	1.12	0.73
Aurizon Holdings	0.39	0.44[a]
Average	**0.85**	**0.78**
Median	**0.85**	**0.89**
Minimum	**0.39**	**0.41**
Maximum	**1.16**	**0.96**

a Aurizon Holdings was listed only in 2010 – data presented here is for the previous 7 years

Note: Equity betas were de-levered using the Monkhouse formula. Regulators such as the AER and ERA have previously considered weekly, rather than monthly, returns to evaluate beta. While this provides more observations, it can also have the adverse effect of capturing greater volatility in returns. In any case, the results using weekly returns remain robust, with a 5-year average (median) of 0.91 (0.93) and a 10-year average (median) of 0.86 (0.89).

Source: Bloomberg, Synergies calculations

The asset beta for Aurizon Holdings is well below that of the other rail comparators, and can possibly be considered an outlier, particularly on account of its customer base and the relatively low proportion of its revenue being related to intermodal traffic. When Aurizon Holdings is removed from the sample, the 5 year average (median) increases to 0.91 (0.96), while the 10 year average (median) is 0.83 (0.91).

Additional beta diagnostics, including portfolio betas, are presented in Attachment B.

4.2.4 First principles analysis

The comparator analysis in Section 4.2.3 establishes a point estimate for beta, which necessitates an assessment of where ARTC's beta may sit relative to these comparators. The key objective of the first principles analysis is to inform this decision through qualitatively assessing the sensitivity of the ARTC's cashflows relative to movements in the general economy.

The nature of the demand for ARTC's services is a key determinant of its systematic risk. ARTC's operations are subject to significant competitive pressure from road transport. The exit of Aurizon from its intermodal business only serves to highlight this and will lead to heightened uncertainty over the coming regulatory period.

Intermodal is the dominant business area for ARTC and traffic volumes are likely to be correlated with domestic economic conditions. Operating leverage is another key consideration. ARTC is likely to have materially higher operating leverage relative to the listed comparators, owing to its substantial infrastructure component. Holding all other factors constant, this will lead to an increase in systematic risk.

A detailed first principles assessment is contained in Attachment A.

4.2.5 Relevant regulatory precedent

Six Australian regulators have considered regulated revenues of transport infrastructure:

- ACCC – rail
- IPART – rail
- ERA (WA) – rail
- QCA – rail and coal terminal
- ESC – rail
- ESCOSA – rail.

All regulators have acknowledged the specific challenges the sector presents to identify comparators given the paucity of listed Australian transport entities. However, the ESC and ESCOSA have not engaged in a detailed review of comparable companies for many years and hence they have not been included in this review.

For rail businesses, Australian regulators have generally adopted an international sample of rail businesses (ERA for a freight rail network and ACCC for the ARTC Interstate network).

These approaches (to varying degrees of analysis) conclude that the absence of enough Australian transport comparators forces international comparison to ensure robust beta estimates, without the need for the intervening step of a detailed analysis of a broader set of Australian comparators.

The following section reviews the approach that the ACCC adopted in the 2008 IAU. An overview of the ERA's approach to rail beta determination is located in Attachment C.

4.2.6 ACCC – ARTC's Interstate network (2008)

In the ACCC's beta assessment of ARTC's interstate network (2008) it determined that the asset betas of Australian trucking, shipping and other non-rail service providers are not suitable proxies for ARTC's asset beta.[5]

Although these firms are observable and have the desirable quality that they are Australian based transport businesses, the systematic risks of these types of transport investments is likely to differ markedly to that of a below rail service provider. For this

[5] ACCC (2008). Access Undertaking – Interstate Rail Network Australian Rail Track Corporation, Final decision, April.

reason, the ACCC has focussed on non-regulated below rail operators operating overseas to determine whether ARTC's requested beta seems reasonable. In its view, the use of overseas firms was necessitated by the lack of non-regulated below rail operators in Australia to use as proxy companies.

Despite the fact these firms operate overseas, the ACCC identified these companies as the best proxy companies to use to estimate ARTC's exposure to systematic risk. The proxy companies chosen by the ACCC, principally operating in North America, typically had asset betas estimated at over 0.65 as shown in Table 4.

Table 4 ACCC 2008 IAU equity and asset beta estimates

	Equity Beta	D/E ratio %	Asset Beta
Burlington Santa Fe Corporation	0.969	41	0.69
Canadian National Railway Company	0.62	46	0.43
Canadian Pacific Railway Limited	0.793	32	0.60
CSX Corporation	0.822	72	0.48
Genesee & Wyoming Inc	1.54	28	1.21
Kansas City Southern	1.241	72	0.73
RailAmerica	1.498	133	0.65
Union Pacific Company Limited	1.097	38	0.80
Simple Average	1.0725	57.75	0.70

Note: Equity Betas were estimated using Bloomberg using 5 years of monthly data. The debt to equity ratio is the estimated average debt to equity ratio over the beta estimation period and was the debt to equity ratio used for delevering the equity betas. Equity betas were delivered using the Monkhouse formula.

Source: Bloomberg

Finally, the ACCC noted that ARTC operates under some market demand and price constraints due to intermodal competition. This is the principal reason it operates well below its revenue ceiling on major segments. As such, it bears some market risk and if the economy does badly (or well) ARTC will lose (or gain) business and profits. This is different to a typical regulated business, such as electricity distribution or transmission, that can raise prices if demand drops and, therefore, bears far lower market risk.

While the ACCC considered that an asset beta of 0.65 per cent was broadly acceptable for ARTC's interstate network at the time of the assessment, it noted this conclusion would not necessarily apply to other rail networks nor would it necessarily hold for a future regulatory review.

4.2.7 Conclusion

Overall, we consider that an asset beta value of 0.80 is reasonable for ARTC. This estimate is substantiated by the following:

- the empirical evidence appears to directly support an asset beta of at least 0.80 and possibly as high as 0.85.
- ARTC is exposed to significant volume risk, and the exit of Aurizon from its intermodal business also generates material uncertainty.
- The asset beta estimate has been generated using a similar comparator set that the ACCC adopted for the 2008 IAU.[6]

4.3 Market risk premium

The Market Risk Premium (MRP) is the amount an investor expects to earn from a diversified portfolio of investments (reflecting the market as a whole) that is above the return earned on a risk-free investment. The key difficulty in estimating the MRP arises from it being an expectation and therefore not being directly observable.

Whilst the MRP is an inherently forward-looking parameter, the difficulty with observing or inferring it from market data means that there is valuable information in historical data (historical averages of excess returns from the market above the relevant risk-free rate).

A range of methods have been developed to estimate the MRP falling broadly into two approaches – historical and forward looking. In its draft decision for the 2017 HVAU, the ACCC stated that does not consider the results from dividend growth models when determining the MRP.[7] Therefore, Synergies draws solely on historical estimates in calculating the MRP for ARTC.

In evaluating approaches to determining the MRP we have had regard to the approaches adopted by financial practitioners, academic literature and Australian regulators in their assessment of the MRP.

[6] The comparator set now includes Aurizon Holdings and Norfolk Southern Corporation, but no longer includes BSNF or RailAmerica.

[7] ACCC (2017). Draft Decision – Australian Rail Track Corporation's 2017 Hunter Valley Access Undertaking, 20 April, p.148.

4.3.1 Historical average methodologies

Within the historical average methodologies, there is a range of approaches that can be adopted. However, we consider the most informative measures are at two ends of a spectrum as follows:[8]

- the Ibbotson approach, which reflects the long term historical average of the difference between the return on the market and the risk-free rate (and has been the preferred method of certain Australian regulators). It assumes that the MRP remains relatively constant through time;
- the Wright approach, which assumes that the overall return on equity remains reasonably stable over time rather than the MRP. It therefore estimates the MRP as the difference between a long-term average of the (real) return on the market and the current risk-free rate. Since the GFC, this approach has gained greater regulatory acceptance.

The post-GFC evidence supports the Wright approach to the determination of the MRP. This point was implicitly made by the Governor of the Reserve Bank of Australia in a speech to the Australian American Association:[9]

> But another feature that catches one's eye is that, post-crisis, the earnings yield on listed companies seems to have remained where it has historically been for a long time, even as the return on safe assets has collapsed to be close to zero (Graph 2). This seems to imply that the equity risk premium observed *ex post* has risen even as the risk-free rate has fallen and by about an offsetting amount. Perhaps this is partly explained by more sense of risk attached to future earnings, and/or a lower expected *growth rate* of future earnings.
>
> Or it might be explained simply by stickiness in the sorts of 'hurdle rates' that decision makers expect investments to clear. I cannot speak about US corporates, but this would seem to be consistent with the observation that we tend to hear from Australian liaison contacts that the hurdle rates of return that boards of directors apply to investment propositions have not shifted, despite the exceptionally low returns available on low-risk assets.
>
> The possibility that, *de facto*, the risk premium being required by those who make decisions about real capital investment has risen by the same amount that the riskless

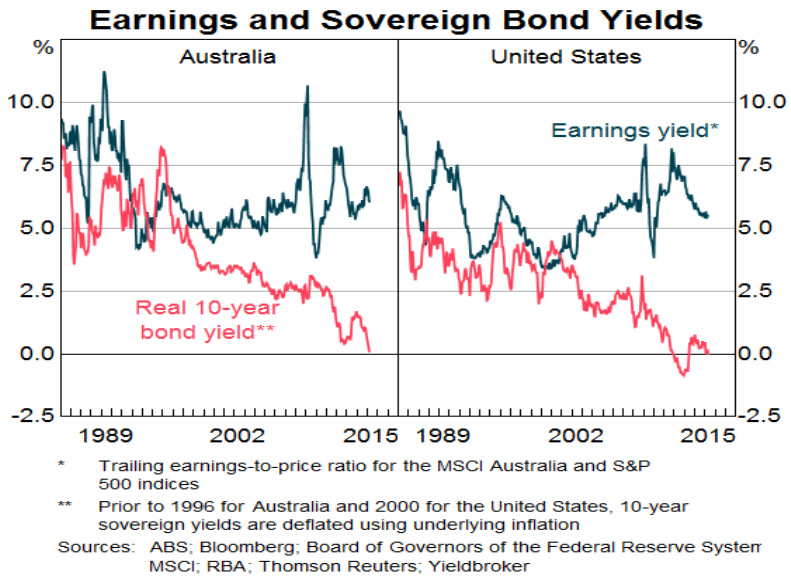
[8] Other methods involve other parameters in the estimation. For example, the Siegel method incorporates inflationary expectations into the analysis. However, in our opinion, this undermines the very strength of historical approaches to the assessment of the MRP.

[9] Glenn Stevens, Address to The American Australian Association Luncheon, New York, USA – 21 April 2015.

rates affected by central banks have fallen may help to explain why we observe a pick-up in financial risk-taking, but considerably less effect, so far, on 'real economy' risk-taking.

The graph the Reserve Bank Governor referred to is reproduced below.

Figure 1 Earnings and sovereign bond yields



Source: RBA

Based on this recent evidence, to the extent that an historical market return informs the MRP (which fundamentally is a forward-looking parameter), the Wright approach should be given more weight than the Ibbotson approach, at least in recent history. Indeed, the fact that the Governor of the Reserve Bank of Australia has specifically commented favourably on the very premise that underpins Wright approach lends support to its acceptance.

Nevertheless, we have averaged the two approaches here to provide a robust and in our view conservative estimate of the MRP based on historical excess returns.

4.3.2 Relevant Australian regulatory decisions on the MRP

Table 5 summarises the most recent MRP estimates derived by Australian economic regulators. Most regulators have adopted values for the MRP greater than 6%.

Table 5 Most recent MRP estimates applied by Australian regulators

Regulator	Date	Sector	MRP (per cent)
QCA	December 2017	Rail	7.0%
ERA	October 2017	Rail	7.2%

Regulator	Date	Sector	MRP (per cent)
IPART	August 2017	Biannual WACC update	7.8% based on the August 2017 range from 6.0% - 9.5%.
AER	April 2017	Electricity Distribution	6.5%
AER	April 2017	Electricity Transmission	6.5% based on a range from 5% to 7.5% set out in its Rate of Return Guideline
ACCC	April 2017	Rail	6%
QCA	November 2016	Ports	6.5%
ERA	June 2016	Gas Transmission	7.4%
ESCOSA	June 2016	Water	6%
ESC	July 2016	Water	6%

Source: Synergies based on Australian regulatory determinations

Key points to note in terms of Australian regulators' recent approved MRPs are as follows (refer to Attachment D for a more detailed review):

- IPART derives its feasible MRP range based on long run averages and current market data. The latter value is derived from the DDM. IPART applies the mid-point of its MRP range. However, IPART's MRP estimate as a margin above the contemporary risk free rate is greater than its reported value (7.8%) because of the higher risk free rate assumed in its approach.[10]

- ERA's determination of an MRP range is also based on historical averages (using the Ibbotson and Wright averaging methods) and current market data using the DDM. ERA selects an MRP point estimate from within its range at each regulatory determination based on judgement and has not been transparent about the weighting it applies in reaching this position.

- The QCA has applied four main methods to estimate the MRP, being two forms of historical averaging (the Ibbotson and Siegel averaging methods), survey evidence (including independent expert reports) and the Cornell DGM. In its December 2017 UT5 Draft Decision for Aurizon Network, the QCA has also stated that it will now have greater regard to the Wright MRP in its determinations, to which it has previously given only a low weight.[11]

- ESCOSA and ESC appear to solely rely on historical long-term averages based on the Ibbotson averaging approach.

[10] IPART (2017). WACC Biannual Update, August.

[11] QCA (2017). Aurizon Network's 2017 draft access undertaking, December, p.492.

4.3.3 Estimating MRP using Market Surveys

To varying degrees, Australian regulators have referenced the outcomes of market surveys to support their preferred MRP values.

Lally (2013) notes that "the respondents to these surveys are academics, analysts, and managers rather than investors per se."[12] Hence it is unlikely that the overwhelming majority of any of the survey respondents would be employing their estimate of the MRP to reach real-world investment decisions.

The Australian Competition Tribunal has raised concerns about the use of market surveys:[13]

> Surveys must be treated with great caution when being used in this context. Consideration must be given at least to the types of questions asked, the wording of those questions, the sample of respondents, the number of respondents, the number of non-respondents and the timing of the survey. Problems in any of these can lead to the survey results being largely valueless or potentially inaccurate
>
> When presented with survey evidence that contains a high number of non-respondents as well as a small number of respondents in the desired categories of expertise, it is dangerous for the AER to place any determinative weight on the results.

In our view, market surveys are not a transparent or robust approach to guiding determination of the MRP and therefore we consider that minimal weight should be attributed to them. Furthermore, the methodologies employed by respondents can depart from the conventional theory and ad hoc adjustments are common. Attachment D of our report provides more information on market surveys.

4.3.4 International evidence on estimating the MRP

Ofgem's consultants, Wright and Smithers (2014)[14], made the following comments in regards to establishing a value for the MRP:

> … the [UK's Competition Commission] has given at least some weight to a model in which the expected market return is assumed to have been pulled down by falls in the risk-free rate… We argued against this model, pointing to the lack of any historical stability in the risk-free rate, and hence in estimates of the market equity premium.

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12 Lally, M. (2013). Response to submission on the risk-free rate and the MRP, 22 October, p.23.

13 Application by Envestra Ltd (No. 2), ACompT 3, para 162-163.

14 Wright, S. and Smithers, A. (2014). The cost of equity for regulated companies: A review for Ofgem, p.2.

> We believe that recent events have simply added to the weight of evidence against this approach.
>
> A counter-cyclical equity premium is consistent with some more recent academic research, and with recent patterns in observable proxies for risk premia such as corporate bond spreads. It also has the advantage of providing stability in the regulatory process.
>
> We conclude that there is no plausible case for any further downward adjustment in the assumed market cost of equity based on recent [downward] movements in risk-free rates.

Wright and Smithers conclude:[15]

> Thus both historical and more recent evidence point to the same conclusion: in contrast to the stock return there is no evidence of stability in the risk-free rate, at any maturity. As a direct implication, there is no evidence of stability of the market equity premium. Without such evidence, there is no empirical basis for the assumption that falls in risk-free rates should translate to falls in expected market returns.

The US Federal Energy Regulatory Commission (FERC) has adopted a similar stance. It was previously FERC's practice to adjust the return on equity with a 1:1 correspondence between the return on equity and changes in US Treasury bond yields. However, in light of the GFC, they have decided that this methodology may no longer "produce a rational result":[16]

> The capital market conditions since the 2008 market collapse and the record in this proceeding have shown that there is not a direct correlation between changes in U.S. Treasury bond yields and changes in ROE… U.S. Treasury bond yields do not provide a reliable and consistent metric for tracking changes in ROE.

Dobbs, Koller and Lund (2014) from McKinsey Inc. have also contributed to the debate about the MRP:[17]

> … a "rational expectations" investor who takes a longer-term view should regard today's ultra-low rates as temporary and therefore likely will not reduce the discount rate used to value future cash flows. Moreover, such investors may assign a higher risk premium in today's environment. Our conversations with management teams

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15 Wright, S. and Smithers, A. (2014), p.15.

16 FERC Opinion 531, Docket EL11-66-001, June 2014, pp 77-78.

17 Dobbs, R., Koller, T. and Lund, S. (2014). "What effect has quantitative easing had on your share price?" McKinsey on Finance, Winter (49), p.16.

and corporate boards suggest that they take a similar approach when they consider investment hurdle rates. None of those with whom we spoke have lowered the hurdle rates they use to assess potential investment projects, reflecting their view that low rates will not persist indefinitely.

4.4 Conclusion on the MRP

It is clear that the majority of regulators have acknowledged the limitations of solely relying upon the Ibbotson approach to assess the MRP. Concerns have also been raised regarding excessive reliance on surveys.

Several regulators (including the ERA and QCA), the Governor of the Reserve Bank and international regulatory bodies and financial experts have explicitly or implicitly adopted the Wright approach to the formulation of the MRP. It is arguable that forward-looking approaches based on the DDM are also acceptable, although in this instance we have not incorporated them given their inherent instability and the ongoing disagreement over transition and terminal growth discount rates.

Accordingly, for the purposes of estimating the MRP we have averaged the outcomes of applying the Wright and Ibbotson approaches. Our simple weighted average estimate of the MRP (as at 31 January 2018) based on these approaches is a value of 7.69% (assuming a gamma of 0.25) as follows.[18] This MRP value is similar to the most recent IPART update (7.8%).

Table 6 MRP estimate using historical approaches

Methodology	Estimate	Weighting
Ibbotson Historical Excess Returns	6.56%	50%
Wright Historical Excess Returns	8.82%	50%
Weighted Average MRP	**7.69%**	

Note: Calculations assume a utilisation rate (theta) of 0.35, consistent with a distribution rate of 0.7 and a gamma of 0.25.
Source: Synergies calculations

[18] A gamma of 0.4, holding the distribution rate constant, would imply a utilisation rate of 0.57. This would lead to a revised Ibbotson MRP of 6.65%, and a Wright MRP of 8.90%, resulting in an overall MRP of 7.78%.

5 Return on debt

In simple terms, the return on debt calculation is the sum of the risk-free rate and an estimate of the debt risk premium consistent with the risk profile of the entity in question.

This approach is underpinned by the concept of credit spreads reflecting credit and liquidity risks associated with government and corporate bonds. A credit spread is the difference in yield (return to the investor) between two bonds of similar maturity but with different credit quality due to the different underlying risks associated with each bond. The difference in yields between a long-term government bond (assumed to be the risk-free rate) and an equivalent term corporate bond is an example of the credit spread concept.

The return on debt calculation can be expressed as follows:

$$R_d = R_f + DRP + DRC$$

Where:

Rf = risk free rate

DRP = debt risk premium

DRC = debt raising costs

In applying the above return on debt formula, there are several underlying assumptions that are required including in regards to the:

- risk-free rate
- notional credit rating assumption
- term to maturity
- debt management approach
- method used to estimate the debt risk premium (DRP)
- assumed debt raising costs.

Each of these parameters is estimated in the sections below after we have summarised Australian regulatory precedent regarding estimation of the return on debt.

5.1 Australian regulatory precedent

Given the CAPM is intended to reflect expectations as of the day of analysis, it is theoretically correct to base the risk-free rate on the prevailing yield on the date of the valuation. This means that the return on debt is based on prevailing rates, set over a very short averaging period prior to the point at which prices are reset. It then remains fixed during the regulatory period, with the regulated business managing the risk of interest rate movements.

However, problems may occur if there is a spike in yields on the day that the rate is applied. It is therefore now common regulatory practice to average the rate over a short horizon, which typically ranges from between ten and forty days, noting that over such a short horizon the choice of averaging period is likely to be of little consequence. The Independent Pricing and Regulatory Tribunal (IPART) in NSW is the only Australian regulator that has looked at longer term averages in conjunction with short term estimates.

Until relatively recently, Australian regulators always applied an 'on the day' approach to estimate the return on debt. This is the approach adopted by the ACCC, most recently in its April 2017 HVAU Draft Decision.

The AER, however, now applies a 10-year 'trailing average' approach as explained in its Rate of Return Guideline.[19] This approach emanated from the recognition that in practice, a more efficient debt management strategy may be to maintain a staggered debt maturity profile and progressively refinance debt through time. This in turn means that the return on debt set in the WACC will therefore reflect the cost at which debt was raised or refinanced historically, resulting in a return on debt that reflects historical rates. The trailing average approach involves 'averaging in' a portion of the prevailing return on debt each year, meaning that the regulated return on debt, and hence tariffs, will vary throughout the period.[20]

The 2012 rule changes made by the AEMC allowed for the return on debt to be estimated based on one of: the trailing average approach; the current on the day approach; and a hybrid of the two. In its 2013 Rate of Return Guideline, the AER determined that its preferred approach is the trailing average. It has employed a simple averaging approach, which means that each year, one-tenth of the prevailing ten year bond yield would be

[19] AER (2013). Rate of Return Guideline, December, p.28.

[20] Alternatively, they could be adjusted via a 'true up' mechanism at the end.

'averaged in' to the return on debt estimate.[21] The AER also determined that this must be implemented over a ten year transition period.[22]

Other economic regulators that have accepted the trailing average approach include Victoria's Essential Services Commission (ESC) for Melbourne Water, allowing an immediate transition but based on a data series that excluded the 'GFC years' (2008-09 to 2012-13).

WA's Economic Regulation Authority (ERA) has accepted the trailing average approach in recent gas network decisions[23], although based on a 'hybrid' approach, allowing an immediate transition for the DRP and a ten year transition for the base rate.

In its recent decision for SA Water, the Essential Services Commission of South Australia (ESCOSA), determined that it will immediately transition to this approach in the first year of its new regulatory control period.[24]

The only Australian regulator that has explicitly rejected the trailing average approach outright is the Queensland Competition Authority (QCA).

5.1.1 Synergies' proposed approach

While the application of a long-term trailing average approach is more likely to approximate the debt management practices of an entity that has been subject to deterministic price regulation for an extended period of time, this does not invalidate the application of the on the day approach. This is because a regulated entity could choose to adopt a debt management practice that reflects the on the day approach.

In the 2017 draft decision for the HVAU, the ACCC calculated the return on debt using an on the day approach that was based on an average of adjusted RBA and Bloomberg bond yield estimates.[25] This is the approach that we adopt in this report.

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[21] We would consider that a more effective approach would be to adjust the changes in the benchmark debt balance, as this recognises the lumpy capital expenditure profiles that are typical of regulated businesses, that is, in a year when capital expenditure is high, more weight would be given to the prevailing return on debt in that year.

[22] This is seen as particularly relevant at the current time given the recent contraction in debt margins, that is, the estimate that would be produced using the 'on the day' approach would be lower than the trailing average, which would reflect the significant expansion in debt margins following the global financial crisis.

[23] Refer: ATCO Gas Australia, Dampier to Bunbury Pipeline.

[24] Refer: Essential Services Commission of South Australia (2016). SA Water Regulatory Determination 2016, Final Determination, June. In making this conclusion it noted that over the previous ten years, ESCOSA noted that there would have been an immaterial difference had there been a gradual transition to the trailing average compared to the on the day approach.

[25] Full details of the methodology are provided in Appendix A of the 2017 HVAU draft decision.

5.2 Risk free rate

As outlined in Chapter 4, we have estimated the risk-free rate based on a 20-day average of the ten-year Commonwealth Government bond yield as at 31 January 2018.

The resulting estimate is 2.78% (annual effective rate).

5.3 Notional credit rating assumption

ARTC's return on debt has previously been estimated based on a BBB credit rating. The ACCC has previously determined that a BBB rating is appropriate for ARTC and similarly we see no reason to change that assessment. Therefore, we have maintained this assumption for the current review. Furthermore, Table 7 shows that the majority of Class I railroads, as well as Aurizon, have been assigned ratings of BBB or equivalent.[26]

Table 7 Credit ratings for comparable companies

Company	Moody's Credit Rating	S&P Credit Rating
CSX Corporation	Baa1	BBB+
Genesee & Wyoming Inc.	Ba2	BB
Kansas City Southern	Baa3	BBB-
Norfolk Southern Corporation	Baa1	BBB+
Union Pacific Corporation	A3	A
Canadian National Railway Company	A2	A
Canadian Pacific Railway Limited	Not rated	BBB+
Aurizon Holdings	Baa1	BBB+

Note: A Moody's credit rating of Baa is equivalent to an S&P credit rating of BBB.
Source: Bloomberg

5.4 Term to maturity

Consistent with our calculation of the risk-free rate, we have assumed a ten year term to maturity for BBB bonds, the longest available tenor (with appropriate liquidity) in an Australian context. This is also consistent with past ACCC decisions for ARTC.

5.5 Debt risk premium

The DRP is estimated based on the difference between the yield on ten year BBB corporate bonds and the risk-free rate (averaged over the same twenty day period). The

[26] In the RBA and Bloomberg published bond yield estimates, BBB+. BBB and BBB- are grouped into a broad BBB credit rating.

key issue is the data source and methodology used to estimate the ten year BBB corporate bond yield.

In the 2017 HVAU draft decision, the ACCC's approach was to take an average of yield estimates calculated from RBA and Bloomberg data. This approach was adopted on the basis that neither method is clearly superior in terms of bond selection or curve fitting method, and because there is no clear indication that one estimate has been consistently higher or lower over time. The following sections provide an overview of these two data sources.

5.5.1 RBA data series

The RBA dataset contains estimated bond yields for broad A and BBB rated bonds over 3, 5, 7 and 10 year target tenors. One advantage of the RBA data series is its transparency, as the methodology used to derive the estimates is publicly available. However, the RBA approach also has limitations that need to be addressed:

- *single day end of month estimate*: as the estimates are currently only produced on the last day of each month, there is a risk that this day was 'atypical' or influenced by a one-off event or perturbation in the market. This is addressed by interpolating daily bond yield estimates between observed end of month bond yields;
- *average tenor less than ten years*: to the extent that the 'ten year' estimate reflects an average bond tenor of less than ten years, it is not a ten year estimate. Accordingly, it should be extrapolated to a ten year estimate. We have done this by using the RBA's seven year estimates to approximate the slope of the RBA's yield curve.

5.5.2 Bloomberg BVAL data series

Bloomberg provides estimates of BBB-rated Australian corporations under its Bloomberg Valuation service, also referred to as 'BVAL'. The BVAL curves use a proprietary algorithm to derive bond prices which are then used to construct a yield curve. The inputs to the BVAL models include direct observations of bond prices through trading and historical tracking of the bond compared to comparable firms if there is thin data available for the given security. Another method used to address thin trading is that the data can be supplemented using the historical correlation of price movements with observed comparable bonds. Unlike the RBA, Bloomberg does not publish its methodology for deriving the BVAL series.

5.6 Debt raising costs

The debt risk premium reflects a premium for credit and liquidity risk. However, it does not include any allowance for the actual costs of raising debt. In practice, transaction and administration costs will be incurred when raising and managing debt.

5.6.1 Regulatory precedent

PwC relatively recently undertook market research of Australian debt raising transaction costs, which have been applied in an Australian energy economic regulation context.[27] Incenta have subsequently applied PwC's findings in recent energy regulatory processes. PWC's study built on earlier work undertaken by Allen Consulting Group.[28] We regard this collective body of work prepared in an Australian regulatory context to provide the most authoritative evidence of debt raising costs for Australian corporates based on surveys and interviews with legal firms, banks and credit rating agencies that are involved in the corporate bond raising process.

PWC noted that during the past decade a benchmark of 12.5 basis points per annum (bppa), representing direct costs of debt raising, was developed and applied by several Australian regulators. However, from 2004 the AER applied a methodology based on empirical observations of direct debt raising costs, which resulted in lower benchmark values in the range of 8 to 10 bppa depending on the size of the regulated network business.[29]

PwC's breakdown of direct debt transaction costs are as follows:

- Legal counsel – Master program – legal costs for the preparation of a Master Program, which becomes the base document for multiple issuances over 10 years;
- Legal counsel – Issuer's – legal fees for the preparation of documents under the Master Program;
- Credit rating agency – Initial credit rating – a fee to establish the credit rating;
- Credit rating agency – Annual surveillance – a rating agency fee for the maintenance of the credit rating each year;
- Credit rating agency – Up front bond issue – a fee charged by the rating agency when a new bond is issued;

[27] PwC (2013). Energy Networks Association: Debt financing costs, June.

[28] Allen Consulting Group (2004). Debt and Equity Raising Transaction Costs, Final Report, December.

[29] PwC (2013), p.6.

- Registrar – Up front – an initial set-up fee charged by a bond registry organisation;
- Registrar – Annual – the annual fee charged by the registry service; and
- Investment bank's out-of-pocket expenses – the fees charged by the agents of a bank for travel, accommodation, venue hire, printing etc.

Using the above cost components, PwC derived an estimate for total debt raising transaction costs for Australian bond issues, based on the standard issue size ($250 million) and benchmark term to maturity (10 years), of 10 bppa. This estimate combines the base arrangement fee with 'other' costs in terms of an equivalent bppa.

In the 2017 HVAU, the ACCC allowed for debt raising costs of 0.095 per cent. Based on the evidence presented above, we see no reason to deviate from this value.

5.7 Return on debt estimate

Table 8 presents our estimate of the return on debt following the ACCC on the day methodology set out in Appendix A of the HVAU 2017 draft decision. Accordingly, we apply an equal weighting to the estimates derived from the RBA and Bloomberg.

We believe that the use of publicly available datasets provides for an open and transparent estimation of the DRP. The RBA's data and methodology is openly available, and Bloomberg's data service is one of the most common platforms for the access of robust and independent market data. Combining estimates from these two data sources will, in our opinion, form the best estimate of the prevailing return on debt.

Table 8 Return on debt estimate for ARTC

Parameter	Value
RBA DRP	1.75%
Bloomberg DRP	1.70%
Average of RBA and Bloomberg DRP	**1.73%**
Risk free rate	2.78%
Debt raising costs	0.095%
Return on debt	**4.61%**

Note: Return on debt calculations assume a BBB credit rating using a 20-day averaging period ending 31 January 2018.
Source: RBA, Bloomberg, Synergies calculations

6 Gamma

Gamma (γ) is the value of imputation credits to investors, where some part of corporate tax paid by this entity can be claimed as a tax credit against personal income tax. To the extent it can be accessed by investors, it forms part of the assumed equity return to investors.

Following an introductory section on the components of gamma, the remainder of this chapter outlines the different approaches to determining gamma, before proceeding to an overview of Australian regulatory precedent.

6.1 Introduction

Under a dividend imputation system, corporate tax paid prior to the distribution of dividends can be credited against the tax payable on the dividends at a shareholder level. In other words, corporate tax is a prepayment of personal tax withheld at a company level. Under Australia's dividend imputation system, only domestic shareholders can avail themselves of imputation credits.

Gamma is the product of two inputs which must be estimated:

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

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

Imputation credits are only available in respect of company tax paid on income subject to Australian taxation. For gamma to equal one all income must be domestically taxable. What is clear is that different shareholders value franking credits differently, as their tax status determines whether their credits can be redeemed.

If the shareholder is an Australian taxpayer, then they are subject to Australian personal income tax and can offset the prepayment of this tax at the corporate level against their own personal liabilities. If they are not subject to Australian personal income tax, such as non-residents and tax-exempt individuals or entities, then the company tax paid cannot be offset, and no additional value is therefore derived. In other words, the value of gamma is zero.

6.2 Gamma approaches

Australian regulatory precedent is a highly contested area with ongoing disagreement over the value of imputation credits (theta) in the hands of investors, one of the two critical inputs into the gamma calculation.

Consequently, there are several approaches that have been applied in Australian regulatory practice. This has been reflected in a large range of gamma values from 0.25 to 0.65 that have been adopted by Australian regulators in recent years. However, what is common to all these regulatory decisions is the assumption that the marginal investor is either a resident Australian or that the identity of the marginal investor is not relevant to the assessment of the valuation of imputation credits.

In this regard, the distribution rate is relatively non-contentious and has settled around 70%. In contrast, the value of theta continues to be highly contentious and in broad terms can be estimated using the following non-market and market-based approaches:

- the equity ownership approach, which is the proportion of Australian equity held by Australian residents (given only domestic investors can utilise franking credits), or taxation approach using statistics drawn from the Australian Taxation Office on the utilisation of franking credits
- market value studies, which seek to ascribe the value that investors place on theta using techniques, such as dividend drop-off studies (i.e. pre- and post-dividend share prices)

Each of these approaches establishes a broad range of theta values and in turn a gamma value. The equity ownership approach has been applied by some regulators. It provides a theta value of around 0.6 to 0.7 resulting in a gamma value of 0.4 to 0.5. This approach assumes an investor that is eligible to fully utilise imputation credits they receive has a utilisation rate of 1 (i.e. they gain 100 percent of the "value" of the imputation credits); whereas an investor that is ineligible to redeem imputation credits has a utilisation rate of 0 (i.e. they gain no "value" from the imputation credits). However, this approach fails to recognise the potential for individual eligible investors to value imputation credits at less than their nominal dollar value, notwithstanding evidence to the contrary. Moreover, the equity ownership approach does not reflect a market based approach despite every other relevant parameter informing the WACC being based on a market proxy.

In contrast, market value studies estimate the value of imputation credits based on observed financial market data. Dividend drop-off studies are the most commonly applied form of market value study, and have been endorsed by IPART. The most recent

dividend drop-off study from 2017 maintains support a theta value of 0.35 and hence a gamma value of 0.25 (assuming a 70% distribution rate).[30]

There is also substantial evidence that imputation credits are not considered by independent experts in a valuation context. Australian economic policy makers have questioned the value of imputation credits in an economy that is small by international standards and characterised by open capital markets. Furthermore, academic literature strongly indicates that the gamma for a security where the marginal investor is foreign should be zero given the marginal investor is an international investor and hence, in an Australia context, unable to utilise any accrued imputation credits.

We now turn to an examination of Australian regulatory precedent.

6.3 Australian regulatory precedent

Determining an appropriate value for gamma has proven highly contentious in economic regulation and most of this debate has played out under the Australian national energy framework.

Historically, most Australian regulators applied a value of 0.5. In its 2009 WACC guidelines review, the *Statement of Regulatory Intent* (SoRI), the AER increased the value of gamma to 0.65. Energex, Ergon Energy and ETSA Utilities (now SA Power Networks) appealed the AER's application of a gamma of 0.65 in their revenue determinations.[31]

In that review, it was accepted that the distribution rate applied should be 0.71 (reflecting the proportion of corporate tax paid that has been distributed to shareholders as franking credits), which is directly observable from Australian tax statistics. A distribution rate of 0.7 has generally been adopted by Australian regulators and is not contentious.

In contrast, the key issue of contention in the SoRI process and in subsequent regulatory proceedings is the value of theta (the value of franking credits). As part of the review process, the Tribunal commissioned a 'state of the art' dividend drop-off study[32] from SFG Consulting to estimate theta, which was subject to intense scrutiny. This study arrived at a value of theta of 0.35, which results in a gamma of 0.25. The Tribunal

[30] Cannavan, D. & Gray, S. (2017). Dividend drop-off estimates of the value of dividend imputation tax credits. Pacific-Basin Finance Journal, 46, pp.213-226.

[31] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9

[32] The dividend drop off study is one of the most common empirical approaches used to estimate the value of theta. The estimate is based on an analysis of the change in share price following the payment of a dividend. One of the key difficulties with this is attributing the change in share price to the value of the dividend and the value of the franking credit that is attached to it. This leads to the statistical problem of multicollinearity.

accepted this value and overturned the AER's decision. The AER subsequently applied a value of 0.25 in decisions made under its SoRI.[33]

In 2013, the AER completed its review of its WACC guidelines, resulting in the replacement of the SoRI with the Rate of Return Guideline. In that review, the AER reverted to a value of 0.5, which was revised down to 0.4 in subsequent revenue determinations using updated data. This hinged on a review of the 'conceptual definition' of theta and a dismissal of market value studies as being of any relevance in valuing theta.

The AER's approach to gamma was one of the matters successfully appealed by the NSW and ACT network businesses in the most recent revenue determination processes. The Tribunal concluded that the AER's gamma was too high and that the upper bound for the value of theta should be no more than 0.43, which reflects the utilisation rates from ATO tax statistics (which would equate to a gamma of 0.3 at a distribution rate of 0.7). It highlighted that the AER's equity ownership approach arrives at a value that is above this upper bound and therefore "the equity ownership approach overstates the redemption rate."[34] It stated that:[35]

> Given that two of the three approaches adopted by the AER [the equity ownership approach and tax statistics] are considered no better than upper bounds, it follows that the assessment of theta must rely on market studies. The Tribunal considers that, of the various methodologies for estimating gamma employed by the AER, market value studies are best placed to capture the considerations that investors make in determining the worth of imputation credits to them. [words in brackets added]

The Tribunal remitted the decision back to the AER to remake with guidance consistent with the above quote implying that gamma should be set at a value no higher than 0.3 based on utilisation rates taken from ATO tax statistics. The AER subsequently made an application for judicial review of this decision to the Federal Court.

The Full Federal Court upheld the AER's judicial review of the Tribunal's decision on theta. The Full Federal Court found that:[36]

> …the Tribunal assumed other parameters in the WACC calculations were market values that already incorporated investors' tax positions and transactions but that

[33] A gamma of 0.65 continued to be applied to electricity transmission network businesses because it was prescribed in the National Electricity Rules. The value of gamma is no longer prescribed in the National Electricity Rules.

[34] Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1, para.1093.

[35] Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1, para.1096.

[36] *Australian Energy Regulator v Australian Competition Tribunal* (No 2) [2017] FCAFC 79, para 755.

> misconstrued the 'post tax' framework [used in the NER]. The rules required gamma to be determined consistently with the return on equity.

The AER is likely to continue with its equity ownership approach to determining gamma following the Full Federal Court's judgment, which based on data as at 2015 suggests a gamma of 0.4.

However, it is unclear whether special leave will be sought to appeal the Full Federal Court's judgment in the High Court and the Full Federal Court is yet to determine another judicial review of the Tribunal's decision in Application by South Australian Power Networks where one of the grounds of review is the Tribunal's formulation on gamma (the Tribunal in this decision found that the AER was not in error).

Furthermore, central to the Full Federal Court's judgment is the belief that the WACC calculated in accordance with the NER is calculated using face values rather than market values.[37] To the extent that the WACC methodology adopted considers market values, then consistent with the Full Federal Court's judgment, a gamma that reflects market values would be appropriate. In particular, we note that whether the Officer framework used to determine the WACC under the NER adopts face or market values is disputable given the Tribunal finding:[38]

> Moreover, the AER's reasoning ignores the fact that other parameters in the WACC calculations are market values that already incorporate the effects of the differences in investors' tax positions and transaction costs. As noted by Professor Gray of SFG Consulting, Estimating gamma for regulatory purposes, 6 February 2015 at 9:
>
> > In my view, gamma is no different from any other WACC parameter in this respect. For example, when estimating beta, the AER uses traded stock prices, which reflect the value of those shares to investors. That value reflects any "personal costs" that the investors bear. There is no process of adjusting share prices to reverse some of the reasons why investors value shares the way they do. The same applies to the traded bond prices that the AER uses to estimate the cost of debt. All of these prices reflect the value to investors – *all* of the considerations that are relevant to how investors value the stock are reflected in the price. [italicised emphasis in the original]

[37] Differences between face values and market values emerge when investors cannot redeem the full value of imputation credits.

[38] Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1, para.1073-4.

> Consequently, there is no inconsistency between the use of market studies to estimate the value of imputation credits and the methods used to calculate other parameters of the costs of debt and equity from market data.

It is true that the estimation of theta under market based approaches is not without controversy (with measurement and estimation issues arising in part because of the restricted window of analysis). However, all other WACC parameters are set having regard to market values. Accordingly, the assessment of the value of gamma should be informed by approaches assessing market values.

Furthermore, the market value interpretation is more compatible with the concept of the marginal investor, whereas the redemption proportion interpretation relies on the concept of an average investor. In the context of price setting in financial markets, especially in Australia, the former is likely to be a more realistic representation. This approach is consistent with the academic findings and equity market data presented in earlier sections of this chapter.

Approaches applied by other Australia economic regulators

Australian economic regulators' positions on gamma remain mixed, with both market and non-market approaches being applied. Table 9 summarises the current status of regulatory precedent.

Table 9 Current Australian regulatory status of gamma

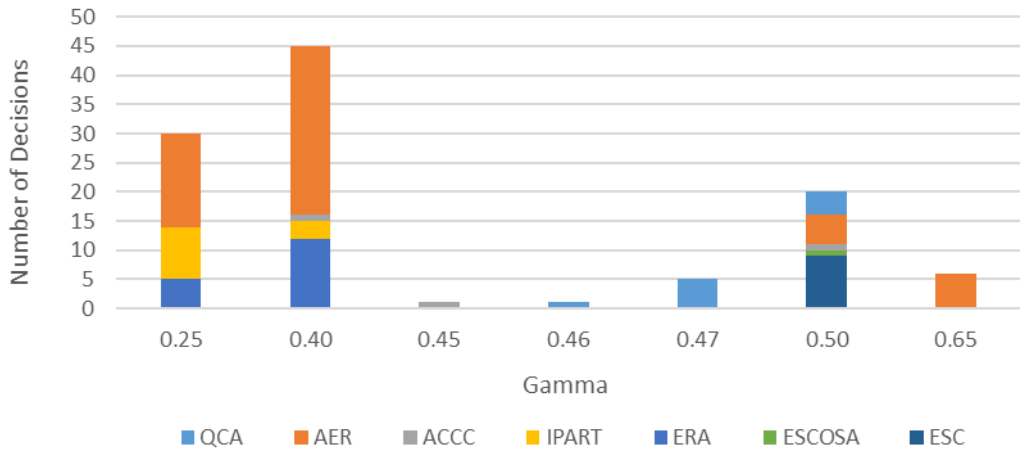
Regulator	Current value applied	Comments
QCA	0.46	Previously revised down from 0.5.
AER	0.4	A gamma value of 0.5 is specified in the AER's Rate of Return Guideline. However, it has applied a value of 0.4 in all its energy revenue determinations since 2013. Several of these decisions have been subject to merits review. Depending on the out-workings from these merits review processes, there is the potential for different values of gamma to apply across revenue determinations (0.4 and something between 0.25 and 0.4).
ACCC	0.4	This was applied in the draft ARTC Hunter Valley Access Undertaking
IPART	0.25	Arrived at under a specific review of gamma concluded in 2012. Not revisited in its 2013 WACC methodology review. October 2017 draft WACC methodology proposes retaining 0.25.
ERA	0.4 and 0.25	Has aligned with the AER's approach of 0.4 for the rail entities it regulates. This value was also maintained in its June 2016 Final Decision for the Dampier to Bunbury pipeline. However, in July 2016 the Tribunal overturned a previous ERA decision for ATCO Gas Australia, which resulted in a gamma of 0.25 being applied for this entity.
ESCOSA	0.5	As per 2016 Final Decision for SA Water.
ESC	0.5	As per most recent Melbourne Water decision. The ESC has not provided its rationale, other than noting in the Guidance Paper that this was consistent with its previous review.

Source: Synergies based on Australian regulatory decisions

It is possible that other regulators will be influenced by the outcome of the current appeals for energy network businesses. In saying this, we note that some of the State-based regulators also gave no recognition to the Tribunal's previous determination made for Energex, Ergon Energy and SA Power Networks in 2011.

Figure 2 shows the diversity of gamma values approved by Australian regulators between 2010 and 2017. Although a number of gamma decisions have resulted in a value of 0.25, 0.4 is the most frequently adopted value.

Figure 2 Australian regulatory gamma decisions (as at December 2017)



Data source: Synergies based on Australian regulatory decisions
Note: The AER and ESC gamma values are applied across multiple decisions for the energy (AER) and water (ESC) entities that they regulate.

6.4 Conclusion

Synergies contends that there is substantial financial market and academic evidence to support a gamma value of 0.25 (and in fact even zero). However, we understand that ARTC proposes a gamma value of 0.4 in line with recent regulatory decisions from the ACCC, AER and ERA.

We note that the regulatory approach to gamma differs from the approach taken in financial markets and academic literature. There is extensive evidence that independent expert valuations do not place a value on imputation credits when establishing required rates of return. Findings from the financial literature also question the value of imputation credits. Academic research analysing market data indicates strong support for a gamma value of zero based on the assumption that in open capital markets like Australia, the marginal investor will be an international investor who gains no value from imputation credits and hence whose expected return on equity is not affected by the operation of the Australian tax imputation system.

There is also evidence in the regulatory sphere that an appropriate value for gamma could be less than 0.4. In its October 2017 draft report for its WACC methodology review, IPART proposed retaining its current gamma value of 0.25.[39] IPART contends that the value of gamma should be interpreted as a market value, with dividend drop-off studies currently deemed the best method to estimate the market value of gamma. Although several regulators favour a gamma of 0.4, this suggests that the value of gamma in the regulatory context will continue to be contested.

[39] IPART (2017). Review of our WACC method – draft report. October.

7 Conclusion

Based on the parameter estimates presented in this report, the estimated WACC for ARTC is provided in Table 10.

Table 10 Proposed WACC

Parameter	2008 IAU	2018 Estimate
Risk free rate	6.39%	2.78%
Capital structure (debt to value)	50%	52.5%
Debt risk premium	2.85%	1.73%
Debt raising costs	0.125%	0.095%
Market risk premium	6.00%	7.69%
Gamma	0.5	0.25
Tax rate	30%	30%
Asset beta	0.65	0.80
Debt beta	0.00	0.00
Equity beta	1.292	1.675
Return on equity	14.14%	15.66%
Return on debt	9.37%	4.61%
Post-tax nominal (vanilla) WACC	**11.76%**	**9.86%**
Pre-tax nominal WACC	**13.00%**	**12.02%**

Source: Synergies calculations

This proposed WACC is materially lower than the value accepted in the 2008 IAU. This has been driven by a substantial reduction in the risk-free rate and return on debt. On the other hand, our estimate of the asset beta has increased owing to an increase in the empirical estimates from the comparator set. The estimated market risk premium is also higher as a result of the lower risk free rate. Meanwhile, our estimate of gamma at 0.25 is lower than the value of 0.5 adopted in the 2008 IAU.

A First principles analysis

The key objective of the first principles analysis is to assess the extent to which the firm's net cashflows (revenues less costs) have some sensitivity to movements in the general economy. Lally identifies a number of factors to be considered here, including: nature of the product or service; nature of the customer; pricing structure; duration of contracts; market power; nature of regulation; growth options; and operating leverage.[40]

The first principles analysis is largely contextual and can inform an assessment of where beta might sit within a range (that is, does a factor put upward or downward pressure on the beta for the firm). However, this remains qualitative. Noting the inherent uncertainty in beta estimation, it is not feasible to reliably quantify the impact of a particular factor on beta in isolation of other factors.[41]

A number of these factors are also interrelated – that is, the impact of one factor on beta could either be increased or lessened by another factor. Hence, while the impact of each factor can be considered in isolation, the overall assessment will reflect the net impact of the factors in combination. The first two factors are inextricably linked and so will be considered together.

A.1 Nature of the product / nature of the customer

When assessing the market for rail services, it is important to consider the underlying demand for these services and the customers utilising them. The key issue to establish here is the extent to which there is some correlation between the cashflows from these activities and domestic economic activity.

These cashflows comprise both revenue and costs. As most of the costs faced by the owner of a rail network are fixed, the main driver will be revenues (this will be discussed further as part of the analysis on operating leverage), and this will therefore be the focus here. However, of those costs that are variable, generally operating and maintenance there will be some relationship between these costs and general movements in the domestic economy. Overall, the impact of variable costs on ARTC's systematic risk profile is expected to be relatively small, although the impact of having a high fixed costs base is likely to be significant (this is discussed further below under operating leverage).

ARTC's interstate revenues are dominated by intermodal traffic, with the balance of revenue accounted for by steel, grain, passenger and minerals. Each of these traffic types

[40] Lally, M. (2004). The cost of capital for regulated entities, Report prepared for the Queensland Competition Authority.

[41] This would necessitate being able to have two samples, where the firms in the samples are largely identical other than for the relevant factor.

will now be considered (with the exception of minerals traffic, which is currently relatively marginal and is therefore unlikely to have an impact on ARTC's risk profile).

A.1.1 Intermodal

As discussed throughout the report, the market for intermodal traffic is very competitive, with road particularly dominant for shorter hauls. While ARTC is undertaking significant investment to improve the performance of rail relative to road, competition is likely to remain intense into the future.

Intermodal transport generally involves the carriage of containers, most of which are likely to contain manufactured goods or inputs for production processes (some commodities such as rice are also carried via container). It is understood that intermodal traffic is dominated by goods destined for the domestic market, with the balance ultimately destined for export markets.

This composition is to be expected, given that producers of manufactured goods destined for export are more likely to be located near a major industrial centre and export port facility. There may be some movements intrastate, however, this is likely to be only over short distances. It is also noted that most of the domestic traffic is interstate, rather than intrastate. This is likely to reflect the difficulties that rail currently faces in competing with road over shorter distances.

The demand for goods in the domestic market will have a high correlation with domestic economic activity, irrespective of whether these goods are imported or produced domestically. When the economy is buoyant, incomes rise, as does the consumption of a range of goods and services, albeit to varying degrees (with the exception of less income-sensitive commodities, such as essential food items, but these are less likely to be transported by rail). As the economy contracts, consumption patterns will tend to exhibit a similar trend. Hence, the demand for manufactured goods is likely to broadly follow movements in the domestic economic cycle.

Because rail is a relatively marginal player compared to road on some parts of the network, any reduction in the demand for transport services (which could be purely cyclical) is likely to result in rail having to compete more intensely in order to retain market share. This intensity of competition means that prices cannot necessarily be set at a level that fully recovers costs. As a result, implementation of any further reductions in prices to maintain market share (or increase it) are not feasible.

A further issue that needs to be considered here is the number of buyers on the demand side. The more concentrated the market on the demand side (that is, fewer buyers), the greater that party's countervailing market power. Aurizon's exit from its intermodal

business is likely to have significant implications for ARTC. To the extent that Pacific National gains market share (noting the leakage that may continue to road), freight forwarders will be keen to avoid concentration of supply chain power, preferring instead to maintain competitiveness between transport options.

A.1.2 Steel

Steel is used in a variety of applications, including manufacturing and construction. Steel for domestic use is sourced from domestic producers but is also imported. Manufacturing activity will have a strong correlation with domestic economic activity. Construction activity will also have a strong correlation with the domestic economic cycle, whether this is in the residential, commercial or industrial sectors. For example, it is widely recognised that residential building approvals are often relied upon as a leading indicator of economic activity in Australia.

As outlined above, we would expect that export-oriented producers are likely to locate reasonably close to port facilities.[42] Hence we would not expect that a significant proportion of steel hauled on the interstate network is likely to be destined for export markets; any haulage is likely to involve shorter interstate movements between capital cities. Increasingly, steel producers also have their own trucking networks, which reduce their reliance on rail transport.

A.1.3 Passenger

Passenger transport only accounts for a relatively small share of ARTC's interstate network revenues and hence while it will have some impact on ARTC's risk profile, it will not be a significant driver. Passenger travel undertaken on ARTC's interstate network will be for travel between regional centres, as well as long-distance leisure travel.

The market for passenger travel is very competitive. With increasing competition in the aviation industry, it is increasingly difficult for rail to compete with domestic airlines for market share. There are also other substitutes for rail travel, such as cars and buses. The overall demand for passenger travel services will have some sensitivity to income and will therefore be correlated with domestic economic activity.

The long-distance train travel market is a niche market. It not only competes with other transport alternatives, but it is also part of the broader tourism industry, competing with coach tours, cruising, island or resort holidays, and travel to overseas destinations.

[42] The key steel-making facilities in Australia are located at Port Kembla, Whyalla, Melbourne, Sydney and Newcastle.

Demand for this service will be particularly sensitive to income, particularly at the luxury end of the market.

A.1.4 Grain

Demand for grain transport services can be quite variable and is highly seasonal. The demand for grain transport services is increasingly impacted by changes in climate variability (arising from more frequent and more severe droughts, storms and floods). This leads to variability in yields, as the area of land devoted to grain production is typically fixed in the short to medium term. Furthermore, the majority of grain production is destined for export markets, which increases exposure to currency fluctuations, international competitive forces, and global economic conditions more generally.

Competition with road transport is also intensifying as grain facilities on branch rail lines consolidate in favour of new, state-of-the-art grain facilities being constructed on main lines. Road transport is now estimated to account for 50% of all grain movements on a total kilometre-tonne basis.[43] Fuel costs remain a key driver of road-rail competitiveness.

Thus, despite their relatively small share of total revenues, fluctuations in grain traffics do have the potential to contribute to ARTC's systematic risk.

A.1.5 Summary: implications for systematic risk

The underlying demand for ARTC's interstate network services has a significant systematic risk element. This is dominated by intermodal traffic, the majority of which is destined for domestic markets and is likely to have a strong correlation with domestic economic activity. This is further augmented by the demand for services to transport steel, as well as passenger travel (particularly in terms of the leisure travel market), both of which are also related to the domestic economy. These drivers will lead to a higher value for beta.

A.2 Pricing structure

Pricing structure refers to the extent to which the firm's pricing arrangements either mitigate or increase its exposure to systematic risk. For example, if a firm's cost structure comprises fixed and variable costs, an important consideration here will be the extent to which prices have a fixed and variable component that reflect this cost structure.

[43] GrainGrowers (2016). State of the Australian Grains Industry 2016.

Consistent with other capital-intensive infrastructure businesses, ARTC's tariff structure has a fixed and variable component. To the extent that a greater proportion of the tariff (and hence revenues) is fixed, this gives ARTC some protection in the event of economic shocks, provided that fixed tariff component is largely aligned with its fixed cost base. The other risk is that ARTC incurs costs which are subsequently not approved by the regulator and hence cannot be passed through to customers. This is a source of regulatory risk.

Given the competition from road transport, ARTC is currently unable to price its intermodal services to recover the full economic costs of the services (based on a DORC valuation). Hence, even if it could do so, it is unlikely to be able to increase its prices in response to an increase in variable costs induced by an economic shock. This competition with road transport will only become more pronounced with the exit of Aurizon from its intermodal business.

This is also likely to be the case with respect to grain and passenger services. Prices for the former tend to be constrained due to capacity to pay (at least relative to other traffics). The demand for passenger services is also likely to be relatively elastic, so if ARTC sought to increase prices to these service providers, they may be unable to pass them onto customers and remain competitive.

A.3 Duration of contracts

ARTC generally enters into long term contracts with customers. We expect that this is typical of the industry, including the US Class I railways that are used as comparators in the beta analysis.

On the one hand, the existence of long term contracts provides ARTC with revenue certainty. However, this also depends on the extent to which the contracts provide surety in relation to prices and/or volumes. ARTC remains highly exposed to volume risk in the medium to long term, with the exit of Aurizon from its intermodal business adding to uncertainty. Term contracts can also constrain the business from varying certain provisions that it might have otherwise sought to review due to a change in the market or its risk profile (unless customers agree to re-open the contracts).

A.4 Market power

Most regulated businesses tend to possess some market power, which tends to be a key rationale for the declaration of a service, as well as the degree of prescription in the regulatory framework. The existence of market power tends to have a mitigating effect on systematic risk and therefore suggests a lower value for beta.

ARTC is in a unique position relative to many other regulated industries in that it faces competition from road transport on a substantial part of the interstate network. This competition is particularly intense on the Sydney to Melbourne and Brisbane to Melbourne corridors. The exception is for those transport services where ARTC has more market power (due to fewer substitutes), such as steel, minerals and grain. However, these traffics account for around 30% of ARTC's revenues.

Overall, therefore, the 'dampening' effect that market power has on systematic risk, and consequently beta, is substantially reduced in this circumstance. On this basis, to the extent that the comparator firms used to determine a range for beta also have limited market power, ARTC could be seen to be no different.

A.5 Form of regulation

Regulatory frameworks are either based on:

- a revenue cap, which insulates the regulated entity against volume risk, providing relative revenue certainty for the term of the regulatory period;
- a price cap, where prices are set for the term of the regulatory period based on forecast volumes, hence exposing the regulated entity to differences between these forecast volumes and actual throughput. While there is a downside risk if volumes fall, the regulated entity is generally able to retain the benefit of any upside; or
- some form of 'hybrid', which sits somewhere in between (for example, a price cap with volume triggers, where prices are reset if actual volumes move beyond a certain threshold relative to the forecast).

The effects of regulation on beta are unclear. In the first instance, regulatory risk is not necessarily in itself systematic as it could be avoided through diversification. However, the issue of relevance here is the extent to which regulation mitigates, or increases, ARTC's exposure to systematic volume risk.

Regulation can reduce risk if it increases revenue certainty over a period. Conversely, regulatory risk can be seen as a source of risk to the extent that there is uncertainty as to how it will be applied and/or it reduces the firm's ability to adjust prices in response to changes in costs.

The general practice of Australian regulators is to assume that regulation reduces risk and accordingly will have a dampening effect on beta. However, this is unlikely to be the case for ARTC as it is likely to have its revenues significantly affected by levels of economic activity throughout the regulatory period. The regulatory framework impedes

ARTC's ability to respond to emerging economic challenges, thereby increasing systematic risk.

A.6 Growth options

Growth options refer to the potential to undertake significant new investment, particularly in new areas or products. ARTC's capital requirements reflect investment in growth assets as well as the replacement of aging network infrastructure. Chung and Charoenwong (1991) argue that businesses that have a number of valuable growth opportunities, in addition to their existing assets, will tend to have higher systematic risk compared to firms that don't have these opportunities.[44]

This can be illustrated if we consider two firms of the same value. One business has few growth opportunities, so that the value of the business will largely reflect the earning capacity of the assets already in place. The other business has the same value, however has fewer assets in place but a number of growth opportunities which have some value.

Of the two firms, the one that would be most affected by economic shocks is the one that has the greater portion of its value represented by growth opportunities. This is due to the fact that assets not yet invested in are at greater risk of being deferred or mothballed in economic downturns. This will be reflected in the company's equity beta, which would be higher. Overall, Chung and Charoenwong's empirical results strongly support this hypothesis.

A.7 Operating leverage

Operating leverage is measured as the ratio of fixed to variable costs. A high degree of operating leverage will increase the volatility of a firm's returns relative to the market, which can increase its beta.

ARTC's cost base is largely fixed, with only a relatively small proportion of its costs sensitive to volumes. This is typical for a rail infrastructure provider. High operating leverage is associated with higher systematic risk, as these fixed costs will still be incurred irrespective of actual volumes (and revenues). We would expect that ARTC's operating leverage remains largely unchanged since its previous review.

As this first principles analysis is being used to determine where ARTC would be positioned with respect to a range of beta estimates sourced from comparators, the

[44] K. Chung and C. Charoenwong (1991). Investment Options, Assets in Place and the Risk of Stocks. Financial Management, Vol.3.

impact of operating leverage on this decision will depend on ARTC's operating leverage relative to these comparators.

We understand that ARTC's operating leverage is similar to that of other rail network providers with a significant infrastructure component. However, its comparator group comprises US Class I railways, who we expect would have lower operating leverage, due to their above rail businesses. As operators primarily of trains and rollingstock, their ratio of fixed to variable costs will tend to be lower, holding all else equal. This is because their operating costs will exhibit a stronger relationship with actual volumes. This in turn tends to reduce systematic risk of US Class I railways relative to ARTC (since ARTC does not have lower operating leverage above rail operations).

A.8 Conclusions from first principles analysis

ARTC is exposed to relatively high systematic risk on its interstate network, especially when compared to other rail infrastructure providers. One of the key determinants of this is the existence of volume risk that is largely systematic in nature, driven by the strong relationship between the demand for intermodal services and the domestic economy. A relationship also exists between domestic economic activity and the demand for services to carry steel, as well as leisure-based passenger travel, although they are less significant in terms of their overall influence on ARTC's revenues.

The presence of market power is often seen as having a dampening effect on the systematic risk of regulated entities relative to other businesses. However, given the intensity of competition from road transport, this effect is substantially lessened here, to the extent that ARTC's market power is likely to be similar to the other transport firms used as comparators.

B Beta diagnostics

The purpose of this attachment is to present estimates that reinforce the robustness of our beta analysis. To this end, we have estimated portfolio betas for our comparator set of railroads, and we have also experimented with different monthly starting days for the monthly returns used in our beta estimates.

B.1 Portfolio betas

An informative robustness test for our beta estimates is to evaluate the beta for each sector using a value-weighted portfolio of the comparable companies, rather than averaging across the firms in each sector. The returns of each stock in the portfolio were weighted by market capitalisation in each month. In a similar way, the monthly market return was calculated as the weighted average of the monthly returns for each company's home country benchmark. Likewise, each company's gearing ratio was also weighted by its market capitalisation. The results from these estimates are presented in Table B.1.

Table B.1 Portfolio asset beta estimates

Portfolio	Portfolio asset beta	Averaged asset beta
5 Year Portfolio	0.93	0.85
10 Year Portfolio	0.86	0.78

Source: Bloomberg, Synergies calculations

The estimated portfolio asset betas compare favourably to the conventional averaged asset betas that we calculated in Section 4. These results provide further support to our proposed asset beta of 0.80. The difference between the two sets of estimates likely stems from the respective market capitalisations of the firms in the sample.

B.2 Monthly starting day robustness checks

By default, the monthly returns used in our beta analysis are calculated at the end of each month. To add robustness to our beta estimates, we have compiled supporting beta estimates using every other day of the month, and have averaged across these individual estimates. Results over both a five-year and ten-year time frame are displayed in Table B.2, and reinforce an asset beta estimate of at least 0.80.

Table B.2 Beta estimates averaged across different starting days

Timeframe	31-day Average	31-day Median
5 Years	0.95	1.00
10 Years	0.83	0.89

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

The results presented in the table above are based on 31 day averages. If the given starting date falls on a weekend or public holiday in a particular month, we use the most recent trading day as an approximation. For example, where the starting day is set to be the 15th of the month, if the 15th falls on a weekend, the value from the previous trading day is used as an approximation. To accommodate different month lengths throughout the year, we have also taken averages over 28 days. This leaves the estimates virtually unchanged.

C ERA regulatory precedent on rail sector beta determination

The purpose of this attachment is to set out in more detail relevant regulatory precedent from the ERA for the assessment of an asset beta for rail sector determinations where revenues and earnings are affected, to varying degrees, by levels of economic activity.

C.1 ERA – Arc Infrastructure, The Pilbara Infrastructure (TPI) and Public Transit Authority

The ERA establishes WACC estimates for Arc Infrastructure (formerly Brookfield Rail), the Public Transit Authority and TPI.[45]

The Authority notes that choosing a relevant benchmark sample for these three entities is difficult due to the lack of close comparators of rail infrastructure trading on the Australian Stock Exchange. Only one directly comparable company is available in Australia, Aurizon, which was floated on the ASX in July 2010 as QR National. A single comparable firm leaves the Authority with an insufficient sample on which to estimate regulated cost of capital parameters.

The Authority is of the view that estimates of asset beta based on benchmark samples should ideally be relevant to the regulated rail businesses in Western Australia. In this context, the Authority considers that two aspects of relevance to a benchmark entity should be considered.

First, estimates of asset beta from the benchmark samples should provide some relevance to the economy in which the efficient benchmark entity is operating (in this case, the Australian economy). Second, these estimates should also provide some relevance to the industry/sector in which the efficient benchmark entity is operating (in this case, the rail industry).

The Authority considers that a benchmark sample including only Australian businesses that are comparable with rail is preferred for the purposes of its empirical studies. However, the Authority's analysis indicates that there are insufficient rail businesses comparators operating in Australia. Given empirical estimates are the only viable option for estimating the asset beta for rail businesses, the Authority is of the view that a benchmark sample including both Australian and developed countries in Europe and America is appropriate.

[45] ERA (2014a). Review of the method for estimating the weighted average cost of capital for the regulated railway networks, Revised draft decision, November.

In this context, the ERA follows the same structured process to determine its beta comparators for each of these regulated entities, which entails first identifying Australian comparators and then due to an insufficiently small sample, extending its search to include the most comparable international entities.

C.1.1 Arc Infrastructure

The Arc Infrastructure network in the south-west of Western Australia is a freight rail network that primarily transports commodities such as iron ore, grain, coal, alumina and interstate freight.

The Authority considered that a firm must satisfy the following conditions in order to belong to the Arc Infrastructure benchmark sample:

- primarily involved in the transportation of goods across comparable distances;
- located in Australia or a similar developed economy;
- involved in the transportation of similar commodities to those transported on the Arc Infrastructure network (that is, bulk goods, but also general freight).

The ERA indicated that it applied the following filters in the Bloomberg terminal using the Equity Screening function, such that the comparator firm must:

- operate in an OECD country that has similar political, economic and geographical similarities to Australia;
- belong to the ICB Subsector: Railroads; and
- provide sufficient pricing data to allow calculation of its equity beta and gearing.

In addition, the Authority included comparator companies that were included in its previous WACC determinations for the Arc Infrastructure network.

The Authority considered that Aurizon is the closest comparator company to the Arc Infrastructure network in respect of its Australian operations and transport task. It is also listed. However, the regulatory regime differs between Arc Infrastructure and Aurizon in that Arc Infrastructure is subject to a negotiate-arbitrate regulatory regime, while the Aurizon network is subject to a revenue cap system. In addition, the use of only one comparator company may not adequately capture the risks faced by the Arc Infrastructure network.

The Authority has previously accepted advice that Australian and New Zealand transport companies are relevant to inform the required equity beta, credit rating and gearing for the Arc Infrastructure network. However, it considered non-rail operators to

be less relevant proxy companies compared to rail network operators. Nevertheless, they provide some information of value, particularly given the small size of the sample, so are retained.

ERA's beta comparators are presented in the following table.[46] This sample of 11 comparators was reduced from the 15 comparators used in its rate of return decisions prior to 2015. The Authority removed Auckland Airports and Infratil (a NZ investment fund with investments in energy, transport and social infrastructure businesses) from the pre-2015 benchmark sample, as well as Macquarie Infrastructure Group. Aurizon Holdings has been added to the sample.

Table C.1 Comparator companies for Arc Infrastructure

Company Name	Country	Ticker	Company Description
Genesee & Wyoming	United States	GWR US Equity	Genesee & Wyoming Inc., through its subsidiaries, owns and operates short line and regional freight railroads and provides related rail services. The company also provides railroad switching and related services to United States industries with extensive railroad facilities within their complexes. Genesee operates in the United States and Australia.
Union Pacific Corporation	United States	UNP US Equity	Union Pacific Corporation is a rail transport company. The Company's railroad hauls a variety of goods, including agricultural, automotive, and chemical products. Union Pacific offers long-haul routes from all major West Coast and Gulf Coast ports to eastern gateways as well as connects with Canada's rail systems and serves the major gateways to Mexico.
Norfolk Southern Corporation	United States	NSC US Equity	Norfolk Southern Corporation provides rail transportation services. The Company transports raw materials, intermediate products and finished goods primarily in the Southeast, East and Midwest and, via interchange with rail carriers, to and from the rest of the United States. Norfolk Southern also transports overseas freight through several Atlantic and Gulf Coast ports.
Kansas City Southern	United States	KSU US Equity	Kansas City Southern, through its subsidiary, is the holding company for transportation segment subsidiaries and affiliates. The Company operates a railroad system that provides shippers with rail freight services in commercial and industrial markets of the United States and Mexico.
CSX Corporation	United States	CSX US Equity	CSX Corporation is an international freight transportation company. The Company provides rail, intermodal, domestic container-shipping, barging, and contract logistics services around the world. CSX's rail transportation services are provided principally throughout the eastern United States.
Canadian Pacific Railway	Canada	CP CN Equity	Canadian Pacific Railway Limited is a Class I transactional railway, providing freight and intermodal services over a network in Canada and the United States. The Company's mainline network serves major Canadian ports and cities from Montreal to Vancouver, and key centers in the United States Midwest and Northeast.
Canadian National Railway	Canada	CNR CN Equity	Canadian National Railway Company operates a network of track in Canada and the United States. The Company transports forest products, grain and grain products, coal, sulphur, and fertilizers, intermodal, and automotive products. Canadian National operates a fleet of locomotives and rail cars.
Toll Holdings Limited	Australia	TRH NZ Equity	Toll NZ Ltd. Provides freight transport and distribution services. The Company offers transportation, long-haul bulk freight, warehousing and freight forwarding services. Toll NZ also operates passenger and freight

[46] ERA (2014a), pp 28-30.

Company Name	Country	Ticker	Company Description
			transport vehicles that provides relocation and priority delivery services. Toll NZ conducts its business in New Zealand and Internationally.
Aurizon Holdings	Australia	AZJ AU Equity	Aurizon Holdings Ltd. is a rail freight company. The Company provides coal, bulk and general freight haulage services, operating on the Central Queensland Coal Network (CQCN) and including specialised track maintenance and workshop support functions.
Asciano Limited	Australia	AIO AU Equity	Asciano Limited is a provider of essential transport services in the rail and ports and stevedoring industries in Australia and New Zealand. The Company operates container terminals, bulk export facilities and container and bulk rail haulage services.
Port of Tauranga	New Zealand	POT NZ Equity	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.

Source: Bloomberg, ERA Analysis.

The Authority indicated it will therefore employ significant regulatory discretion when determining appropriate benchmark parameters for the Arc Infrastructure network, with a view that its risks are at the lower end of overseas railway operators, and at the higher end of Australian and New Zealand transport companies.

The Authority estimates the asset beta for the Arc Infrastructure network as being 0.7. Utilising the estimated gearing of 25 per cent, this corresponds to an equity beta of 0.9.

C.1.2 TPI

The TPI railway transports iron ore from Fortescue Metal Groups (FMG) Cloud Break iron ore mine in the East Pilbara to TPI's port facilities at Anderson Point, Port Hedland.

Of the three Western Australian rail networks, TPI has the least number of direct comparators. Unlike, the PTA and Arc Infrastructure, TPI lacks diversification and exclusively services the mining industry exposing it to the relatively high volatility of minerals markets.

The Authority notes that TPI's reliance on a single commodity – iron ore – transported across one large distance, significantly differentiates it from the Arc Infrastructure network. As a consequence, not all of the companies in the Arc Infrastructure sample are appropriate as comparators to TPI. The Authority considers that only Aurizon in Australia supplemented by overseas railway operators are able to adequately capture the risks faced by the TPI rail network.

Furthermore, the Authority considers that due to TPI's exposure to only a limited number of potential users in the mining industry, TPI's risks are likely to be at the upper end of those faced by the companies contained in the benchmark sample. At the same time, the Authority considers that the US short-line rail operator Genesee & Wyoming

Inc. is likely to be the best comparator for TPI. This is primarily due to Genesee & Wyoming Inc. operating class II/III short railway lines, including a number of similar lines in Australia.

ERA's beta comparators are presented in the Table C.2

Table C.2 Comparator companies for TPI Network

Company Name	Country	Ticker	Company Description
Aurizon Holdings	Australia	AZJ AU Equity	Aurizon Holdings Ltd is a rail freight company. The Company provides coal, bulk and general freight haulage services, operating on the Central Queensland Coal Network (CQCN) an including specialised track maintenance and workshop support functions.
Genesee & Wyoming Inc.	United States	GWR US Equity	Genesee & Wyoming Inc., through its subsidiaries, owns and operates short line and regional freight railroads and provides related rail services. The company also provides railroad switching and related services to United States industries with extensive railroad facilities within their complexes. Genesee operates in the United States and Australia.
Union Pacific Corporation	United States	UNP US Equity	Union Pacific Corporation is a rail transportation company. The Company's railroad hauls a variety of goods, including agricultural, automotive, and chemical products. Union Pacific offers long-haul routes from all major West Coast and Gulf Coast ports to eastern gateways as well as connects with Canada's rail systems and serves the major gateways to Mexico.
Norfolk Southern Corporation	United States	NSC US Equity	Norfolk Southern Corporation provides rail transportation services. The Company transports raw materials, intermediate products, and finished goods primarily in the Southeast, East, and Midwest and, via interchange with rail carriers, to and from the rest of the United States. Norfolk Southern also transports overseas freight through several Atlantic and Gulf Coast ports.
Kansas City Southern	United States	KSU US Equity	Kansas City Southern, through its subsidiary, is the holding company for transportation segment subsidiaries and affiliates. The Company operates a railroad system that provides shippers with rail freight services in commercial and industrial markets of the United States and Mexico.
CSX Corporation	United States	CSX US Equity	CSX Corporation is an international freight transportation company. The Company provides rail, intermodal, domestic container-shipping, barging, and contract logistics services around the world. CSX's rail transportation services are provided principally throughout the eastern United States.
Canadian Pacific Railway	Canada	CP CN Equity	Canadian Pacific Railway Limited is a Class I transcontinental railway, providing freight and intermodal services over a network in Canada and the United States. The Company's mainline network serves major Canadian ports and cities from Montreal to Vancouver, and key centres in the United States Midwest and Northeast.
Canadian National Railway	Canada	CNR CN Equity	Canadian National Railway Company operates a network of track in Canada and the United States. The Company transports forest products, grain and grain products, coal, sulphur, fertilizers, intermodal, and automotive products. Canadian National operates a fleet of locomotives and railcars.

Source: Bloomberg Terminal, ERA Analysis

The Authority considers that an asset beta of 1.05 reflects the higher risks associated with the returns of the TPI network. When combined with the estimated gearing of 0.2, this results in an equity beta of 1.3.

C.1.3 Public Transit Authority (PTA)

The Authority considers that a firm must satisfy the following in order to belong to the PTA benchmark sample:

- provide a service similar to passenger rail, for example toll road or commercial passenger transportation companies;
- be located in Australia or a similar OECD economy;
- be mature, hence have limited growth opportunities;
- be of similar size to the PTA.

The Authority has used the Bloomberg terminal in order to identify comparable companies for the PTA. The following filters were applied in the Bloomberg terminal using the Equity Screening function. Selected companies will:

- provide a reference service similar to that of the PTA (toll roads and/or
- commercial passenger transportation across suburban areas);
- be well established with limited growth opportunities; and
- have sufficient pricing data in order to estimate equity beta and gearing.

ERA's beta comparators for the PTA are presented in Table C.3

Table C.3 Comparator companies for PTA as returned by Bloomberg

Company Name	Country	Bloomberg Ticker	Company Description
Transurban Group	Australia	TCL AU Equity	Transurban Group is involved in the operation of the Melbourne City Link and the Hills Motorway M2 toll roads. The Group is also involved in developing an operating electronic toll systems.
Atlantia SPA	Italy	ATL IM Equity	Atlantia S.P.A is a holding company with responsibility for portfolio strategies in the transport and communications infrastructures and network sectors.
Vinci SA	France	DG FP Equity	Vinci SA builds roads, offers electrical, mechanical and civil engineering and construction services, and operates toll roads. The Company builds and maintains roads and produces road construction materials, builds electricity and communications networks, installs fire protection and power and ventilation systems, and operates toll highways, bridges, parking garages, and a stadium.
Abertis Infraestructuras S.A	Spain	ABE SM Equity	Abertis Infraestraucturas S.A is an international group which manages mobility and telecommunications infrastructures through three business areas: toll roads, telecommunications infrastructure and airports. The group is present in Europe and the Americas.
Macquarie Atlas Roads Group	Australia	MQA AU Equity	Macquarie Atlas Roads Group manages toll roads. The Company operates toll highways in the United Kingdom, France and the United States.

Source: Bloomberg Terminal, ERA Analysis.

Given the low level of systematic risk for the PTA rail network, the Authority considers that an asset beta of 0.3 is appropriate. Utilising the estimated gearing of 50 per cent, this corresponds to an equity beta of 0.6.

C.2 ERA's pre-2015 beta comparators for Arc Infrastructure (freight)

Based on advice from Allen Consulting Group, ERA used the following sample of Australian and international beta comparators in its rate of return decisions between 2008 and 2015.[47] A key difference in the comparator set adopted in 2008 relative to 2015 was the inclusion of airports in the former sample.

Table C.4 Relative asset and equity betas of US comparator firms

Company	Country	Raw Equity Beta	Debt/assets ratio	Asset beta
Kansas City Southern	US	1.23	0.70	0.74
Union Pacific Corporation	US	0.81	0.38	0.59
RailAmerica Inc	US	1.61	1.32	0.69
CSX Corporation	US	1.15	0.77	0.65
Burlington Northern Santa Fe	US	1.07	0.43	0.75
Average				**0.69**

Source: Bloomberg, ACG Analysis

Table C.5 Relative asset and equity betas of Canadian comparator firms

Company	Country	Raw Equity Beta	Debt/assets ratio	Asset beta
Canadian Pacific Railway Ltd	Canada	0.956	0.48	0.65
Canadian National Railway Company	Canada	1.023	0.28	0.80
Average				**0.73**

Source: Bloomberg, ACG Analysis

Table C.6 Relative asset and equity betas of Australian comparator transport sector firms

Company	Country	Raw Equity Beta	Debt/assets ratio	Asset beta
Adsteam Marine Limited	Australia	1.238	0.90	0.65
Macquarie Infrastructure Group	Australia	0.745	0.31	0.57
Patrick Corporation Ltd	Australia	1.056	0.07	0.99
Toll Holdings Limited	Australia	0.869	0.22	0.71
Average				**0.73**

Source: Bloomberg, ACG Analysis

Table C.7 Relative asset and equity betas of New Zealand comparator transport sector firms

Company	Country	Raw Equity Beta	Debt/assets ratio	Asset beta
Auckland International Airport Ltd	New Zealand	0.944	0.26	0.75

[47] Allen Consulting Group (2007). Railways (Access) Code 2000: Weighted average cost of capital, 2008 WACC determinations, October, pp.28-29.

Company	Country	Raw Equity Beta	Debt/assets ratio	Asset beta
Infratil Ltd	New Zealand	1.29	0.65	0.78
Port of Tauranga Ltd	New Zealand	0.873	0.31	0.67
Toll NZ Ltd	New Zealand	0.773	0.72	0.45
Average				**0.66**

Source: Bloomberg, ACG Analysis

D Market risk premium – Supplementary information

The purpose of this attachment is to provide further details of regulatory precedent and market survey evidence in regards to the market risk premium.

D.1 Regulatory decisions on the MRP

Brief summaries of Australian regulators' approaches to estimating the MRP are presented below.

D.1.1 IPART

IPART derives its feasible WACC range from a range based on long run averages and a range based on current market data.

Under this approach, it will still use long run historical averages of the MRP, which it values at between 5.5% and 6.5%, to estimate its long run average WACC range. Its current WACC range reflects the current implied MRP, which is derived from DGM estimates.

In its most recent semi-annual update for August 2017, IPART's range for the MRP extends from 6.0% (mid-point of long term average range) to 9.5% (mid-point of current range), with a mid-point of the two ranges of 7.80%.[48]

However, IPART's MRP estimate as a margin above the contemporary risk free rate is likely to be greater than this reported value because of the higher risk free rate assumed in its approach (3.4%, due to its 50% weighting on the 10-year risk free rate estimate).

D.1.2 ERA (WA)

In 2015, the ERA completed a review of the methodology it applies to estimate the WACC for rail networks. In its first Draft Determination for this review released in June 2014, the ERA's assessment of the MRP was primarily informed by historical averages and the DGM.[49] It arrived at a range of 5% to 7.5% and stated that it will apply judgement as to where it will select the point estimate at any point in time. For that Draft Determination, it proposed a value of 6%.

[48] IPART (2017). WACC Biannual Update, August, p.2.

[49] ERA (2014b). Review of the method for estimating the weighted average cost of capital for the freight and urban rail networks, Draft determination, 5 June.

Subsequently, the ERA fundamentally changed its approach to estimating the MRP for rail networks. In a revised Draft Decision issued in November 2014, it proposed to solely rely on the Wright approach.[50] The ERA further revised its position in the Final Decision issued in September 2015 and took into consideration estimates informed by historical excess returns (Ibbotson and Wright) and DGMs.[51] It stated it is more inclined towards the Wright approach as "a strong indicator for the likely return on equity for the next 50 years, given the statistical evidence for the mean reversion of the return on equity."[52] It arrived at a final estimate of 7.3%.

It took a similar approach in its assessment for ATCO Gas, where it applied a MRP of 7.6%.[53] It applied an updated value of 7.4% in its most recent determination for the Dampier to Bunbury Pipeline.[54] In its June 2015 decision for ATCO, the ERA commented on its approach as follows:[55]

> Most significantly, the Authority has now concluded that it is not reasonable to constrain the MRP to a fixed range over time. The erratic behavior of the risk-free rate in Australia to date, and more particularly, its pronounced decline in the current economic environment, leads to a situation where the combination of a fixed range for the MRP and prevailing risk free rate may not result in an outcome which is consistent with the achievement of the average market return on equity over the long run.
>
> The results indicated the market return on equity was stationary [consistent with the Wright approach for estimating the MRP] ... with the analysis supporting a conclusion that the MRP is non-stationary. This finding led the Authority to the important conclusion that the long run historical estimate of 6 per cent could be a poor predictor of the MRP prevailing in future regulatory periods.

We note that the changing values applied by the ERA primarily reflect changes in the DGM estimates, which are more volatile through time (compared with comparatively stable historical excess returns).

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50 ERA (2014a).

51 ERA (2015a). Final decision on the review of the method for estimating the weighted average cost of capital for the regulated railway networks, 18 September.

52 ERA (2015a). p.145.

53 ERA (2015b). Final decision on proposed revisions to the Access Arrangement for the Mid-West and South-West gas distribution systems, Submitted by ATCO Gas Australia Pty Ltd, 30 June.

54 ERA (2016). Final decision on proposed revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016-2020, 30 June.

55 ERA (2015b), p.249.

D.1.3 AER

Under the AER's Rate of Return Guideline, the AER is proposing to estimate the MRP having regard to historical excess returns, DGM estimates, survey evidence and conditioning variables.[56] The key difference from previous approaches is that it may place some weight on forward-looking DGM estimates, which could see more variability in the MRP estimate through time. Unlike previously, the AER has not stipulated the value of the MRP in the Guideline but will review it at the time of each revenue determination.

In its Explanatory Statement accompanying its Final Decision on the Guideline[57], the AER arrived at a range for the MRP of 5% to 7.5% (with historical averages informing the lower bound and DGM estimates the upper bound). It arrived at a point estimate of 6.5%, which was consistent with its post-GFC uplift previously applied under its Statement of Regulatory Intent. It set out its reasons based on the consideration of the relative strengths and weaknesses of each piece of evidence. It did not stipulate weights but stated that "greatest consideration" was given to historical averages, followed by the DGM estimates and then surveys.[58]

Unlike previously, the AER has not prescribed the MRP in its guideline, which reflects a view that it is likely to vary through time (although this does not imply that it is considered highly variable or volatile). However, it has consistently applied a MRP of 6.5% in all decisions made under that guideline since it was finalised in December 2013.

D.1.4 QCA

The QCA has applied four main methods to estimate the MRP, being three forms of historical averaging (the Ibbotson, Siegel and Wright methods), survey evidence (including independent expert reports) and the Cornell DGM.

It had previously applied equal weights to each approach but similar to the AER, proposes a more flexible approach based on judgement. It concluded that 6.5% was the most appropriate value at the time and it has continued to apply this value in decisions made since then, including its most recent Draft Decision for DBCT, where it rejected DBCT Management's proposed MRP of 8%.[59]

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[56] The AER does not explain what it means by 'conditioning variables'.

[57] AER (2013b). Better regulation: Explanatory statement, Rate of return guideline, December.

[58] AER (2013b), p.95.

[59] QCA (2016). DBCT Management's 2015 draft access undertaking, Draft decision, April.

However, in its UT5 draft decision for Aurizon Network in December 2017, the QCA approved Aurizon Network's proposed MRP of 7%. The QCA stated that it in light of stakeholder submissions, it reviewed its position on the Wright approach and will now give "more regard to estimates from the Wright method".[60] In reaching this conclusion, the QCA noted that its analysis suggesting greater stability in the MRP than the return on equity over time was "not determinative, given the limitations identified."[61]

D.1.5 ESCOSA

In its June 2016 for SA Water, ESCOSA applied a MRP of 6%, expressing a preference for historical excess returns. It considers that the DGM approach is "potentially volatile and unreliable." It also notes that this is the value it has applied to SA Water in previous determinations.

D.1.6 Essential Services Commission (Vic)

The ESC does not have any formal guidelines in place that outline its approach to assessing WACC.

We note that in its June 2016 Melbourne Water decision it applied a MRP of 6%, which was originally contained in a Guidance Paper.[62] The reasoning behind this was not provided. It reflects a preference for relying on historical excess returns to estimate the MRP.

D.2 Market surveys

D.2.1 Fernandez's surveys

Of the surveys frequently cited by regulators is one conducted by the Spanish academic Pablo Fernandez. Frontier Economics (2016) raises the concern that this source consistently reports an MRP in the range of 6%, regardless of the conditions in financial markets.[63]

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[60] QCA (2017). Aurizon Network's 2017 draft access undertaking, Draft decision, December, p.493.

[61] QCA (2017), p.493.

[62] ESC (2015). Melbourne Water 2016 price review, Guidance paper, March. We note that 6% was also applied to Goulburn Murray Water in its June 2016 decision, although for a different reason, which was the need for consistency with the ACCC's Pricing Principles for Price Determinations and Approvals under the Water Charge (Infrastructure) Rules 2010. These Pricing Principles prescribe an MRP of 6%.

[63] Frontier Economics (2016). The market risk premium: Report prepared for Aurizon Network, November.

However, in the 2017 Fernandez et al. survey, the average (median) MRP was estimated to be 7.3% (7.6%) for Australia.[64] However, in a report for the QCA, Lally (2017) argued that this Australian MRP estimate was higher than any other developed country in the survey (other than Portugal) and that the sample size was relatively small (26 responses, roughly one third of the previous year's responses).[65] Thus, there are substantial issues regarding how much weight can be placed on evidence from market surveys.

Respondents were identified as finance and economics professors, analysts and managers of companies obtained from previous correspondence, papers and webs of companies and universities, but there is no further information presented about the specific qualifications of these respondents. The survey does not ask respondents for what purpose they are using their estimate of the MRP.

Lally (2003) notes that "the respondents to these surveys are academics, analysts, and managers rather than investors per se."[66] Hence it is unlikely that the overwhelming majority of any of the survey respondents would be employing their estimate of the MRP to reach real-world investment decisions.

Another issue relates to response rates. Emails were sent to 22,500 email addresses with 2,396 emails received in reply. Whilst this is probably a reasonable response rate for an international survey, there is no real indication of how the non-response may impact upon the results.

On top of this, there is evidence that many respondents may simply base their estimates on textbooks or historical data, meaning that there is often no real value added compared to other measurements.

D.2.2 Asher and Hickling Surveys

Regulators including the ACCC also rely upon the Asher and Hickling *Equity Risk Premium Surveys*. In a summary of the survey results, Asher and Carruthers (2016) discuss the methods that survey respondents use for determining their MRP estimates:[67]

> Most people (52%) used a variety of methods for determining the equity risk premium, with forward looking measures (21%) more prevalent than historical data

[64] Fernandez, P., Pershin, V. & Acin, I.F. (2017). Discount rate (risk-free rate and market risk premium) used for 41 countries in 2017: a survey.

[65] Lally, M. (2017). Review of submissions from Frontier Economics on the WACC for Aurizon Network. 8 November, p.19

[66] Lally M. (2013). Response to submissions on the risk-free rate and the MRP, p.23.

[67] Asher A. and Carruthers, D. (2016). Equity risk premium survey 2015, Actuaries Digital, Available from: https://www.actuaries.digital/2016/05/26/equity-risk-premium-survey-2015/ [Accessed 4 May 2017].

> (17%) for the rest. The methodology for determining the ERP ranged from detailed modelling to "gut feel based on 40 years' experience". Gut feel has a bad name in some quarters … but only time will tell which method proves to be most accurate.

KPMG Australian Valuation Practices Survey

With regard to the KPMG *Australian Valuation Practices Survey*, 40% of participants state that they 'always' adjust the CAPM rate of return by a premium, to reflect unique risks that are not modelled in the forecast cash flows.[68] The remaining 60% report doing this at least 'sometimes', while no respondent stated that they 'never' make an adjustment. In terms of the methodology used to adjust the CAPM rate of return, 13% of respondents relied solely on the historic equity bond spreads, 26% relied solely on the expected premium, while the majority (61%) used a combination of the two.

The Australian Competition Tribunal has also raised concerns about the use of market surveys:[69]

> Surveys must be treated with great caution when being used in this context. Consideration must be given at least to the types of questions asked, the wording of those questions, the sample of respondents, the number of respondents, the number of non-respondents and the timing of the survey. Problems in any of these can lead to the survey results being largely valueless or potentially inaccurate.
>
> When presented with survey evidence that contains a high number of non-respondents as well as a small number of respondents in the desired categories of expertise, it is dangerous for the AER to place any determinative weight on the results.

In a report to Corrs Chambers Westgarth, McKenzie and Partington list several shortcomings associated with surveys:[70]

- Selecting an appropriate survey group that is representative of actual investors.
- Low response rates, and the extent to which survey authors deal with response bias.
- The lack of justification for respondents' claims
- The effect of question wording on responses – ambiguity can lead to diverse responses

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[68] KPMG (2015). Australian valuation practices survey 2015, May, p.21.

[69] *Application by Envestra Ltd (No 2)* [2012], ACompT 3, para. 162-163.

[70] McKenzie, M. and Partington, G. (2011). Equity market risk premium: Report to Corrs Chambers Westgarth, p.19.

- How respondents adjust their opinions in relation to changing market conditions

D.2.3 Synergies' view

Based on the above expert opinions, we surmise that surveys need to meet three broad criteria to provide an informed estimate of the MRP:

- they must be timely;
- there must be clarity around what question the respondents were asked to answer; and
- the survey must gauge the market's view of the MRP and not the view of a small, unrepresentative sample.

Whilst open to interpretation, there appear to be very limited circumstances where a survey would meet all three criteria and therefore would be eligible for inclusion in a robust regulatory determination on MRP.