

WEIGHTED AVERAGE COST OF CAPITAL

Discussion Paper

**INDEPENDENT PRICING AND REGULATORY TRIBUNAL
OF NEW SOUTH WALES**

WEIGHTED AVERAGE COST OF CAPITAL

Discussion Paper

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Independent Pricing and Regulatory Tribunal
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1 INTRODUCTION

In the near future, the Tribunal will be reviewing its pricing decisions on electricity distribution, gas distribution access, water and transport. When conducting these price reviews, an important factor is to determine the return on assets. Current regulatory practice determines the return on assets by applying a cost of capital to an asset base.

At present there are some major issues being raised regarding the cost of capital. Thus this discussion paper focuses on the cost of capital, in particular the Weighted Average Cost of Capital (WACC). The feedback and information provided in response to the matters raised in this paper will be considered by the Tribunal when making its decision on the cost of capital in the up and coming industry reviews.

The Tribunal is interested in the current market and industry practice adopted with regards to the WACC. In particular, the Tribunal is interested in your comments and views regarding the current major issues of:

- ***Whether the rate of return should be determined as a post-tax or pre-tax,***
- ***Whether the tax rate should be based on the statutory rate or an effective tax rate, and***
- ***What the appropriate assumption for the other WACC parameters are.***

The issue of a post-tax or pre-tax method is discussed in section 2.1 and the issue of the tax rate is discussed in section 3.2.1.

The paper does not address the theoretical arguments for and against using the WACC or Capital Asset Pricing Model (CAPM). The Tribunal has previously indicated its views on this in the AGL Gas Network final determination and the electricity distribution price determination. The issue has also been discussed extensively in various other reviews. The relevant papers are available from the websites of the various regulators (refer to the reading list in Attachment 2).

1.1 Current regulatory environment

Regulators and the regulated industries have generally accepted the CAPM and WACC as the method to determine the cost of capital.

In earlier reviews and determinations by Australian Regulators, the cost of capital was commonly expressed as a pre-tax real WACC. However the regulators generally commented that the cost of capital would be reviewed in light of future developments.

Recently, the Australian Competition and Consumer Commission (ACCC) and Queensland Competition Authority (QCA) have released determinations where the WACC has been formulated based on a nominal post-tax approach. The Essential Services Commission (ESC) has adopted a real post-tax approach, while the Office of Gas Access Regulation (Ofgar) still expresses the WACC in terms of pre-tax real.

Overseas experience

Regulatory decisions in the US generally express the cost of capital as nominal post-tax, applied to the depreciated actual historic cost incurred to build the asset. However, US

regulators tend to focus more on the return on common equity and adopt parameters based on the company's actual position rather than industry benchmarks. US energy regulators generally regulate on the basis of nominal asset values and do not permit revaluation of assets.

The UK regulator Ofgem generally expresses its cost of capital in real pre-tax terms and uses the statutory tax rate. Ofwat on the other hand expresses the cost of capital as real post-tax and adds the projected tax costs to revenue.

The Ontario Board of Energy (OBE) in Canada has released a handbook for the calculation of a Market Base Rate of Return. In it, OBE indicates that the rate of return will be post-tax nominal, once the market opening date is established. Currently the handbook presents the nominal cost of equity and cost of debt, excluding tax payments.

Table 1 below presents a summary of the WACC in recent determinations. Note that though ESC and ACCC have adopted a post-tax approach, they have also indicated the real pre-tax WACC equivalent. QCA has only presented the post-tax nominal WACC. It adds on the tax expense forecast of the utilities in the cash flows.

Table 1 Summary of recent WACC decisions by Australian Regulators

		WACC		
		Pre-tax real	Post-tax Real	Post-tax Nominal
IPART				
Electricity (Final)	Dec 99	7.50%	3.48 – 4.84%	6.58 - 7.98%
AGLGN (Final)	Jul 00	7.75%	3.75 – 4.92%	6.69 - 7.89%
Rail (Final)	Apr 99	8.00%		
Water (Final) ¹	Sep 00	6.10%	3.33 – 4.64%	6.20 - 7.60%
ACCC				
Powerlink (Draft)	Jul 01	7.04%	4.68%	7.00%
Epic Energy (Final)	Sep 01	7.14%	5.25%	7.58%
ESC²				
Electricity (Final)	Sep 00	6.80-7.20%	6.80%	
Gas (Draft)	Jul 02	6.70-7.40%	6.70%	
QCA				
Gas Networks (Draft)	Mar 01		6.70%	9.26%
Electricity (Final)	May 01		5.85%	8.05%
Rail (Final)	Jul 01		6.01%	8.68%
Ofgar				
Goldfields Pipeline (Draft)	Apr 01	7.95%	4.80%	7.05%
Tubridgi (Final)	Oct 01	8.20%	4.96%	7.52%

Note - Values in bold are the actual decisions made by the regulators.

1. This is the return on asset for the year 2003 for Sydney Water Corporation.
2. The pre-tax real WACC for ESC is derived by adding the tax wedge to the post tax real WACC.

From the above table, a comparison of the pre-tax real and post-tax real WACC highlights the significant difference between adopting a statutory tax rate over an effective tax rate.

Table 2 Overseas Regulatory WACCs

		Nominal Cost of Equity	WACC		Post-tax Nominal
			Pre-tax real	Post-tax Real	
Ofgem					
Electricity Distribution	Dec 99		6.50%		
Electricity Transmission	Jan 00		6.25%		
Ofwat					
Water				4.25-5.25%	
US					
Iowa Utilities Board ¹	Jun 02	11.30%			9.39%
FERC ²	Jul 98	12.49%			10.81%

Notes:

1. MidAmerican Energy Company – Gas Distribution.
2. Transcontinental Gas Pipe Line Corporation – Gas Transmission.

In the current environment, there are three major issues to consider when determining the WACC.

1. The form in which it is presented – that is, real vs nominal and pre-tax vs post-tax. (See section 2)
2. Application of a statutory or effective tax rate (see section 3.2.1).
3. Assumptions on the other WACC parameters (see section 3.2).

2 FORM OF PRESENTATION

Currently the major regimes adopted in Australia's regulatory decisions are:

- Real dollar terms at a pre-tax level.
- Real dollar terms at a post-tax level.
- Nominal dollar terms at a post-tax level.

2.1 Pre-tax vs post-tax

The issue of a post-tax or pre-tax WACC can be separated from the issue of statutory or effective tax rate. Regardless of which regime is adopted, a decision on the tax rate will be required. Hence the choice of expressing the cost of capital as a post-tax or pre-tax should depend on the merits of doing just that.

A pre-tax approach includes an allowance for tax as part of the WACC (return on asset). Under a post-tax approach, tax is included in expenditure cash flow rather than the WACC.

The use of a pre-tax rate of return introduces the problems and complexity of transforming the post-tax nominal rate, as produced by the WACC, into a pre-tax value. This is highlighted in the Tribunal's current electricity network determination¹ issued in 1999, which estimated the range of feasible WACC is 5.0 – 8.5 per cent. This range was established by taking the minimum and maximum value resulting from the use of both the reverse transformation² and the market transformation³. As a result, the lower end of the range arose from the use of the reverse transformation and the upper end resulted from the market transformation. Using only one of the transformation methods would have yielded a narrower range for the WACC.

The ACCC⁴ also discussed a number of problems associated with converting a nominal post-tax WACC to a real pre-tax WACC, including that:

- conversion formulae have been shown to be significantly in error in ensuring the correct return on equity, although this problem can be overcome by modelling the expected cash flows and taxes over the life cycle of the asset portfolio, and
- the conversion process is unsuitable for assessing revenues over multiple periods where the business regime (principally taxes and inflation) is more likely to change, as it is extremely difficult to adjust the returns already allowed to take account of the new business regime, resulting in over or under recovery of costs.

In moving to a post-tax approach, the debate on the sequence of transformation would no longer be an issue.

In the current Victorian gas access arrangement reviews, the utilities have all stated that they prefer the use of a pre-tax real method, as opposed to the ESC's method of a post-tax real. TXU Networks and Multinet both comment that:⁵

- the post-tax approach produces negative impacts on incentives across the board
- a high degree of complexity is involved in the tax calculations
- a post-tax approach offers no greater advantage than the pre-tax approach, and
- a post-tax approach exposes businesses to further regulatory risks.

However it is not clear whether this reflects a preference between the pre-tax and post-tax approach or a linkage of the choice between effective and statutory tax rates to the form in which the WACC is specified. This issue of a statutory or effective tax rate is not integral to the decision of a post-tax or pre-tax WACC. Continuing with a pre-tax WACC approach would not eliminate these concerns per se. They would continue to arise if an effective tax rate were used in calculating the WACC. The advantages and disadvantages of the post-tax and pre-tax methods are summarised below.

¹ IPART, *Regulation of New South Wales Electricity Distribution Networks, Determination and Rules Under the National Electricity Code*, December 1999.

² The reverse sequence is: nominal post-tax => real post-tax => gross up to real pre-tax.

³ Market transformation sequence is: nominal post-tax => nominal pre-tax => real pre-tax.

⁴ ACCC, *New South Wales and Australian Capital Territory Transmission Network Revenue Caps 1999-00 to 2003-04*, Final Decision., January 2000.

⁵ TXU Networks, 2003 Gas Access Arrangement Review, *The Weighted Average Cost of Capital for Gas Distribution*, March 2002, p 42.

Multinet Gas, *Access Arrangement Information Schedule 1 – Weighted Average Cost of Capital for Gas Distribution*, March 2002, p 39.

Table 3 Post-tax vs pre-tax

Post-tax	Pre-tax
Advantages	
✓ Eliminates the complexities associated with the transformation from post-tax to a pre-tax.	✓ Consistent with previous regulatory decisions.
✓ Cash flow modelling of tax costs more transparent.	✓ Light handed incentive regulation. <i>Participants have commented that tax modelling in cash flows is heavy handed.</i>
✓ Consistent with market practice.	✓ Appropriate for Government owned entities as the taxes and dividends are paid to the same body – ie the government. ✓ With the exception of AGLGN, Albury Gas Company and other privately owned utilities that are regulated.
✓ Consistent with the regulatory decisions of ACCC, ORG and QCA.	
Disadvantages	
✗ Risk of under or over estimating tax liabilities. <i>Variant between allowed tax expense and actual tax paid is more transparent.</i>	✗ Conversion to a pre-tax WACC varies with the transformation method and tax assumptions.
	✗ Not directly comparable to market benchmarks.
	✗ Risk of not providing sufficiently for taxes. <i>Under a post-tax regime where tax liabilities are forecast in the cash flows, the allowed revenue provides more certainty to the businesses.</i>

The Tribunal invites feedback on the pros and cons of adopting a pre-tax or post-tax approach. In particular if the pre-tax real approach is preferred what are your opinions regarding the sequence of transformation?

2.2 Real vs nominal

Theoretically, the use of a nominal or real regime should yield the same result if the indexation is applied correctly and consistently. There are both benefits and disadvantages in adopting either a real or nominal approach. These are summarised below.

Table 4 Real vs nominal

Real	Nominal
Advantages	
✓ Consistent with past regulatory practice.	✓ Consistent with market practice. <i>Tariffs, financial report items, taxes etc are usually presented in nominal dollars.</i>
✓ Easy to apply to real regulatory asset base. <i>ESC comments that where revenue streams are linked to inflation, it is the real WACC that is important rather than the implied nominal returns.⁶</i>	
Disadvantages	
✗ Not consistent with market practice. <i>Not readily comparable to market benchmarks.</i>	✗ Imposes risk given inflation assumption over the pricing period is locked in. <i>There may be a need for a mechanism to adjust for errors in forecasting inflation, this will add a further layer of complexity</i>
	✗ Need to deflate the regulatory asset base. <i>Applying a nominal rate of return to an inflating asset base can lead to possible double counting, which will need to be adjusted for (refer to ACCC's Powerlink draft determination⁷).</i>

The Tribunal invites feedback on the pros and cons of adopting a nominal or a real rate of return.

3 COST OF CAPITAL

The WACC is a weighted average of the cost of equity and debt. Regulatory decisions in Australia have generally determined the cost of debt as a margin over the risk free rate, while the cost of equity is calculated using CAPM.

3.1 Capital Asset Pricing Model (CAPM)

The CAPM is relatively simple to apply in theory and is widely supported by commercial enterprises and other regulators. The CAPM formula (below) essentially states that the required return of an investor is equal to the risk free rate available in the market, plus a premium above the risk free rate, commensurate with the risk taken by the investor.

$$R_e = R_f + \beta_e (R_m - R_f)$$

R_e = Return on equity

R_f = Risk free rate as observed in the market

R_m = Market rate of return

β_e = Equity beta measures the correlation between the asset's risk to the overall market. Current practice is to estimate the equity beta using the Monkhouse formula.

⁶ ESC, *Electricity Distribution Price Determination 2001-5*, Draft Decision, May 2000, p 149.

⁷ ACCC, *Queensland Transmission Network Revenue Cap 2002-2006/07*, Draft Decision, July 2001, p 68.

The most commonly used CAPM model to estimate the cost of equity assumes that national capital markets are completely segregated. As a result, inputs to the CAPM are based on local markets rather than on a global market. However there have been arguments that a global view should be taken, given the integration of the Australian market with overseas markets. Lally comments that, "...in so far as some recognition is given to international influences on the cost of equity for Australian companies, the effect should be to reduce the cost of equity."⁸

Regulatory decisions have thrown up the issue of whether a domestic or international CAPM should be adopted.⁹ The assumption of domestic or international would impact on the considerations of the WACC parameters, including the market risk premium, risk free rate and value of franking credits.

Though the actual ownership varies between utilities, it is open to question whether the parameters for the WACC for a utility should reflect the specific ownership of the utility or an industry/economy wide model. So far the Australian regulators have decided on applying domestic assumptions to the CAPM.

The model is simply CAPM. The issue regarding international or domestic is whether the components used in it, and in the debt side of the WACC, should be based on international or domestic market-observed inputs. The Tribunal seeks feedback on the arguments for and against the assumption of a domestic or international CAPM model.

3.2 Weighted Average Cost of Capital (WACC)

There have not been many disputes as to the application of the WACC; debate is more focused on the determination of some of the parameters. In particular, the calculation of the WACC is affected by the value of imputation credits and tax concessions. Thus in working out the WACC, adjustments for taxation and imputation credits needs to be accounted for.

$$\text{WACC} = R_e \times \frac{E}{V} + R_d \times \frac{D}{V}$$

$$\text{Post-tax WACC} = \frac{R_e (1 - t)}{1 - t(1 - ?)} \times \frac{E}{V} + R_d (1 - t) \times \frac{D}{V}$$

- R_e = Nominal Post-tax Cost of equity (as calculated using the CAPM)
- R_d = Nominal Post-tax Cost of debt
- t = Tax rate
- $?$ = value of imputation credits
- D = Total debt
- E = Total equity
- V = Debt + Equity

The parameters making up the WACC/CAPM are discussed below.

⁸ M. Lally, *Estimating the cost of Australian equity capital*, JASSA Issue 2, Winter 2002, pp 9-13.

⁹ ESC, *Review of Gas Access Arrangements, Draft Decision, Appendix C*, July 2002, pp 266-269.

3.2.1 Tax rate

Presently, the value for tax is a prominent issue. Regulatory decisions have begun to adopt effective tax rates rather than use the statutory rate. However, utilities argue that the use of an effective rate negates government policies to promote investment in the industry.

In moving to a post-tax regime, ACCC, QCA and ESC have adopted an effective tax rate rather than the statutory tax rate. ACCC and ESC have estimated benchmark effective tax rates by modelling tax depreciation. QCA have adopted the utility's forecast tax expense, thereby effectively determining individual company tax positions.

While the change to effective tax rate is often linked to a move from a pre-tax to a post-tax WACC, the two decisions are in fact separable. A post-tax WACC approach could include within the cash flow calculations an allowance for tax that uses either an effective or statutory tax rate. Similarly the tax rate assumption within a pre-tax WACC could be based on a statutory or effective tax rate. However, it has been argued that it is more administratively and computationally difficult to adjust for effective tax rates under a pre-tax approach.

Recently, the Australian Gas Association (AGA) raised concerns over the regulators adopting an effective tax rate. In a letter to the Minister for Energy,¹⁰ AGA commented that regulatory decisions that adopted effective tax rates effectively pass to consumers benefits provided by taxation arrangement, thereby frustrating incentives provided by the government.

However, if it is considered that regulation should mimic a competitive market, it could be argued that regulators should use a WACC that mimics what would happen if the business were an efficiently operated competitive business. Is tax an expense, like capex and opex and interest – in the latter three cases, regulators commonly assume efficient market costs. If so why not do the same for tax?

The ESC and ACCC have argued that to preserve tax changes for the benefit of owners is inconsistent with a competitive market model. That is, the market does not allow benefits to be retained by owners, rather the tax concessions stimulate investment by lowering the cost of prices and promoting increased demand.

Practically it would be impossible for the regulators to replicate the business' actual tax planning in the financial modelling. The ACCC and ESC model a benchmark industry tax position. This is a high level modelling based on basic business tax planning. Only major items are taken into account, including depreciation and capital contributions. If a utility can attain more tax benefits, say through corporate restructuring, then they would be allowed to retain it as incentive/reward for prudent tax planning.

Under the ACCC and ESC's recent decisions, the effective tax rates for the businesses are indeed much lower than the statutory tax rate of 30 per cent. There are various benefits and disadvantages with the use of an effective tax rate or statutory tax rate. These are tabled below.

¹⁰ Letter from The Australian Gas Association to the Minister for Energy, The Hon Kim Yeadon MP, 1 July 2002, Re commonwealth Government Decision on Effective Life Caps for Gas Distribution Networks and Pipelines.

Table 5 Statutory vs effective tax rate

Effective tax rate	Statutory tax rate
Advantages	
<p>✓ Cashflow modelling based on effective tax rate is more consistent with market outcomes. <i>Arguably, government policy ultimately aims to benefit consumers, through investments and not provide windfall gains to the businesses. Hence using an effective tax rate helps to pass on these benefits in the form of lower cost (hence lower prices).</i></p>	<p>✓ Light handed incentive regulation.</p>
<p>✓ Consistent with the regulatory decisions of ACCC, ORG and QCA.</p>	<p>✓ Simple to apply.</p>
Disadvantages	
<p>✗ Increased information requirements. <i>Arguably, such information should be readily available, as the businesses would need it for their actual tax reporting to the ATO.</i></p>	<p>✗ Almost certain to be higher than the actual tax paid, hence providing the businesses with a higher return than intended (at the expense of consumers). <i>Not consistent with competitive market model</i></p>
<p>✗ Increase in modelling complexity. <i>Taxation cashflow will have to be assessed and modelled. How reasonable is the benchmark tax modelling compared to the business' actual tax modelling?</i></p>	<p>✗ Appears to be less commonly used by other regulators in Australia and overseas.</p>
<p>✗ The Tribunal may have to engage professional tax consultants to derive the industry average effective tax rate. This could become a very costly exercise for all the industries we regulate. Who should pay for the costs? <i>ESC sought professional tax advice from BDO Parkhill.</i></p>	
<p>✗ Risk of under or over estimating tax liabilities. <i>How large is this risk, especially of underestimation if only a high level tax modelling was carried out?</i></p>	

The Tribunal invites comments on the preferences for the use of an effective or statutory tax rate. If an effective tax rate is preferred, how should it be determined? Is the method used by ACCC and ESC appropriate?

3.2.2 Risk free rate

The Tribunal's current practice is to determine the nominal and real risk free rate as a 20-day average of the Ten Year Commonwealth Government Bond Rate Index¹¹ and the Ten Year Capital Indexed Bond Rate, respectively. Using this method, the value of the risk free rate is dependent on the time at which the decision is made.

¹¹ The use of the bond index is because it accounts for the timing of the decisions being made. Source for the Ten Year Bond Index is from Lewis Securities, published in the Australian Financial Review.

Table 6 Nominal risk free rate calculation methods

	Method used	Basis
IPART	20 day average	10 Yr Commonwealth Bond Index
ESC	20 day average	10 Yr Commonwealth Bond
QCA	20 day average	10 Yr Commonwealth Bond
Ofgar	20 day average	10 Yr Commonwealth Bond
ACCC	40 day average	5 Yr Commonwealth Bond

Regardless of a 20 or 40 day average, the bottom line is that a current rate is adopted, as opposed to a longer dated historical average.

The Tribunal welcomes any comments relating to the method of determining the risk free rate.

3.2.3 Market Risk Premium (MRP)

In the last rounds of electricity and gas reviews over the period of 1997-2000, the Tribunal adopted a MRP of 5.0 – 6.0 per cent. This was after considering various market studies and submissions. In the recent determinations of ACCC, ESC, QCA and Ofgar, a MRP of 6 per cent was used in the calculations.

In the current Victorian Gas reviews, Envestra and Multinet have proposed a MRP of 7.3 and 7.0 per cent MRP, respectively. They support their proposal by citing new studies by Welch and Dimson, Marsh and Staunton. TXU has maintained a MRP of 6 per cent. In its draft decision, ESC has maintained a 6 per cent MRP, after having regard to various studies and practitioner surveys.

Various studies have tried to estimate the MRP in the Australian market, these studies are summarised in the table below.

Table 7 MRP studies

Study	Time period of study	MRP	Method of averaging
Officer (1989)	1982-1987	7.9% 6.6%	Arithmetic Geometric
Officer (1989) Updated	1982-1997	7.1% 5.7%	Arithmetic Geometric
Hathaway (1996)	1882-1991	7.7%	Arithmetic
Hathaway (1996)	1947-1991	6.6%	Arithmetic
Centre for Research in Finance (1999)	1974-1998	4.8% 2.8%	Arithmetic Geometric
Centre for Research in Finance (1999) – excluding Oct 1987	1974-1998	6.4% 4.9%	Arithmetic Geometric
Ibbotson Associates (1999)	1970-1998	3.4%	Arithmetic
Dimson, Marsh and Staunton (2000)	1900-2000	7.6 (nominal) 6.5 (real)	Geometric
Welch (Survey 2000)	Oct 98-late 98	7.1%	Arithmetic
Welch (Survey 2001)	Aug 2001	5.5%	Arithmetic
Graham & Harvey (2001)	June 00-Sep 01	3.6 – 4.7%	Survey of 1107 CFO
Mercer Investment Consulting (2002)	May 02	3.0%* 4.0% (incl franking credits) 3.0-6.0%	Arithmetic Broker survey

* This value reflects that used by Mercer Investment Consulting in its asset allocation advice to institutional investors. In addition, Mercer Investment Consulting also surveyed various brokers on their assumptions of the equity risk premium.

The Tribunal invites feedback on the current market practice with regards to the market risk premium.

3.2.4 Betas

Beta reflects the variability of returns in a sector to changes in economic trends. It is assessed relative to the average variability for the market as a whole.

Asset beta

In the regulatory case, the asset is the regulatory asset base. The asset beta reflects the operational risk and excludes the financial risk introduced by the capital funding behind the assets. To take into account the gearing, the asset beta is levered up to attain the equity beta.

In the Tribunal's 2000 AGL Gas Network final decision, a range of 0.40-0.50 was adopted for the asset beta. In the 1999 Electricity Distribution final decision the range of 0.35-0.50 was adopted. Table 8 presents the recent asset betas adopted in regulatory decisions.

Table 8 Asset betas

			Asset beta
IPART			
Electricity	Dec 99 FD		0.35-0.50
AGLGN	Jul 00 FD		0.40-0.50
ACCC			
Powerlink	Jul 01 DD		0.40
Epic Energy	Sep 01 FD		0.50
ESC			
Electricity	Sep 00 FD		0.40
Gas	Jul 02 DD		Not provided
QCA			
Gas Networks	Mar 01 DD		0.55
Electricity	May 01 FD		0.45
Ofgar			
Goldfields	Apr 01 DD		0.65
Tubridgi	Oct 01 FD		0.65

Note: FD means Final Decision and DD refers to Draft Decision.

Debt beta

The issue of a debt beta first appeared in the Victorian 1998 gas access arrangement approval process. The Tribunal's current decisions assume a debt beta of 0.06. However current regulatory decisions have all assumed debt betas in the range of 0-0.28.

Similar to an asset beta, a debt beta reflects the risk of a debt security and how it correlates with the market. The risk involved in debt securities is the default risk. Where the risk of debt is not related to the market what so ever, then the debt beta would be zero. If there was no default risk, then the debt beta is irrelevant.

Arguably, the issue of debt beta would be important for businesses that are net lenders, i.e. with large amounts of capital invested in debt securities. Given that the regulated utilities invest little in debt instruments, the debt beta is likely to be small.

The Tribunal seeks feedback on whether a debt beta is used in market practice, what it represents and hence whether it should be included in regulatory decisions.

Equity beta

Currently, the equity beta is calculated using the Monkhouse formula. As a result, the equity beta will be affected by the assumption on gearing, asset and debt betas, debt margin and tax.

$$\text{Monkhouse formula} \quad \beta_e = \beta_a + (\beta_a - \beta_d) \left(1 - \frac{R_d}{(1 + R_d)T}\right) \times \frac{D}{E}$$

β_e = Equity beta

β_a = Asset beta

β_d = Debt beta

R_d = Cost of debt

D = Proportion of debt funding

E = Proportion of equity funding

T = Tax rate

Apart from the Monkhouse formula there are other formulae that can be used, these include the Hamada formula and the simple formula.

$$\text{Hamada formula is} \quad \beta_e = \beta_a \left[1 + (1 - T) \frac{D}{E}\right]$$

$$\text{Simple formula is} \quad \beta_e = \beta_a \times \frac{(D+E)}{E} + \beta_d \times \frac{D}{E}$$

Unlike asset betas, which cannot be observed in the market, equity betas for listed companies can be observed and then delevered. Various financial information providers publish information on equity betas, though in the case of Australian utilities the number of companies is limited.

The Tribunal seeks feedback on the levering formula most commonly used in the market? That is should regulators be using the Monkhouse formula or another formula, and why?

3.2.5 Gearing

In the last determination, the gearing assumption of 60 per cent debt funding was adopted based on industry benchmarks. Recent decisions have maintained this gearing ratio.

The Tribunal seeks comments on the efficient level of gearing for regulated monopolies?

3.2.6 Cost of debt

The cost of debt is generally determined by applying a debt margin over the risk free rate. In the Tribunal's AGLGN and electricity determinations, the debt margin was set as a range between 90-110 basis point and 80-100 basis point, respectively. This was determined after having regard to the margins achieved in debt issues at that time. Recent decisions of other regulators have adopted higher debt margins.

Table 9 Debt margins

		Debt Margins
IPART		
Electricity	Dec 99 FD	0.9-1.1%
AGLGN	Jul 00 FD	0.8-1.0%
ACCC		
Powerlink	Jul 01 DD	1.20%
Epic Energy	Sep 01 FD	1.20%
ESC		
Electricity	Sep 00 FD	1.50%
Gas	July 02 DD	1.40%
QCA		
Gas Networks	Mar 01 DD	1.60%
Electricity	May 01 FD	1.65%
Ofgar		
Goldfields	Apr 01 DD	1.20%
Tubridgi	Oct 01 FD	1.20%

The Tribunal's past practice was to consider the margins implied in corporate bond issues of infrastructure businesses, having regard to the duration of the debt, the credit rating and the amount borrowed. Other regulators have assessed debt margins after considering corporate bond issue for businesses with investment grade (usually BBB or BBB+) ratings.

The Tribunal invites feedback on how the cost of debt should be assessed and determined, in particular, how should the debt margin be determined and what additional costs should be considered.

3.2.7 Gamma

Gamma reflects the value of imputation credits when assessing the cost of capital. There has always been debate about whether gamma has any value at all. This is associated with the earlier issue of domestic or international CAPM. Arguments supporting a zero gamma value adopt an international assumption, that is, Australia is a price taker in world capital markets, and hence imputations credits have little value.

However, ACCC have argued for gamma to be valued at 1, given the use of a domestic CAPM and the changes in the Ralph Review, which allows individuals to fully benefit from imputation credits, regardless of their income.

The Tribunal's past decisions have adopted a range for gamma between 0.3-0.5. Current decisions by other Australian regulators have all adopted a gamma of 0.5.

In its recent draft decision on the gas access arrangement, ESC presents various studies that attempt to determine the value of gamma. The results vary widely from zero value to full value.

It is understood that market practice attributes little, if any value to gamma.

The Tribunal invites feedback on the value that should be attributed to gamma and the reasons supporting that value.

ATTACHMENT 1 WACCS

Table 10 Summary of current regulatory WACC decisions

	IPART			QCA		ACCC		Ofgar		ESC	
	AGLGN	Electricity	Water	Electricity	Gas Networks	Epic Energy	Powerlink	Goldfields	Tubridgi	Electricity	Gas
					Draft			Draft			Draft
Risk free rate	6.44%	6.62%	6.41%	5.36%	5.97%	5.61%	5.71%	5.35%	5.90%	6.19%	
CPI	2.83%	3.00%	2.79%	2.08%	2.40%	2.21%	2.22%	2.14%	2.44%	2.60%	
Real risk free rate	3.52%	3.52%	3.52%	3.21	3.49	3.32%	3.41	3.14%	3.38%	3.50%	3.50%
Market risk premium	5.0-6.0%	5.0-6.0%	5.0-6.0%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
Debt margin	0.9-1.1%	0.8-1.0%	0.8-1.0%	1.65%	1.60%	1.20%	1.20%	1.20%	1.20%	1.50%	1.40%
Debt funding	60%	60%	60%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%	60.00%
Gamma	0.3-0.5	0.3-0.5	0.5-0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Asset beta	0.40-0.50	0.35-0.50	0.3-0.45	0.45	0.55	0.5	0.4	0.65	0.65	0.4	
Debt beta	0.06	0.06		0.28	0.27	0.06	0	0.2	0.2		
Tax rate	30%	30%	30%					31.40%	30.00%	32-30%	
Equity beta	0.9-1.1	0.78-1.14	0.65-1.02	0.71	0.97	1.16	1.00	1.33	1.33	1.00	1.00
WACC (nominal post-tax)	6.69-7.89%	6.6-7.5%	6.2-7.6%	8.05%	9.26%	7.58%	7.00%	7.05%	7.52%	9.58%	
Post-tax real WACC	3.75-4.92%	3.50-4.37%	3.33-4.64%			5.25%	4.68%	4.81%	4.96%	6.80%	6.70%
Pre-tax real WACC	5.4-8.2%	5.0-8.5%	4.8-7.8%			7.14%	7.04%	7.95%	8.20%	6.80-7.20%	6.70-7.4%

ATTACHMENT 2 READING LIST

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