Analysis of the weighted average cost of capital for ElectraNet SA

Submission to the ACCC by Network Economics Consulting Group

April 11, 2002

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1 Introduction

ElectraNet SA Pty Ltd (ElectraNet) has asked the Network Economics Consulting Group (NECG) to prepare a report for the Australian Competition and Consumer Commission (ACCC) on the appropriate weighted average cost of capital it should be allowed to earn on its regulated transmission assets.

In this report, we have estimated a weighted average cost of capital (WACC) for ElectraNet, broadly following the approach that has been adopted by the ACCC in its previous decisions in the electricity transmission sector, its Draft Statement of Principles for the Regulation of Transmission Revenues (DRP) and decisions in other utility sectors. In so doing, we adopt parameter values for the WACC, which we believe are appropriate for ElectraNet.

Conclusion

We estimate that as of 4 March 2002 the nominal, post-tax "vanilla" WACC of ElectraNet is 10.03%. This includes the following components:

- Risk-free rate based on the 40-day average yield on 10-year Commonwealth bonds;
- a market risk premium (MRP) of 6.5%;
- an asset beta of 0.45;
- the cost of debt of 172 basis point above the risk-free rate; and
- an increment to the cost of equity capital for asymmetric risk of 0.5%.

2 Weighted average cost of capital model

Consistent with regulatory decisions across Australian industries, we use the weighted average cost of capital (WACC) model to estimate the appropriate rate of return to be earned by ElectraNet on its regulated assets.

Determination of the appropriate WACC will vary depending upon how cash flows or earnings are being discounted. There are a number of possibilities. Under the ACCC's post-tax revenue methodology (PTRM) cash flows are defined in nominal terms and after tax, with the effect of tax incorporated in the cash flows. Recently, the ACCC has moved to adopt what is referred to as a "vanilla" WACC. In this formulation the value of imputation tax (franking) credits and the tax impact of interest expense are dealt with in the cash flows. This approach results in a nominal, post-tax WACC defined as:

$$WACC = r_e (E/V) + r_d (D/V) \quad (1)$$

where

r_e = cost of equity capital,

r_d = cost of debt capital,

E = market value of equity,

D = market value of debt, and

V = market value of the firm (E+D).

The formulation in equation (1) is gaining acceptance for regulatory purposes in Australia by regulators and some companies. However, there are some important questions currently being debated about measurement issues. Of particular importance is ensuring the WACC is consistent with the measurement of cash flows. This requires assessing the following dimensions:

- real versus nominal returns; and
- pre-tax versus post-tax returns.

Consistent with the ACCC's approach, we assume that cash flow will be measured in nominal, post-tax returns. We follow this measurement assumption through to a conclusion as to the appropriate nominal, post-tax WACC for ElectraNet.

Some of the key measurement issues that we will address as we develop the nominal, post-tax WACC revolve around the cost of equity capital. The cost of equity capital is determined using the capital asset pricing model (CAPM). A number of measurement issues surround the following key parameters in the CAPM:

- risk-free rate of return;
- market risk premium; and
- systematic risk (beta).

Other key parameters in the WACC include:

- the cost of debt capital, including
  - debt and equity proportions; and
  - the market rate of interest on debt;
- taxation, including;
  - use of corporate tax rate; and
  - value of imputation credits (i.e., γ); and
- additional risk factors, notably the treatment of asymmetric risk.

3 Risk-free rate of return

The risk-free rate of return is generally derived from government bonds rates. The major regulatory issue with the risk-free rate is the appropriate bond maturity to use.

The bond maturity in the CAPM should reflect the decision that an efficient firm would reach in choosing its capital structure. In non-regulated applications, companies investing in long-lived assets generally finance those assets with debt of similar maturities.[1] This allows the company to service its debt from the revenue generated by the assets without being exposed to interest-rate risk. While both the assets and debt will generally have some potential to be liquidated before maturity, it is normally the intention of management to keep both in place through to the end of their lives. Mortgage financing typically provides this concordance of maturities. Financial leases also inherently follow this rule.

Brigham and Gapenski discuss the maturity issue and conclude as follows:

> *For all these reasons, the best all-around financing strategy is to match debt maturities with asset maturities.* In recognition of this fact, firms generally do place great emphasis on maturity matching, and this factor often dominates the debt portion of the financing decision.[2] (Emphasis is in the original text)

The key issue is whether the financing decision of an efficient firm would change in a regulated environment. In this light the ACCC's use of a bond maturity corresponding to the length of the regulatory period should be considered.

The ACCC has provided a number of arguments in support of its position. In its Powerlink decision the ACCC notes that setting the bond maturity equal to the regulatory period minimises expectation errors and is appropriate for the one-period nature of the CAPM:

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1 Actually a company would match 'duration' of debt and assets, but this does not change the conclusions.

2 E. Brigham and L. Gapenski, *Intermediate Financial Management,* 5th ed, The Dryden Press, Fort Worth, 1996, p. 544.

> First, the use of such bond yields will ensure that rates that asset owners are expected to be subject to through the course of the regulatory period will exactly correspond with estimated rates. Secondly, the use of yields commensurate with the regulatory period is appropriate under the CAPM framework. The CAPM is a one period model and thus theoretically more appropriate to estimate the rate for one regulatory period, rather than over the course of numerous regulatory periods.[3]

The ACCC has also argued that regular review of investments by investors also warrants the use of a shorter bond rate. In its Powerlink draft decision it states:

> given that investors review investments over short periods, a shorter-term bond rate is the appropriate measure of the risk free rate.[4]

The ACCC's position as set out in its Powerlink draft and final decisions is misguided for a number of reasons:

- the expected returns of asset owners will only correspond to 'estimated rates' where it is efficient to alter financing to be consistent with the regulatory decision. Given the transaction costs in re-issuing debt and the long-lived nature of infrastructure assets, short-term financing is likely to increase overall costs to the company;
- although it is correct that the CAPM is a single-period model, the model provides no guidance on the appropriate length of that period. There is nothing in CAPM that supports using the regulatory period. A longer period is supported by the observation that three-quarters of the Net Present Value (NPV) of a regulated business is in future regulatory periods, namely the terminal valuation in an NPV calculation of regulated revenue streams; and
- the frequency of trading in a stock is irrelevant in relation to efficient financing. The idea that because investors regularly review investment decisions, a short bond rate

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3 ACCC, Final Decision, Queensland Transmission Network Revenue Cap 2002-06/07, November 2001, p. 15.

4 ACCC, Draft Decision, Queensland Transmission Network Revenue Cap 2002-06/07, July 2001, p. 13.

is appropriate is without foundation. The aim of the regulatory regime should be to send the appropriate signal for new investment in the transmission network (i.e. long-term infrastructure assets), which suggests the use of a long-term bond rate.

About 95% of ElectraNet's assets are in transmission system lines and substations. These have lives up to 55 years and average expected useful lives of well over 20 years. Matching debt maturity with asset maturity suggests use of a long trading bond of similar length.[5]

Regulatory precedent

It is insightful to note the approach other regulators have taken on this issue. The ORG, IPART, ICRC and QCA have consistently applied the principles in the National Electricity Code and used the 10-year bond to derive the risk-free rate in electricity decisions. Table 1 sets out the bond rate used by regulators in electricity decisions and highlights the isolation of the ACCC.

Table 1: Bond-rate maturity – recent regulatory decisions in the electricity sector

Regulator	Decision	Date	Sector	Bond rate
ACCC	SMHEA	2001	Transmission	5-year Commonwealth 40-day average
ACCC	Transgrid	2000	Transmission	10-year Commonwealth 40-day average
QCA	Qld DBs	2001	Distribution	10-year Commonwealth 20-day average
ORG	Vic DBs	2000	Distribution	10-year indexed Commonwealth 20-day average
IPART	NSW DBs	1999	Distribution	10-year Commonwealth 20-day average
OTTER	Aurora/Transend	1999	Dist/Trans	10-year Commonwealth 12-month average
ICRC	Actew/AGL	1999	Distrbution	10-year Commonwealth 20-day average
OFGEM	UK PES	1999	Distribution	Range with weight on 10-year Gilt

[5] The longest trading bond is the Commonwealth 20-year indexed bond, which arguably should be the appropriate benchmark for the risk-free rate and debt maturities. Bonds of similar length are commonly used in the UK and the US. While the 10-year bond may underestimate the benchmark, it has the advantage of consistency with the market risk premium, where estimates are based on the 10-year bond.

As shown in table 1, the use of the longer-term bond is not just confined to other Australian regulators. UK regulators consistently base the risk-free rate on a range of gilts, which includes both 10- and 20-year gilts. As noted by Ofgem in its draft decision on National Grid Company:

> as NGC's assets have an average life of around forty years, it would be surprising if it did not finance these with long-term finance. Ofgem has consistently used the yield on bonds with long maturities to calculate the risk-free rate in the past, and the current, unusual, shape of the yield curve is not a reason for changing this practice.[6]

A similar position exists with respect to other regulated industries where all other regulators have based the risk-free rate for regulatory decisions on the 10-year bond. This is set out in Table 2.

Table 2: Bond rate maturity –regulatory decisions (non-electricity)

Regulator	Decision	Date	Sector	Bond rate
ICRC	Actew/AGL	2000	Gas distribution	10-year Commonwealth 20-day average
IPART	AGLGN	2000	Gas distribution	10-year Commonwealth 20-day average
OFFGAR	Dampier Bunbury	2001	Gas transmission	10-year Commonwealth 20-day average
OFFGAR	Mid West South West	2000	Gas distribution	10-year Commonwealth 20-day average
ORG	Victorian gas	1998	Gas distribution	10-year Commonwealth 2-month average
QCA	Allgas, Envestra	2001	Gas distribution	10-year Commonwealth 20-day average
SAIPAR	Envestra (draft)	2000	Gas distribution	10-year Commonwealth
ORG	Victorian ports	1999	Ports	10-year Commonwealth 20-day average
IPART	NSW rail	1999	Rail	10-year Commonwealth 20-day average
QCA	Queensland Rail	2001	Rail	10-year Commonwealth 20-day average
IPART	Sydney Water	2000	Water	10-year Commonwealth 20-day average

As noted in Table 1, the ACCC has not exclusively used the 5-year bond rate in its regulatory decisions. Prior to its Powerlink decision, the ACCC has stressed the importance of consistency on the term of the bond rate between decisions in the distribution and

[6] Ofgem, The Transmission Price Control: Review of the National Grid Company from 2001, Draft proposals, June 2000, p. 48.

transmission sector. The ACCC set the risk-free rate for Transgrid based on the 10-year bond to be consistent with the approach of IPART in its 1999 determination on NSW distributors.[7] However, in its Powerlink decision, the ACCC changed its stance on this issue, noting that its position set out in its Transgrid decision 'did not reflect the final position of the Commission'.

The inconsistency of the ACCC's stance on the risk-free rate, in relation to its own and other regulatory decisions sends confusing signals to infrastructure industries and thereby can only increase regulatory risk. This will have negative implications for investment in all regulated industries, not just those regulated by the ACCC.

Appropriate bond rate

To summarise, we believe the use of a bond rate consistent with asset maturities would best reflect efficient financing behaviour for a company such as ElectraNet. Given the shape of the yield curve and the precedent set by all regulators other than the ACCC for a 10-year bond rate, the 10-year Commonwealth bond is the appropriate bond rate to use at this time. Consistent with the ACCC's approach on averaging we have adopted a 40-day average of this bond[8].

Conclusion

We consider that the appropriate risk-free rate for ElectraNet is given by the 40-day average yield on 10-year Commonwealth Fixed Coupon Bonds, which as of 4 March 2002 is 5.90%.

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7 Note that the WACC underlying the South Australian Electricity Pricing Order (EPO) is based on the 10-year bond rate. In its future determination on electricity distributor ETSA Utilities, the jurisdictional regulator is required in all but exceptional circumstances to set the risk-free rate based on the 10-year bond.

8 Whilst in theory an "on the day" rate best reflects the market's view of the 10-year rate, ElectraNet accepts the ACCC's practice in relation to the 40-day averaging. While use of any rate other than on the day induces random error, this should even out over time if it is used consistently.

4 Market risk premium

The market risk premium (MRP) is the amount an investor expects to earn from an investment in the market above the return earned on a risk-free investment. The MRP is an expectation and therefore is not directly observable. The difficulties in estimating the MRP are well known, and the choice of an appropriate rate is inevitably *ad hoc*. Generally a range of plausible values is identified and the MRP is chosen within the range, most commonly at the midpoint.

In determining the appropriate MRP we will consider two main approaches:

- use of historical data; and a
- benchmarking approach using international data.

We then assess the regulatory position of the ACCC and in particular address the claim by the ACCC that the appropriate MRP for regulatory purposes has been falling in Australia.

4.1 Historical estimates of MRP

The use of historical estimates of MRP has been the predominant method of estimating a forward-looking MRP by regulators in Australia. In assessing historical evidence, the generally accepted range among corporate finance professionals in Australia has been 6% to 8%.[9] This range is largely favoured because of empirical evidence of the historical, realised MRP in Australia dating as far back as 1882. In the absence of additional evidence, the midpoint of 7% was often picked as the point estimate. In 1999, Davis presented a range for MRP of between 5% and 8%, and noted that the midpoint of 6.5% "is not unreasonable."[10] Section 3.2 of Schedule 6.1 of the National Electricity Code also notes that the MRP has averaged 6.6% since 1952.

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9 For example, see R. Officer, "Rates of Return to Shares, Bond Yields and Inflation Rates: An Historical Perspective," in *Share Markets and Portfolio Theory*, 2nd ed, 1989 University of Queensland Press, St Lucia, 1989, pp. 207-11.

10 K. Davis, "Comments on the Cost of Capital: A Report prepared for the ACCC," April 1999.

Table 3: Historical estimates of MRP

Source	Market risk premium (%)
Officer (1989) (based on 1882-1987)[11]	7.9
Hathaway (1996) (based on 1882-1991)[12]	7.7
Hathaway (1996) (based on 1947-91)[13]	6.6
NEC (based on 1952-99)[14]	6.6
AGSM (based on 1964-95, including October 1987)[15]	6.2
AGSM (based on 1964-95, excluding October 1987)[16]	8.1

The historic data set out above is consistent with a range of 6.0% to 8.0%. The midpoint of 7.0% is well above the 6.0% figure that has generally been used by regulators in Australia. If we were to base our estimate of the Australian MRP on historical data, we believe it should be approximately 7%.

4.2 Benchmarking approach to MRP

An alternative way of setting a forward-looking MRP is through a benchmarking approach. Australia is an open and international economy. Investment funds move freely into and out of the country and the currency. For example, as of September 2000 non-resident investors owned 37.5% of the value of the Australian Stock Exchange,[17] the largest single shareholder

11 R. Officer, op cit, pp. 207-11.

12 N. Hathaway, "Market Risk Premia", unpublished manuscript.

13 Ibid.

14 National Electricity Code, schedule 6.1, section 3.2.

15 IPART, "Regulation of New South Wales Electricity Distribution Networks," section 5.4.2, Table 5.4, December 1999.

16 Ibid.

17 Information provided by Australian Stock Exchange, figures for 19 September 2001.

group by far and more than 30% of the trading on the Australian share market is due to foreign investors.[18]

The Australian debt and equity markets have only been integrated into world markets for 20 years. In a recent study, Ragunathan found that the Australian stock market was segmented from the world capital markets during the period 1974 to 1983. Over the period 1984 to 1992, Australia was integrated into the world markets. She says:

> Consistent with expectations, our test indicates that the capital market, segmented prior to deregulation, was integrated in the post-deregulation period.[19]

The market in Australia prior to deregulation was different to that after deregulation, since market prices (and in turn the MRP) were significantly affected by government intervention, in particular the restrictions on foreign ownership of shares and exchange rate controls. This resulted in prices of shares and government bonds being predominantly determined by domestic (rather than international) factors. Given these circumstances, it is unlikely that the ex-post MRP in this market provides the best estimate of an ex-ante MRP in the current (international) market.[20]

In the absence of sufficient relevant historical information from the current market, we have estimated the MRP using a benchmarking approach.[21] A benchmark country is chosen based upon its having a reliable estimate of MRP available, and the potential differences between the MRP in that country and in Australia are evaluated. The benchmark MRP is adjusted for

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18 ASX Fact Book 2001.

19 V. Ragunathan, "The Effect of Financial Deregulation on Integration: An Australian Perspective," *Journal of Economics and Business*, November 1999, pp 505-514.

20 Although Australian markets have been open to international investment for nearly two decades, that is too short to provide a reliable *ex ante* estimate of MRP. For example, B. Cornell, J. Hirshleifer and E. James ("Estimating the Cost of Equity Capital," *Contemporary Finance Digest*, 1997, p 16) state, "The unfortunate fact is that stock prices are so variable that the risk premium cannot be estimated precisely even with 20 years of data."

21 See R. Bowman "Estimating the Market Risk Premium," *JASSA*, Spring 2001 for a more extensive discussion of this approach to estimating the MRP.

the estimated difference between the two countries to arrive at an estimate of the Australian MRP.

Using this approach, Australia's MRP can be thought of as being equal to an international benchmark MRP plus a premium for the incremental risks associated with the Australian equity market. We believe the best benchmark country for this exercise is the United States. Contrary to Australia, the US has been an open economy for virtually all of its existence. The size of the US equities markets dwarfs every other market in the world. For example, the US equities markets comprise almost 50% of the Morgan Stanley Capital International (MSCI) index.[22] The quantum and quality of evidence and analysis of the US equities markets (and its MRP) exceeds that of all other countries in the world combined.

Bowman recently estimated the Australian MRP from the US MRP using a benchmarking approach to be 7.8% on the basis of:[23]

- a US MRP in the range of 6.0 to 9.0%; and
- an increment of 0.1% to 2.35% on the US MRP for differences in taxation, market composition, country risk and estimation time horizon between the US and Australia, with 0.3% considered an appropriate adjustment.

Similarly, Ibbotson Associates suggest that the US market risk premium is 7.76% and that based on Australia's country credit rating, the expected return on the Australian market is 1.53% to 2.26% higher than for the U.S.[24]

This benchmarking approach suggests that a figure at least at the upper end of the 6.0 to 8.0% range would be appropriate for Australia.

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22 Axiss Australia, The Australian Equity Market at www.axiss.com.au.

23 R. Bowman "Estimating the Market Risk Premium," *JASSA*, Spring 2001.

24 Ibbotson Associates, (2001), "International Cost of Capital Report 2001," valuation.ibbotson.com.

4.3 ACCC approach to MRP

The historical and benchmarking estimates of MRP above suggest that a MRP of 7.0% is justified. However, this does not accord with regulatory practice, in particular the ACCC decisions and supporting arguments.

In its regulatory decisions the ACCC has generally set a MRP of 6.0%. While this is the same headline rate as used by most other regulators, the effective MRP used is different due to the ACCC's use of the 5-year bond rate for the risk-free rate. As historical estimates of the MRP have been based on a 10-year bond rate, conversion to a MRP for the 5-year bond requires adjustment for the difference in yield between the two bond rates.

Since daily trading in these bonds began in October 1983, the difference between the 5- and 10-year nominal bond has averaged 21 basis points. Using this as an adjustment suggests that to be consistent with other regulators, the ACCC should have increased the MRP for Powerlink from 6.0% to 6.21%. Given the ACCC has not applied this adjustment, it is effectively stating that the appropriate MRP based on the 10-year bond is around 5.79%. In its Powerlink decision, the ACCC defended this position by stating:

> Further, the Commission believes that the current market risk premium of 6.0 per cent is on the high side and therefore sufficient to compensate for the difference between the five and ten-year bond yields.[25]

Arguments provided by the ACCC to support a MRP below 6.0% include:

- evidence of a lower *ex post* MRP over recent years; and
- an article by Tro Kortian who suggests that the MRP may be as low as 3%.[26]

We discuss each of these in turn.

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25 ACCC, Final Decision, Queensland Transmission Network Revenue Cap 2002-06/07, November 2001, pp. 19-20.

26 See the ACCC's Final Decision, Access Arrangement proposed by Epic Energy South Australia Pty Ltd for the Moomba to Adelaide Pipeline System, September 2001, p. 40.

4.3.1 Decline in *ex post* MRP

There has been a decline in the *ex post* MRP in the last decade or so. Table 4 sets out estimates made by the QCA on MRP for each decade since 1888. This shows that the estimate for the last decade is below the historical average of 7.4%.

Table 4: Estimates of ex post MRP by decade 1888-1997

Period	Mean (%)
1888-97	6.06
1898-1907	8.87
1908-17	6.26
1918-27	11.61
1928-37	8.40
1938-47	6.02
1948-57	7.83
1958-67	9.60
1968-77	-0.07
1978-87	11.82
1988-97	3.89 (5.28 if imputation credits are considered with gamma of 0.5)

Source: QCA Working Paper 4, Issues in the Estimation of Queensland Rail's Below Rail Coal Network Expected Rate of Return, December 2000

However, even though the MRP has been below the historical average over the past decade, this does not provide sufficient evidence to reject the historical data on MRP:

- the data on MRP does not provide statistically significant results to support the hypothesis that the MRP has reduced over recent years. In a recent paper, Stephen Gray estimates that for the period 1883-2000 there is no 'breakpoint' between the years 1960 and 1985 where it can be concluded at a 95% confidence level that the MRP in the second period is lower than the MRP in the first[27]; and

[27] S. Gray, "Issues in Cost of Capital Estimation", submission to Office of the Regulator General Victoria, University of Queensland Business School, 19 October 2001.

- given the volatility of the MRP on a year-to-year basis, there are many periods in which the *ex post* MRP has been below or above the historical trend for a significant period.

An additional important issue in using historical data to set the regulatory MRP is to understand the distinction between *ex ante* (i.e., expectations going forward) and *ex post* (i.e., historical) data on MRP. An example will show how the relationship between the *ex post* and *ex ante* MRP may be moving in opposite directions.

Assume a simple market that is expected to earn $100,000 of cash flow to distribute to shareholders as a dividend in perpetuity (i.e. no growth). If the risk-free rate of interest is a constant 3% and the *ex ante* MRP is 7%, the cost of equity capital is 10%.[28] Since the earnings is a perpetuity, the value of the market is the earnings divided by the cost of equity capital:[29]

Value of the market = $100,000 / 10% = $1,000,000

If the parameters of the valuation do not change, the value of the market will not change, and the annual return to the shareholders will be the perpetuity. As time passes the *ex ante* MRP of 7% will also be observed as the *ex post* MRP.

Now assume the *ex ante* MRP increases to 7.1% over the course of a year. By the end of the year the cost of equity capital will be 10.1%, and the value of the market will be

Value of the market = $100,000 / 10.1% = $990,099

During this year the shareholders will realise a return by dividend of $100,000 but a loss of value of the investment of $9,901 ($1,000,000 - $990,099) for a net return of $90,099 on the investment of $1,000,000. This gives the shareholder an *ex post* return in this year of 9.01% and a MRP after deducting the risk-free return of 6.01%.

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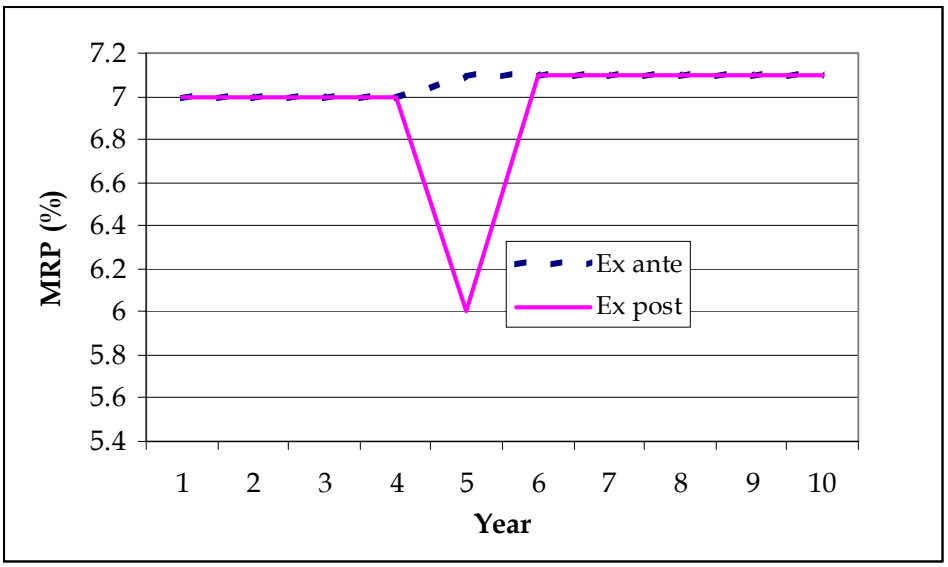
[28] Since we assume this is the market, it is not necessary to know the beta. Alternatively it could be assumed to be a company with a beta of one.

[29] This is the discounted dividend model, which is consistent with analysis by Kortian in his section 3.

If in the subsequent year the *ex ante* MRP remains at 7.1%, the value of the market will not change and the *ex post* MRP will also be 7.1%.

This example illustrates four important facts about the behaviour of *ex post* and *ex ante* MRP (*ceteris paribus*). First, if the *ex ante* MRP is constant, the *ex post* MRP will also be constant and equal to the *ex ante* MRP. Second, an increase (decrease) in the *ex ante* MRP will result in a decrease (increase) in the *ex post* MRP in the period that the change in expectation occurs. In the period when the *ex ante* MRP is changing, the *ex post* MRP will move in the opposite direction. Third, a small movement in the *ex ante* MRP can cause a much larger impact on the *ex post* MRP. In the previous example, an increase of only 0.1% in the *ex ante* MRP resulted in a decrease in the *ex post* MRP of 0.99% (7% - 6.01%). Fourth, the *ex post* MRP moves down and then up before settling on the new equilibrium. The *ex ante* MRP moves directly to the new equilibrium. This can be seen in Figure 1.

Figure 1: Comparison of *ex ante* and *ex post* MRP



Taking the third point above, consider a case where the *ex ante* MRP declines gradually from 7% to 4% over a period of 10 years. That would seem to be a very gradual change in the MRP. Using the same assumptions as above, the *ex ante* decrease of 3% will decrease cost of equity capital to 7% and increase the value of the market to $1,428,571. The *ex post* MRP over the 10 years will be 9.4%. For the *ex ante* MRP to drop from 7% to 4% over 10 years, the *ex post* MRP would have to be observed at an average 9.4% over the same 10-year period!

Now conversely consider a case where the *ex ante* MRP increases gradually from 7% to 10% over a period of ten years. That is a very gradual change in the MRP, averaging only 0.3% per annum. Using the same assumptions as above, the *ex ante* increase of 3% will increase cost of equity capital to 13% and decrease the value of the market to $769,231. The *ex post* MRP over the ten years will be 5.44%. For the *ex ante* MRP to increase from 7% to 10% over ten years, the *ex post* MRP would have to be observed as decreasing, averaging about 5.44% over the same 10-year period.

These illustrations put the evidence of declining *ex post* MRP into context. A declining MRP over the past decade is completely consistent with the forward-looking MRP increasing, perhaps substantially. In fact, in the US, the very high returns and *ex post* MRP in the stock market over much of the 1990s was used to support arguments that the *ex ante* MRP was declining. The key point is that a period when the *ex post* MRP departs significantly from the long-run average is likely to be a period when the *ex ante* MRP is changing but in the opposite direction.

4.3.2 Kortian paper

The ACCC has noted an unpublished paper by Tro Kortian, which suggests that MRP may be as low as 3%.[30] In this paper, Kortian applies a dividend discount model framework to value the Australian sharemarket. He is forthright in stating the serious limitation in this approach, both in terms of the model itself and the parameter estimates needed to employ the model. To estimate the equilibrium dividend yield, the model requires estimates of the real long-bond yield, the real dividend growth rate and the MRP. From this analysis, he estimates that the MRP for Australia at June 1997 is about 3%.

In the final empirical section, factors are investigated that are possible explanations for the observed movements in the MRP. Kortian considers four factors: perceptions of declining riskiness of equities; increasing importance of institutional investors; inflation and changing demographics of investors.

Kortian shows that there has been a marked increase in the percent of younger workers (35-54 years) in the workforce, relative to older workers (55-64 years). He then asserts that

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30 Tro Kortian, "Australian Sharemarket Valuation and the Equity Premium", September 1998, working paper.

younger workers have longer investment horizons, and hence they will consider equity securities as lower risk than older workers. He bases this on his earlier analysis that shows the risk of equities relative to bonds declines as the holding period increases. He then concludes that MRP should be declining because of the demographic shift to younger workers. He uses this conclusion to support the validity of his empirical evidence on MRP in earlier sections.

The next factor is based on distortions that may have been caused by the 1929 Crash and the Great Depression. He cites an article on US equities[31] that suggests that the high volatility and uncertainty of the depression period created high perceived riskiness of equities that gradually dissipated, leading to a declining MRP in the US. However, Kortian notes that the US analysis has little relevance to Australia, and in fact a similar analysis may support an opposite interpretation. This is because the volatility of the Australian stock market shows a clear upward trend from about 1932 until about 1990 (his data only goes to 1996). Even in the period from about 1990 to 1996, volatility is substantially higher than either prior to the depression or up to the mid-1960s.

In considering the effect of inflation, Kortian states that high inflation tends to be associated with high MRP. In other words, the two are positively correlated. He also shows graphically that this has been the case in Australia for the period 1974 through 1996. Since he expects inflation to remain low for the foreseeable future, he believes this is consistent with the low MRP, which he supports.

The final factor that Kortian discusses is the increasing role of institutional investors in the equity market. He provides data to support that institutional investors have an increasing share of equities and speculates that their role will continue to increase. He then posits that by their nature, institutional investors have long-time horizons. As he stated earlier, he considers a long-time horizon to be consistent with a low MRP.

However, there are a number of problems with Kortian's analysis that mean it should not be relied upon in regulatory decision-making. These include the failure to take account of the distinction between *ex ante* and *ex post* MRP; problems with the analysis of demographic

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[31] O. Blanchard, "Movements in the Equity Premium," *Brookings Papers on Economic Activity*, vol.2 (1993), pp. 519-43.

changes and failure to adequately identify the marginal investor. These are discussed in turn.

Ex ante ex post distinction

Kortian fails to distinguish between *ex post* data and *ex ante* expectations – as discussed above. Therefore, the changes in *ex post* MRP reported by Kortian may be consistent with significant increase in the *ex ante* MRP.

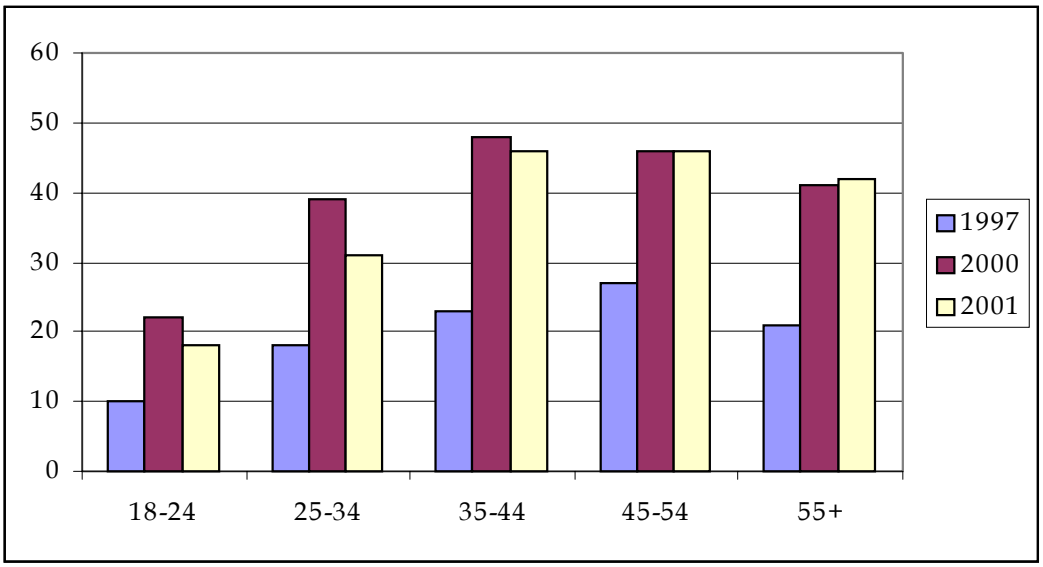
Changing demographics of investors

Kortian's argument that the shift to a younger working population is consistent with a lower MRP is founded on the notion that younger workers have longer investment horizons, and the longer the investment horizon, the lower is the risk of equity investments relative to government bonds.

However, an alternative perspective on investment horizon is the holding period of a specific investment. From this perspective, it is not at all clear that younger investors have longer investment horizons. There is no data to support this view, but it is conceivable that the holding period of younger investors is actually shorter than that of older investors. If that is correct, the shifting demographics may support a higher MRP.

Kortian bases his argument of an increasing proportion of younger investors on data from the 1997 ASX Share Ownership survey that showed, between 1991 and 1997 an increasing proportion of younger age groups and a reducing proportion of older age groups held shares. However, post-1997 data shows a different trend, with increases in share ownership sustained in the older age groups, while the proportion of share ownership in younger age groups has dropped off, as shown in Figure 2. These post-1997 changes highlight the dangers of changing the MRP based on transient factors — given the large increase in share ownership by the 35 and over age cohorts suggests that the MRP has increased in recent years.

Figure 2: Proportion of direct share-ownership by age group, 1997-2001



Marginal investor

In a related point to the issue of demographic shifts discussed above, it is accepted by most financial economists that in a competitive market, marginal investors set security prices. Investors that simply buy and hold, with little or no transacting, such as individual shareholders, will not influence security prices. However, groups such as overseas investors who buy and sell regularly are likely to set prices and therefore influence the *ex ante* MRP.

To summarise, we do not regard Kortian's paper, or other similar investigations, to offer substantive support for a declining MRP.

Conclusion on MRP

Historical data and benchmarking estimates of the Australian MRP suggest that a figure towards the upper end of the historic range of 6.0% to 8.0% is justified. While the ACCC has suggested that the MRP should be below 6.0%, the evidence provided does not provide support for a declining MRP. We have adopted an estimate of 6.5% which we believe is conservative.

5 Systematic risk

The CAPM assumes all non-systematic (specific) risks are diversifiable and hence are not provided an expected return in a competitive market. The systematic risk (β or beta) of a firm is the only risk factor incorporated in the CAPM. Systematic risk is usually estimated by direct measurement or consideration of comparable companies, also known as "method of similars".

For ElectraNet, where there is no time-series of market returns to use to estimate beta, the method of similars provides the best approach for determining the beta. A set of comparable (listed) firms is identified, and the average asset beta of those firms is used as a proxy for the asset beta of the company in question. We adopt this approach for ElectraNet, determining a plausible range for its asset beta from other regulatory decisions and individual (comparator) company data.

A breakdown of recent decisions on asset beta is given in Table 5.

Table 5: Recent regulatory decisions – asset betas

Year	Regulator	Decision	Asset beta
Gas Transmission			
2001	OffGAR	Dampier to Bunbury (draft)	0.60
2001	ACCC	Moomba to Adelaide	0.50
2001	ACCC	NT Gas (draft)	0.50
2000	ACCC	EAPL	0.50
2000	ACCC	Central West Pipeline	0.60
2000	OffGAR	Parmelia pipeline	0.65
1998	ACCC	TPA (GPU GasNet)	0.55
Gas distribution			
2001	QCA	Qld gas distribution	0.45-0.60 (0.55)
2000	SAIPAR	SA distribution systems (draft)	0.45-0.50
2000	OffGAR	Mid West and South West	0.45-0.60 (0.55)
1999	IPART	AGL Gas Network	0.40-0.50
1999	IPART	Gt Southern energy gas network	0.40-0.50
1999	IPART	Albury gas distribution system	0.40-0.50
1998	ORG	Victorian gas distributors	0.55
Electricity transmission			
2001	ACCC	Powerlink	0.40
2000	ACCC	SMHEA	0.30-0.50 (0.40)
2000	ACCC	Transgrid	0.35-0.50
Electricity distribution			
2001	QCA	Electricity distributors	0.45
2000	ORG	Victorian distribution businesses	0.40

As seen in Table 5, regulatory decisions have considered the appropriate range for the asset beta to be 0.40-0.45 in electricity distribution, 0.40-0.60 in gas distribution and 0.50-0.65 in gas transmission. The ACCC has adopted a range of 0.30-0.50 in its various electricity transmission decisions.

We have estimated asset betas of comparable (listed) companies using the most recent AGSM estimates of equity betas covering the period up to 31 May 2001.[34] These estimates are given in Table 6:

Table 6: Estimates of equity beta and asset beta

Company	Primary business	Equity beta (Blume)	Leverage (%)	Asset beta (Monkhouse)
Australian Gas Light	Gas distribution and retailing	0.700	30%	0.49
Energy Developments Limited	Electricity generation	1.213	25%	0.91
United Energy Limited	Electricity distribution	0.900	53%	0.42

Note: For consistency with the ACCC's regulatory approach to the debt beta, we have assumed a debt beta of zero in determining the respective asset betas. Assuming a debt beta of zero implies that debt is riskless, which will understate the appropriate beta.

The most comparable comparators for ElectraNet are the distribution businesses AGL and United Energy, with a range of 0.42 to 0.49 for the asset beta.

This range for the asset beta is higher than the ACCC's estimate of 0.40 for Powerlink, which is based on the average equity beta of the Infrastructure and Utilities Group average (0.962 as of March 2001). The methodology adopted by the ACCC in producing its estimate of 0.40 is questionable:

- the Infrastructure and Utilities Group includes some questionable outliers, in particular Contact Energy, which has a limited number of observations and has been subject to merger speculation during the period for which listed data is available. Given its negative beta and size ($1.4bn or over 9% of the total asset value of companies in the group), removal from the group increases the average equity beta substantially;

- In de-levering the equity beta to produce an asset beta, the ACCC appears to have assumed gearing of 60% and a debt beta of zero. In practice, this is a significant overestimate. IPART estimated the average gearing of companies in the Infrastructure and Utilities Group in late 1998 at 37%.[32] We have estimated that the average gearing for companies in this group in 2000-01 was approximately 38% and around 40% in 1999-2000.[33] An equity beta of 0.962 equates to an asset beta of 0.58 using 40% gearing, zero debt beta and the Monkhouse formula.

Therefore, we contend that the Infrastructure and Utilities Group data suggests a figure of 0.60 would be appropriate.

A number of other points are of relevance for ElectraNet's asset beta.

Relative risk of electricity transmission and distribution

Asset betas for electricity distribution businesses are likely to understate the appropriate asset beta for ElectraNet, given the greater bypass risk facing electricity transmission companies than distribution networks, in particular from gas pipelines and new gas-fired power stations. While this is partly an issue of asymmetric risk, overall systematic risk is likely to be magnified by the presence of bypass risk.

Size in relation to other transmission companies

There is much evidence, particularly through the research of Rolf Banz[34] and Eugene Fama and Kenneth French[35] that the investment returns to small companies are greater than would

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32 IPART, *The Rate of Return for Electricity Distribution Networks*, Discussion Paper, DP-26 November 1998, p. 20.

33 Based on borrowings reported in financial reports and the market value of equity as of June 2001.

34 R. W. Banz, "The Relationship Between Market Value and Return of Common Stocks," *Journal of Financial Economics*, November 1981.

35 For example, see E. Fama and K. French, "The Cross-Section of Expected Stock Returns", *Journal of Finance*, June 1992, pp. 427-65; "Common Risk Factors in the Returns on Stocks and

be expected based upon the measured beta using CAPM. In this research, returns to companies' shares are explained by a common market factor, size and book value to market value of equity ratio; beta is an insufficient, if not ineffective, explanatory factor of security prices.

Jagannathan and Wang provide evidence on the relationship between beta, size and returns.[36] Small firms have higher returns than large firms, even after adjustment for beta. Furthermore, they show that using conventionally estimated betas provides poor explanatory power for expected returns.

There are at least five published studies of the size effect in Australia, all of which document a significant size effect.[37] Halliwell, Heaney and Sawicki find that "… in all cases the size effect provides considerable explanatory power over realized returns for the period 1980 to 1991."(p. 122)

The results of a vast body of research on the usefulness of beta in estimating future returns show that conventional measurements of beta, as are used in essentially all regulatory rate settings in Australia, seriously understate the appropriate returns for smaller companies. There are a number of possible explanations for this observation. One interpretation of the results, consistent with Handa, Kothari and Wasley, is that estimated betas of smaller firms

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Bonds", *Journal of Financial Economics*, February 1993, pp. 3-56; and "Multifactor Explanations of Asset Pricing Anomalies", *Journal of Finance*, March 1996, pp. 55-84.

36 R. Jagannathan and Z. Wang, "The Conditional CAPM and the Cross-Section of Expected Returns", *Journal of Finance*, March 1996, pp. 3-53.

37 P. Brown, D. Keim, A. Kleidon and T. Marsh, "Stock Return Seasonalities and the Tax-Loss Selling Hypothesis", *Journal of Financial Economics*, 1983, pp. 105-27; W. Beedles, P. Dodd and R. Officer, "Regularities in Australian Share Returns", *Australian Journal of Management*, June 1988, pp. 1-29; D. Anderson, A. Lynch and N. Mathiou, "Behaviour of CAPM Anomalies in Smaller Firms: Australian Evidence", *Australian Journal of Management*, June 1990, pp. 1-38; J. Halliwell, R. Heaney and J. Sawicki, "Size and Book to Market Effects in Australian Share Markets: A Time Series Analysis", *Accounting Research Journal*, 1999, pp. 122-37; and C. Gaunt, P. Gray and J. McIvor, "The Impact of Share Price on Seasonality and Size Anomalies in Australian Equity Returns", *Accounting and Finance*, March 2000, pp. 33-50.

are significantly understated. If this is the explanation then the solution would be to add an appropriate increment to beta. Another explanation is that the CAPM is underspecified in that it does not incorporate all of the risk factors present with small firms. Yet these risks will be understood and priced out in the market. These would include factors such as bankruptcy risk and illiquidity. If omitted factors are the explanation, then the appropriate solution would be to add an increment to the cost of equity calculated using the CAPM.

We believe that an adjustment is necessary for small firms. While it may be theoretically preferable to increase the cost of equity, adjusting the estimated beta relative to a significantly larger comparator is an alternative option that is theoretically valid[38] and also more consistent with regulatory practice in Australia to date.

ElectraNet is small for an electricity transmission company. Table 7 shows that it ranks significantly below the size of other transmission companies in member jurisdictions of the National Electricity Market in terms of asset size.[39] It is also small in relation to comparable transmission companies overseas.

Table 7: Size of transmission entities in NEM jurisdictions[40]

State	*Operator*	*Value ($m)*
QLD	Powerlink	2277
VIC	SPI Powernet	2273
NSW	TransGrid	2012
SA	ElectraNet	938

38 See for example, J. Berk An Empirical Re-examination of the Relation Between Firm Size and Return, University of Washington Department of Finance School of Business Administration Working Paper, 93-BJ-001, revised October 9, 1996.

39 ElectraNet's size is also significantly smaller than that of Western Power and PAWA.

40 Sources: Powerlink – asset base as of 1 July 2001 determined by ACCC, SPI Powernet – total company financing as listed on www.spipowernet.com.au; Transgrid – ACCC estimate of 1 July 2001 asset base at time of regulatory determination (January 2000); ElectraNet – provided by ElectraNet.

There has been extensive research in the US on the size effect. Table 8 outlines the estimates of Ibbotson Associates on this issue. Note that these amounts are in US dollars and are based on equity value, not total assets. As of 30 June 2001, ElectraNet's equity value was approximately US$150 million, which puts it down the table in the micro-capitalisation category.

Table 8: US evidence - impact of size on equity returns

Expected mid-capitalisation equity size premium: *capitalisation between US$755m and US$3,242m*	1.00%
Expected low-capitalisation equity size premium: *capitalisation between US$197m and US$755m*	1.70%
Expected micro-capitalisation equity size premium: *capitalisation below US$197m*	3.50%

Source: Ibbotson Associates 1997. Stock, bonds, bills and inflation yearbook, Chicago, Illinois

While the size of the Australian market is much smaller than the US, even for Australia, ElectraNet is far from a large company. In the *BRW* ranking of the "Top 1000 Public Companies," (November 17, 2000) ElectraNet would need to increase revenues by over 50% just to be ranked number 1000.[41] That issue of *BRW* also listed 51 companies under the category "Electricity, Gas and Water," and ElectraNet would need to more than double its revenue to make the list. In the *BRW* list of the "Top 500 Private Companies," (August 3, 2001) ElectraNet ranks 328. The Australian market is also more volatile than the US market, which implies that the impact of size may be larger than in the US.

[41] The rankings cited here are all on the basis of revenues. It could be argued that ElectraNet would be ranked higher on the basis of total assets, but it could also be argued that it might rank even lower based upon total equity. In any event, it would be clear that it is a small company.

Precedent for reflecting size in the cost of capital can be found in the UK:

- in its decision on the water and sewerage sector in England and Wales, Ofwat allowed all water-only companies a premium on WACC to reflect their limited access to capital markets and higher cost of capital.[42] The three largest water only companies were provided a premium of 0.40% on WACC, with the remainder gaining a premium of 0.75%. Assuming 60% gearing these figures are equivalent to a premium on the cost of equity of 1.0% and 1.875% respectively. The two largest water only companies – South East Water and Three Valleys Water have equity value of approx US$250m each, significantly above that of ElectraNet (approx US$150m); and

- upon appealing Ofwat's decision, the Competition Commission allowed Mid Kent Water and Sutton and East Surrey Water a small company equity premium of 1% to reflect the lower liquidity of trading in its shares.[43]

In its decision on Perth International Airport the ACCC accepted the validity of the size effect, noting that 'evidence showing the tendency of small firms to realise higher rates of return than that predicted by CAPM has been demonstrated in various studies'.[44]

Asset beta summary

The figure of 0.40 for the asset beta adopted by the ACCC for Powerlink (and Transgrid as a midpoint) is not appropriate for ElectraNet for a number of reasons:

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42 Ofwat, Final Determinations: Future water and sewerage charges 2000–05, 1999.

43 Competition Commission (2000): Mid Kent Water plc, A report on the references under sections 12 and 14 of the Water Industry Act 1991; and Competition Commission 2000: Sutton & East Surrey plc, A report on the references under sections 12 and 14 of the Water Industry Act 1991.

44 ACCC, Perth Airport, Proposal to increase aeronautical charges to recover the costs of necessary new investment, Final Decision April 2000, p. 34.

- market data on AGL and United Energy, the closest-listed comparators suggests a range above 0.40 – even before adjusting for the systematic risk of electricity transmission companies, which is likely to be higher than for distribution companies;
- data from another comparator group, the ASX Infrastructure & Utilities Group, suggest an asset beta significantly in excess of 0.40. This is due to the ACCC transforming the equity beta of the group with its target gearing than actual gearing; and
- ElectraNet's relative size suggests an increment to its returns compared with Powerlink and Transgrid.

Conclusion

These factors taken together suggest that as a minimum, the asset beta for ElectraNet should be higher than that provided for Powerlink and Transgrid and that on the upper side a figure as high as 0.60 may be appropriate. In order not to overstate the asset beta and given regulatory precedents, we have adopted for ElectraNet a figure of 0.45, which can be seen as a conservative estimate.

6 Cost of debt capital

6.1 Debt and equity proportions

In its recent Powerlink decision, the ACCC maintained its position established in prior decisions and adopted a gearing ratio of 60% debt. While the gearing of ElectraNet is in excess of this figure and that 60% gearing need not necessarily reflect efficient financing for ElectraNet, we will adopt the ACCC's approach to estimating an industry gearing noting that small differences in gearing will not materially impact on WACC.

Conclusion

We assume 60% gearing for ElectraNet.

6.2 Market rate of interest on debt

The cost of debt capital for a company will be determined by consideration of market rates of interest on debt, the appropriate maturity of debt and the assumed capital structure. In the Powerlink decision, the ACCC stated:

> In considering an appropriate debt margin the Commission adopts industry wide benchmarking. This provides an incentive for minimising inefficient debt financing.[45]

We follow this precedent in developing an estimate of the debt premium for ElectraNet. Therefore, we consider the cost of debt the company would face if it had conventional debt instruments and was geared to 60% debt.

The ACCC approved a debt premium of 120 basis points for Powerlink based on 60% gearing. We do not consider this figure appropriate for ElectraNet and find the ACCC's allowance is inconsistent with market data and other regulatory decisions.

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45 ACCC, Final Decision, Queensland Transmission Network Revenue Cap 2002-06/07, November 2001, p. 18.

Recent regulatory decisions

Both the ORG and QCA have recently set a debt premium significantly in excess of that used by the ACCC:

- QCA, in its recent decision on Queensland distribution businesses, determined that an efficiently financed distribution business, with 60% gearing would have a credit rating in the range of A- to BBB and a corresponding range of 125 to 210 basis points, with BBB+ debt commanding a premium of 165 basis points[46]; and
- the ORG, in its Victorian electricity distribution decision accepted evidence that its use of a debt premium of 120 basis points in its draft decision was on the low side – allowing the distributors a premium of 150 basis points to reflect 'market realities'. The ORG was persuaded by submissions that suggested a margin on 5-year debt of around 140-150 basis points, with the margin on 10-year debt around 170 basis points for BBB credit rating.[47]

Market data on debt premium

Consistent with financial data provided to us by ElectraNet, we assume that with a capital structure of 60% debt it would receive a credit rating of BBB+. As of February 2002, BBB+ debt yielded a premium over the 10-year government debt of between 148 to 195 basis points[48] (exclusive of issuance costs), which is consistent with the ORG and QCA decisions.

From the above, we estimate that a feasible range for the cost of debt should be the risk-free rate plus a debt-risk premium of 150 to 195 basis points. For this report, we are adopting the mid-range figure of 172 basis points.

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46 QCA, Final Determination Regulation of Electricity Distribution, May 2001, p. 85.

47 ORG, Electricity Distribution Price Determination 2001-05, Vol. I, September 2000, p. 130.

48 Information provided to ElectraNet SA by Commonwealth Bank of Australia, 14 February 2002.

Conclusion

As of 4 March 2002, we estimate the cost of debt to be of 7.62%.

7 Taxation issues

The two main issues to be considered are the appropriate tax rate for the business and the valuation of imputation credits.

7.1 Appropriate tax rate

Two approaches have generally been used to determine the tax rate in WACC calculations:

- the statutory tax rate; or
- the corporation's effective tax rate (which may be the statutory tax rate).

The effective tax rate has been measured in a variety of ways, but most commonly it is considered the average tax rate on book income for the firm. Thus, a firm that has substantial tax shelters, typically as a result of differences between economic depreciation and tax depreciation (e.g. from accelerated depreciation) may have an average tax rate that is less than the statutory tax rate.

The argument for using a rate lower than the statutory tax rate is well represented by the following quote from Westpac Corporate Finance (WCF):

> Our experience in modelling electricity and gas distribution companies and other, similar businesses, has shown that there is a significant period of time (generally the first 5 to 10 years) when the effective tax rate is very low (generally 0%). This rate then gradually rises to 36% over the following 10 years. Consequently the average effective tax rate over a considerable period is significantly lower than 36%. Assuming an effective tax rate of 36% will therefore result in a higher WACC than would otherwise be the case. [49]

This statement makes four points, which we discuss in turn:

- we agree that many companies have been able to use accelerated depreciation for tax purposes and deduct tax depreciation that is in excess of book depreciation so

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49 Letter from Stephen Face to Philip Norman, 26 March 1998, Gas Reform in Victoria: Public Consultation re Distribution Access Arrangements.

that the average tax rate on book income is lower than the statutory tax rate, which in Australia is now 30%. We also agree that this ability to shelter income from tax occurs in the early years of an asset's life, but only in the early years. In some cases, and temporarily, this tax shelter may be sufficient to have no tax payable (i.e., tax rate = 0%);

- we agree that this tax shelter advantage will dissipate over time. However, the statement implies that the rate will rise only to the statutory rate. This is not correct. What is not stated by WCF is that, with respect to a specific asset, the tax advantage reverses so that tax depreciation is typically less than book depreciation in the later years of an asset life. As a result the average tax rate can go above the statutory tax rate. In fact, the timing advantage over straight-line depreciation generally only exists for about the first third of an asset life. After that the advantage reverses;

- the tax shelter advantage is a timing advantage, not generally an absolute advantage. Therefore, it is not correct to say, with respect to a specific asset, that the effective tax rate is less than the statutory tax rate.[50] WCF (and others who argue along these lines) makes a mistake by discussing the issue without distinguishing between an asset and a group of assets within a company.

- a mature company whose asset base is stable will enjoy no depreciation tax shelter. A growing company whose investment in new assets exceeds its retirement of assets, and who is able to generate higher depreciation expense for tax purposes than for book purposes, may have an average tax rate less than the statutory rate. The divergence between the average rate and the statutory rate will be a positive function of the rate of growth in investment.

As of 30 June 2000 ElectraNet's property, plant and equipment were roughly fifty percent depreciated, thus the net timing difference may be nil or negative to the company. This is reinforced by the fact that its net deferred tax amount is a debit. This indicates that the company's aggregate timing difference with respect to corporate income tax is against the

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[50] Technically this discussion should focus upon the quantum of income sheltered rather than the average tax rate. The average tax rate will be affected by other factors including changes in the level of taxable income.

company. It also indicates that its forward-looking effective tax rate is likely to be about equal to the statutory tax rate.

We therefore consider the appropriate tax rate to use in WACC calculations is the statutory rate.

Conclusion

We assume the current statutory tax rate of 30%.[51]

7.2 Value of imputation credits

The Australian dividend imputation mechanism is intended to ensure that profits are taxed only once, at least for Australian resident taxpayers. Dividends paid out of after-corporate-tax profits can be accompanied with a 'franking' credit to the extent of the corporate tax paid. The value of franking credits is represented with the parameter gamma (γ).

The value of franking credits will be determined at the level of the investor and influenced by the investor's tax circumstances. As these will differ across investors, the result will be a value of the franking credit between nil and full value (i.e., a gamma value between zero and one). There has been an increasing body of literature focused on estimating the value of gamma. The early literature generally found a value of about 0.5 or slightly below, which is the value the ACCC has adopted in its decisions.

In its regulatory decisions, the ACCC has assumed domestic ownership in setting gamma, refusing to adjust gamma to take account of varying degrees of foreign ownership of Australian utility companies. The ACCC also believes that recent changes to the taxation system mean that the appropriate value of gamma may be closer to one than zero. We discuss these two claims.

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[51] Note that in the nominal post-tax "vanilla" WACC, the only place the tax rate is used is in the leveraging and de-leveraging formula.

7.2.1 Appropriate ownership assumption

The market value of distributed franking credits should be established at the market level, not the firm level. So for regulatory purposes, current shareholding should be irrelevant. Therefore, in principle we agree with the ACCC and others that current ownership should not form the basis for setting gamma.

The gamma used in the CAPM is generally derived as an industry average. However, there is debate whether an average value is appropriate for the basis of setting a forward-looking value consistent with the CAPM aims. The ACCC believes it may be more appropriate to consider the marginal investor – which it claims would increase the gamma towards one. For example the ACCC recently noted:

> For regulatory purposes it is debatable whether an average for the value of imputation credits is appropriate. Generally, if an average rate is used in the regulatory rate of return, investors who are able to take advantage of more than the average will receive a rate of return greater than their expected rate of return. As a consequence the company's share price will be bid up until the actual rate of return (based on market value of the assets and not the regulated value) equals the required rate of return of those investors able to take the most advantage of the tax credits. Investors who are at a comparative disadvantage will either sell their shares or accept a lower rate of return. This argument tends to suggest that the appropriate value for utilisation of imputation credits for regulatory purposes should approach 100 per cent.[52]

In theory, we agree that the use of the marginal investor is appropriate. However, the ACCC's idea that share price will be bid up to match the gamma of the investor who has the highest gamma is unrealistic. In effect, the ACCC are prescribing how security prices will be set and identifying the marginal investor based on one dimension only - utilisation of franking credits. However, taxation and imputation are two of a host of factors that drive investment decisions (diversification, opportunity, growth, synergistic benefits and so on). Accordingly, this argument completely ignores all other factors that determine the marginal investors and hence security prices.

Share prices are set by price-setting (marginal) investors, and this set of investors may have little relationship to the shareholder mix of a company at a point in time. However, it is

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[52] ACCC: Draft Decision, Access Arrangement by East Australian Pipeline Limited for the Moomba to Sydney Pipeline System, 19 December 2000, pp. 77-8.

likely that the marginal investor for publicly listed Australian companies is an international investor. Australian equities represent approximately 1% of the global market and foreign shareholders own over 28% of Australian companies.[53] Also, as noted in section 4.2, non-resident investors own around 37.5% of the value of the Australian Stock Exchange, and more than 30% of the trading on the Australian share market is due to foreign investors.

Indeed, if the ACCC's reasoning was correct, we would be unlikely to see substantial Australian investment abroad since such investments do not gain the benefit of imputation. However, as Australian investment overseas is considerable, the importance of accessing imputation credits is unlikely to be of key importance.[54]

Australia is a net importer of capital. The marginal investor in the Australian equity market is likely to be an international investor who at best will experience considerable difficulty accessing imputation credits. This was reinforced by the 1997 tax change requiring an investor to hold a stock for 45 days to be eligible for the franking credits. This effectively eliminated arbitraging and dividend stripping, ending the secondary market for the credits. These factors suggest that gamma may be as low as zero. This is consistent with a recent study of Cannavan, Finn and Gray, which showed that for companies with substantial foreign ownership, the market value of tax credits is close to zero. [55]

7.2.2 Recent changes to taxation law

Prior to 1 July 2000, any imputation credits that exceeded a taxpayer's basic income tax liability were disregarded and could not be refunded. The Review of Business Taxation recommended that resident individuals, superannuation funds and like entities should be taxed on dividend income at their appropriate tax rates, rather than at the company tax rate.

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53 ABS Cat. No., 5302.0, Balance of Payments and International Investment Position, September Quarter 2001.

54 For example, total Australian overseas investment accounts to over $375 billion, approximately half of the capitalisation of the Australian Stock Exchange.

55 D. Cannavan, F. Finn and S. Gray The Value of Dividend Imputation Tax Credits, unpublished working paper, Department of Commerce, The University of Queensland, 2000.

The changes introduced on 1 July 2000 expands the class of tax offsets that are subject to the refundable tax offset rules to include imputation credits.

These changes have the effect of changing the order of allowable deductions for tax purposes to ensure franking credits are deducted last. The ACCC has stated that these changes are likely to move the appropriate value for gamma closer to one. It states:

> The change results in franking credits being treated as a refundable rebate, similar to the private heath insurance rebate, to resident individuals rather than merely a deductable rebate as it previously applied. In addition, the order of allowable deductions for tax purposes has been amended so that franking credits are deducted last when calculating taxable income. This approach ensures the optimal utilisation of tax deductions and franking credit rebates. Therefore, in line with these changes, the Commission believes that a more appropriate value for gamma would be closer to 1.0. The Commission envisages undertaking further work before altering its current position.[56]

We do not know of any investigation of the impact of the 1 July 2000 tax changes. The ACCC's statement that the tax changes provides a basis for estimating gamma as closer to one is, with respect, most inappropriate without any assessment of the extent of the impact of the change.

Moreover, we believe there is good reason to suggest there would be little change at all, based upon the impact on the marginal investor. The tax law change will only impact gamma to the extent that the impacted investors play a part in the determination of equilibrium security prices, that is, they are marginal investors. We have already stated that this is not likely to be the case because of the extent of foreign ownership in Australia and the extent of foreign investment by Australians and Australian companies. Tax and imputation considerations are but one factor influencing valuation decisions.

Furthermore, the ACCC is only considering one side of the story. Even leaving aside the marginal shareholder issues, it is not at all clear that the tax changes will move gamma towards one – indeed, in times of low inflation it could well be the case that taxation would tend to lower gamma (because of incentives to lower payout ratios with shareholders securing returns through capital gains which attracts a lower taxation rate).

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[56] ACCC, Draft Decision Queensland Transmission Network Revenue Cap 2002-06/07, July 2001, p. 17.

Appropriate estimate of gamma

There is clearly a great deal of uncertainty over the estimate of gamma. Nevertheless, a maximum value of 0.5 is well established in Australian regulatory decision making. As noted, there is much evidence, particularly in relation to the marginal investor, to suggest that 0.5 is on the high side and a figure of zero may be reasonable. The ACCC's claim that the New Tax System increases the gamma towards one is without evidence, given:

- the uncertainty surrounding the full impact of The New Tax System in regard to the concessional treatment of capital gains relative to income;
- the very limited demonstrated impact of these arrangements on the marginal investor; and
- other tax changes reducing the value of franking credits to investors.

Conclusion

When all these factors are combined, we believe that, it would be appropriate for the gamma for ElectraNet to be 0.50.

8 Calculation of cost of equity capital

8.1 Equity beta

A difficulty that arises with estimates of systematic risk is to properly reflect the leverage of the firm. As leverage increases, systematic risk increases. Given the debt level, asset and debt betas, the tax rate and gamma, it is possible to calculate the equity beta for ElectraNet.

This process is usually referred to as re-levering and can be done a number of ways. Each approach implies a different set of assumptions. In its draft Statement of Principles for the Regulation of Transmission Revenues, ACCC presents two alternatives. One common approach, incorporating the value of franking credits, is to use the relationship:

$$\beta_e = \beta_a (1 + (1-T(1-\gamma)) (D/E)) - \beta_d (D/V)$$

where

β_e = equity beta,

β_a = asset beta,

β_d = debt beta,

E = market value of equity,

D = market value of debt,

V = E + D,

T = tax rate, and

γ = value of imputation credits.

Another approach discussed by ACCC and then adopted in its Powerlink Decision uses what they referred to as the Monkhouse formula:

$$\beta_e = \beta_a + (\beta_a - \beta_d) * \{1 - [r_d / (1 + r_d)] * (1 - \gamma) * T \} * (D/E)$$

where

r_d = cost of debt capital.

Consistent with the ACCC's approach we adopt the Monkhouse formula, assuming a zero debt beta for ElectraNet. The re-levered equity beta is then 1.12.

8.2 CAPM calculation

Using the information and estimates developed above, we can use the adapted CAPM to calculate the cost of equity capital. A figure of 13.16% is obtained from the following formula:

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

8.3 Additional risk factors to be included in cost of equity capital

In addition to the conventional analysis above, there is also substantial evidence of asymmetric risks faced by transmission network companies. Asymmetric risk is not captured by the CAPM, but has important implications for the cost of equity capital. We believe it is preferable theoretically and practically to treat this risk as an addition to the cost of equity capital estimated using CAPM, though we note the ACCC's preference for these to be included in cash flows.

Regulated firms such as ElectraNet face a range of risks that are asymmetric and which therefore are not picked up in the equity beta. These include:

- assets becoming stranded as customers change consumption patterns and competitors change strategies;[57]
- regulatory bodies adjusting policies or regulatory frameworks; and
- changes in asset valuation methodologies.

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[57] The stranding risk is, itself, highly dependent on the mode of asset valuation and depreciation used in price setting. Under optimised depreciated replacement cost (ODRC), which has found favour with Australian regulators, assets are valued by reference to an appropriately sized replacement. Hence, asset valuations can be affected by changes in demand.

These risks contain a number of characteristics that differentiate them from other risks faced by the company. First, the risks are unavoidable and asymmetrical. Therefore they are risks that cannot be diversified away by a transmission network company. Secondly, insurance against these risks is not commercially available. Thirdly, these are risks that cannot be diversified away by its investors. This is a critical point as the counter-parties to the risks are not public companies in which investors can invest. The principal counter-parties in each of the cases are consumers. Finally, these risks are not accommodated in conventional pricing models such as are used in the standard WACC approach.

Since the regulated firm has no alternative but to bear the risk of losses, it should be permitted a return that explicitly includes the actuarially fair premium for insuring against this risk. The second point, that insurance is not available to cover these risks, is an important point. It also provides an intuitive explanation of why this risk needs to be recognised and how regulators should handle it. If insurance was available, ElectraNet could take out insurance coverage. If it did so, the expense of the insurance would be fully acceptable as O&M in determining a revenue cap. The company could eliminate the risk with no adverse impact on its profit.

Since insurance coverage is not available, the company is forced to self-insure. Companies could still deal with the issue if they were allowed to use accrual accounting for self-insurance and record an expense for the actuarially fair self-insurance premium. Again, it would be an expense that regulators should accept as a legitimate part of doing business and recoverable through revenue. However, accounting practice in Australia does not allow the accrual of costs related to self-insurance. Accounting requires that self-insurance is accounted on a cash basis as the adverse events occur.

There are two questions that need to be answered. It is clear that these asymmetric risks exist in at least some circumstances. Therefore, the first question in the case of ElectraNet is, does the company face asymmetric risks such as described above? It is just as clear that when they exist, they should be recognised in the regulatory process.

We believe ElectraNet faces significant asymmetric risks that meet all of the tests set out above. Some of the key risks include:

- increased competition from gas transmission, increasing the risk of asset stranding;
- asset valuation risk, as a result of the ACCC's recently commenced review of ODRC guidelines which will set the framework for any optimisation of ElectraNet's transmission network in future regulatory reviews;

- uncertainty surrounding other policy and operational reviews including the COAG energy review and the ACCC's review of service standard guidelines;
- the intrinsic characteristics of ElectraNet's network, in particular its long and radial nature, resulting in a higher risk of interruptions; and
- regulatory uncertainty as a result of the ACCC not intending to finalise its Draft Principles for the Regulation of Transmission Revenues until 2003.

The second question is, how should the risk be reflected in the regulatory process? There are three approaches to consider.

1. The risk can be reflected as an actuarially fair insurance premium and that amount imputed to expenses for the company. This amount would be included in the determination of a revenue cap.
2. The risk can be reflected in the WACC so that the result is equivalent to recovering the actuarially fair insurance premium.
3. The risk can be handled as in accounting. When the adverse event occurs, the cost is recoverable through prices.

The first approach is consistent with Officer who states,

> …what the regulator must do is to apply the WACC to the value to set a price such that the price allows the recovery of all costs including the implicit costs of insurance associated with diversifiable risk. [58]

The second approach has been suggested by Swan.

> …[to] avoid that regulatory impact on investment, one needs to set a margin above the conventional WACC which reflects the option value of actually committing yourself to one of these long-lived projects. [59]

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58 R. Officer, A Note on the ACCC's and the Office of the Regulator-General's Cost of Capital for the Gas Industry, 1 July 1998, p. 3.

The third approach has a major drawback - moral hazard. Essentially, this approach would expose the company to the very asymmetric risk problem that requires a solution. In the event of a significant adverse event, would the regulator allow full recovery? We believe that virtually no regulated company believes full recovery would be allowed. Even if the regulator wished to commit itself to complete recovery, there does not seem to be any practical way to remove the moral hazard problem.

We do not regard the third approach as viable. In addition to the moral hazard problem, the approach has a significant drawback because of the lumpiness that would result in prices.

Conceptually we favour the first option. It properly reflects the issue as an insurance problem. However, it may be considered more acceptable to deal with the issue in WACC. We regard that as a practical solution, but reiterate that the proper adjustment to WACC for a given imputed self-insurance premium will be context specific. There will not be a general adjustment that will apply in all cases.

Handling the matter as an increment to be added to WACC for asymmetric risk is also consistent with the Victoria Gas Decision.

> However, the Office acknowledges that in practice, it is difficult to obtain a reliable actuarial valuation of all diversifiable risks. It is evident from the public submissions that where uncertainty exists in relation to the explicit valuation of such risks, it is common practice to apply a loading to the cost of capital (within the plausible range for the beta estimate) to reflect such risks.[60]
>
> The beta value selected by the Office therefore consciously overcompensates investors for systematic risk, to recognise the existence of such diversifiable (or insurable) risks. In particular, the Office has been deliberate in selecting a beta estimate near the upper bound of the plausible range[61]

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59 Swan quoted in Further Submission by Energy Projects Division (EPD) to the Australian Competition and Consumer Commission (ACCC) and to the Office of the Regulator General (ORG) on Weighted Average Cost of Capital (WACC), 17 July 1998, p. 5.

60 Paragraph C9.3 (a).

61 Paragraph 4.3.4 (b).

The Victoria Gas Decision recognised that asymmetric risks are a valid issue that must be incorporated into the regulatory process. However, the procedure used to reflect the economic impact of asymmetric risk was *ad hoc*. We consider it much better conceptually and practically to treat it as an increment to WACC that supplements the restricted analysis provided by the standard WACC and CAPM models.

The ACCC also recognised asymmetric risks and self-insurance risks in its decision on Central West Pipeline, where it allowed AGL Pipelines the upper end of its range for the asset beta (0.6):

> On balance, the Commission considers that an asset beta of 0.60 is appropriate for the CWP. This value incorporates substantial allowance for the asymmetric and self-insurance risks claimed by AGLP as discussed earlier. It also reflects the risk faced by businesses in the Central West region insofar as that is dependent on the systematic risk of the whole market.[62]

In addition, in its decision on Transgrid, the ACCC allowed Transgrid the upper range of its WACC parameters to reflect the newness of the regulatory regime.

There is considerable research currently going on in financial economics that can be applied to issues such as this. The approaches that seem to hold the most promise utilise a 'real options' framework. Based upon the real risk that ElectraNet faces from potential re-optimisation of its network in future regulatory decisions, we estimate that for an investor to be indifferent about accepting these risks or not requires an increment on the cost of equity capital of between 0.5% and 1.0%, providing these risks are not fully reflected in the business cash flow. This estimate, based upon data provided by ElectraNet is consistent with estimations of the magnitude of the actuarially fair self-insurance premium in other contexts and the research of Conine and Tamarkin that estimated that for a set of 60 US utilities the cost of equity was understated by 1.3% if a reward for asymmetric risk was not included. [63]

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62 ACCC Final Decision: Access Arrangement by AGL Pipelines (NSW) Pty Ltd for the Central West Pipeline, June 2000, p. 42.

63 T. Conine and M. Tamarkin, "Implications of Skewness in Returns for Utilities' Cost of Equity Capital", *Financial Management*, Winter 1985, pp. 66-71.

Summary on asymmetric risk

We estimate that an increment of at least 0.5% is justified.

Conclusion on cost of equity capital

The cost of equity capital is calculated as the CAPM estimate adjusted for asymmetric risk where appropriate. *We recommend an estimate of 13.66% as the cost of equity capital for ElectraNet.*

9 Calculation of WACC

The information above is now sufficient to allow us to calculate the nominal, post-tax WACC for ElectraNet, as follows:

$$WACC = r_e (E/V) + r_d (D/V)$$

All of the values for this calculation have been developed above.

We estimate that the nominal, post-tax "vanilla" WACC for ElectraNet is 10.03%.

Table 9 summarises our parameter estimates.

Table 9: WACC rates

WACC/CAPM parameters	Estimate
Risk-free rate	5.90%
Debt proportion	60%
Equity proportion	40%
Debt risk margin	1.72%
Cost of debt	7.62%
Market-risk premium	6.5%
Asset beta	0.45
Debt beta	0
Tax rate	30%
Franking credits – gamma	50%
Equity beta	1.12
Increment for asymmetric risk	0.5%
Nominal, post-tax cost of equity	13.66%
Nominal, post-tax "vanilla" WACC	10.03%