

Jemena Gas Networks (NSW) Ltd – Further response to the draft decision

Attachment 1

Cost of capital

28 April 2010





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Attachment 1a: Oxera: Cost of equity

Attachment 1b: PricewaterhouseCoopers: Cost of debt

1 Introduction

Jemena Gas Networks (NSW) Ltd (**JGN**) welcomes this opportunity to participate in the Australian Energy Regulator's (**AER's**) public consultation process on the AER's draft decision and JGN's revised access arrangement revision proposal and submission.

This submission covers reports and information that respond to the AER's draft decision and support the position taken by JGN in both its original revised access arrangement and revised access arrangement revision proposal and submission in relation to:

- the cost of equity
- the cost of debt.

JGN requests that the AER consider this submission in conjunction with material submitted by JGN on 25 August 2009 and 19 March 2010, as well as in JGN's subsequent responses to the AER's clarification questions.

JGN would welcome any subsequent questions the AER may have.

2 Cost of Equity

In Appendix 1 of this submission, JGN provides a report from Oxera Consulting Ltd (Oxera) on the Fama-French three factor model (the Fama-French model).¹ This report provides evidence that supports JGN's proposal to use the Fama-French model to estimate the cost of equity for a benchmark efficient gas network in Australia.

2.1 Background

In its August 2009 original proposal, JGN proposed to use the Fama-French model to estimate the cost of equity based on an independent expert report from NERA—the NERA August 2009 report.²

However, in section 5.5 of its draft decision, the AER considered that JGN's proposed cost of equity model did not meet the requirements of rule 87. Further, in this section, the AER required JGN to amend its AA to use the Sharpe-Lintner CAPM to estimate the cost of equity.

In section 5.3.3 of its initial response to the draft decision, JGN reaffirmed its proposal to use the Fama-French model to estimate the cost of equity as per the NERA August 2009 report. JGN based this proposal on a second independent

¹ Oxera, 28 April 2010, *Estimating the cost of equity from the Fama-French model*, prepared for Jemena Gas Networks (NSW) Ltd, (the Oxera report).

² NERA, 12 August 2009, *Cost of equity: Fama-French three-factor model: Jemena Gas Networks (NSW)*. This report was submitted as appendix 5.2 of JGN's initial response to the AER draft decision.

expert report by NERA—the NERA March 2010 report—which responds to a number of matters raised in the AER draft decision.³

2.2 Oxera report

JGN engaged Oxera to provide an expert analysis of the evidence put forward by NERA. In particular, JGN engaged Oxera to consider the appropriateness of NERA's choice of model to estimate the cost of equity, and of NERA's application of the Fama–French model in an Australian market context.

Oxera is an established European economic consultancy that provides regulatory and cost of capital advice to regulators and regulated businesses. Oxera's team includes Professor Julian Franks who is a renowned international corporate finance expert and a professor of finance at the London Business School. Julian is currently on an appeals panel for the New Zealand Commerce Commission and advises Ofcom and BAA on regulatory matters, including on the cost of capital for regulated networks.

JGN engaged Oxera to provide an independent expert report including:⁴

1. *Acceptability of Fama-French model*—an opinion on whether the Fama-French three factor model is a well accepted financial model among experts in the field, including opinions in response to the following questions:
 - a. is there academic evidence that supports multi-factor models, in particular the Fama-French model, as a model for pricing risk?
 - b. is there academic evidence that supports the CAPM as a model for pricing risk?
 - c. in the Australian context, what is the evidence on the applicability of the Fama-French model?
2. *Review of NERA's reports*—an assessment of whether, in its August 2009 and March 2010 reports, NERA correctly specifies and applies the Fama-French three factor model to an Australian market context and whether NERA's cost of equity estimate is: (a) a return on capital that is commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services; and (b) a forecast or estimate that is arrived at on a reasonable basis
3. *Comparison of the Fama-French model with the CAPM*—an assessment of the predictive capacity of the Fama-French model used by NERA, compared to the CAPM as used by the AER.

Oxera find that:

- the Fama-French model is a well accepted financial model⁵
- the specification of the Fama-French model by NERA correctly follows the Fama-French procedure⁶

³ NERA, 19 March 2010, *Jemena Access Arrangement Proposal for the NSW Gas Networks: AER Draft Decision*. This report was submitted as Appendix 5.1 of JGN's initial response to the AER draft decision.

⁴ The terms of reference for the engagement are included as Appendix 3 of the Oxera report.

⁵ Oxera report, pp. 3–5.

⁶ Oxera report, pp. 6–8.

- NERA's dataset and estimates of the factor risk premia do not have any significant issues
- the Fama-French model is a multi-factor model of risk, not a characteristic-based model of returns
- NERA's estimates of the Fama-French parameters are robust⁷
- concerns raised by the AER about uncertainty of the Fama-French model factor premia applies similarly to the market risk premium used in the CAPM⁸
- the CAPM does not have superior forecasting performance to the Fama-French as specified and applied by NERA⁹
- the concerns raised by the AER regarding NERA's specification and application of the Fama-French model may not be fully grounded.¹⁰

Oxera's report also addresses a number of other concerns raised by the AER.

2.3 JGN's position

Based on the Oxera report, JGN reaffirms its view that the Fama-French model—as applied by NERA—satisfies the requirements of rules 87 and 74 of the National Gas Rules and provides a the best estimate of the cost of equity in the circumstances than that provided in the AER draft decision.

Taken together, JGN considers that the two NERA reports and the Oxera report respond adequately to the concerns expressed in the AER draft decision.

3 Cost of Debt

In Appendix 2 of this submission, JGN provides a further letter from PricewaterhouseCoopers (**PwC**) on the appropriate method for estimating the risk premium for a benchmark efficient gas network (the PwC April 2010 report).¹¹ This letter follows an earlier PwC report by responding to matters raised in the AER's recent final decision for ActewAGL.

3.1 Background

In its August 2009 original proposal, JGN proposed using the Tabcorp bond April 2009 issue as the data source to estimate the cost of debt for a benchmark efficient gas network. JGN then deducts the riskfree rate to estimate its proposed debt premium. JGN's proposed data source was based on a report submitted by the


⁷ Oxera report, pp. 9–11.

⁸ Oxera report, pp. 11–13.

⁹ Oxera report, pp. 13–14.

¹⁰ Oxera report, pp. 6–8.

¹¹ PwC, 28 April 2010, *Re: Update of cost of debt methodology analysis in light of the AER's ActewAGL decision*, (the PwC letter).



Victorian electricity distributors as part of their Advanced Metering Infrastructure charges applications (the Tabcorp report).¹²

In section of 5.10 of its draft decision, the AER rejects JGN's proposed data source because the AER considered that it is not appropriate to rely on a single debt issue such as the April 2009 Tabcorp bond issue. Instead, the AER relies on the CBASpectrum's BBB+ fair value curve as its data source for the decision, based on analysis that compares Bloomberg and CBASpectrum fair value yields. The AER gives two reasons for why it considers that it is not appropriate to use the Tabcorp bond, being:

- it is only a single bond
- it requires several adjustments to make it comparable to the benchmark corporate bond.

The AER estimates a debt premium of 4.18 per cent by averaging the 10 year CBASpectrum BBB+ fair value yield over a proxy period, being the 20 business days between 26 November and 23 December 2009—the same proxy period that the AER used to estimate the riskfree rate. The AER then adopts a debt premium estimate of 4.32 per cent. The AER does not discuss the relationship between the two estimates.

In section 5.3.8 of its initial response to the AER's draft decision, JGN proposed a methodology for: (a) testing the Bloomberg and CBASpectrum services by reference to whether the bond yield estimates that are produced by these services are likely to represent prevailing conditions in the market for funds; (b) assessing the relative merits of the Bloomberg and CBASpectrum services to determine which service provides the best estimate of the debt risk premium for a 10 year BBB bond possible in the circumstances; and (c) estimating the debt risk premium using the preferred service, including that if CBASpectrum is preferred, using the fair value yield for 10 year BBB corporate bond, and if Bloomberg is preferred, extrapolating on a linear basis the fair value yields on five and seven year BBB rated bonds. JGN based this methodology on the PwC March 2010 report.¹³

Applying the above described methodology to JGN's sample averaging period,¹⁴ PwC recommended extrapolating the debt premia on five and seven year Bloomberg BBB fair value yields to estimate a debt premium of 4.48 per cent for 10 year BBB corporate bonds. JGN proposed this estimate based on the PwC methodology in its initial response to the AER's draft decision, noting that it would be updated for JGN's final averaging period.

Subsequent to JGN's initial response, the AER released its final decision for ActewAGL, which used the CBASpectrum's BBB+ fair value curve as its data source for estimating a debt premium for ActewAGL of 3.35 per cent.¹⁵ The AER based its decision on further analysis of Bloomberg and CBASpectrum fair value yields.

¹² Victorian electricity distribution businesses, 1 June 2009, *Debt risk premium for use in the initial AMI WACC period*. This report was submitted as part of JGN's revised AA.

¹³ PwC, March 2010, *Jemena Gas Networks (NSW): The benchmark cost of debt for a gas distributor*. This report was submitted as appendix 5.5 of JGN's initial response to the AER draft decision.

¹⁴ JGN's sample averaging period was 15 January to 12 February 2010.

¹⁵ AER, March 2010, *Final decision, Access arrangement proposal, ACT, Queanbeyan and Palerang gas distribution network*.

3.2 PwC letter

JGN engaged PwC to assess the AER's further analysis and its impact on the conclusions reached in the PwC March 2010 report.

In particular, PwC was engaged to provide an independent expert letter including:¹⁶

1. *Review the AER's final decision for ActewAGL on the debt margin*—an assessment of the AER's analysis and conclusions on the data source and estimate of the debt margin in section 5.5 of the ActewAGL final decision, including whether the AER's methodology for comparing Bloomberg and CBASpectrum fair value curves is robust and likely to lead to: (a) a rate of return on capital that is commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services; and (b) a forecast or estimate that is arrived at on a reasonable basis and represents the best forecast or estimate possible in the circumstances.
2. *Review the PwC March 2010 report in light of the AER's final decision for ActewAGL*—an assessment of whether, in light of the AER's final decision for ActewAGL, PwC's methodology for comparing Bloomberg and CBASpectrum fair value curves is robust and likely to lead to: (a) a rate of return on capital that is commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services; and (b) a forecast or estimate that is arrived at on a reasonable basis and represents the best forecast or estimate possible in the circumstances.
3. *Propose a debt premium estimate for a BBB 10 year bond*—propose a debt premium estimate for a BBB 10 year bond over the 20 business days from 15 January to 12 February 2010 that is: (a) a return on debt capital that is commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services; and (b) a forecast or estimate that is arrived at on a reasonable basis and represents the best forecast or estimate possible in the circumstances.

PwC find that there is nothing in the AER's recent final decision for ActewAGL that changes the conclusions in the PwC March 2010 report.¹⁷ In particular, PwC find that:

- there is a sound basis for preferring the linear extrapolation of the Bloomberg BBB debt premia, as previously concluded in the PwC March 2010 report¹⁸
- it is probable that the relative accuracy of the CBASpectrum service for predicting the yields of the bonds on issue is marginal¹⁹
- there are flaws in the AER's method of testing cost of debt estimates based on the Bloomberg service²⁰

¹⁶ The terms of reference for the engagement are included as attachment B of the PwC April 2010 report.

¹⁷ PwC Letter, p. 1.

¹⁸ PwC Letter, p. 5.

¹⁹ PwC Letter, p. 3.

²⁰ PwC Letter, p. 3.

- the CBASpectrum service should not be used to derive a benchmark cost of debt.²¹

PwC's letter also addresses a number of other issues raised by the AER.

3.3 JGN's position

Based on PwC's letter, JGN reaffirms its proposed method as detailed in JGN's initial response to the AER's draft decision.

Moreover, JGN welcomes the AER's willingness to further analyse the best method for estimating the debt premium for a benchmark efficient gas network, as evidenced by its final decision for ActewAGL. JGN considers that PwC's letter responds fairly to issues raised in the ActewAGL decision and provides further evidence that supports PwC's March 2010 report.

²¹ PwC Letter, p. 3.

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Jemena Gas Networks (NSW) Ltd – Further response to the draft decision

Attachment 1a

Oxera: Cost of equity

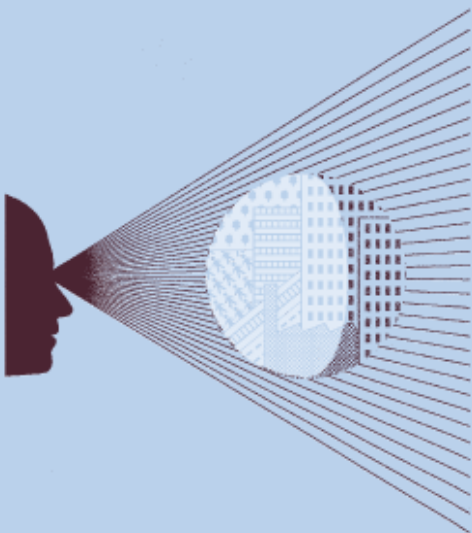
28 April 2010

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Estimating the cost of equity from the Fama–French model

Prepared for Jemena Gas Networks (NSW) Ltd

April 28th 2010



Executive summary

Jemena Gas Networks (NSW) Ltd (hereafter, JGN) submitted its access arrangement proposal for the regulation of its gas distribution networks from 2010 to 2015 to the Australian Energy Regulator (AER) on August 26th 2009. JGN proposed that the cost of equity should be determined using a domestic version of the Fama–French model.

However, in its Draft Decision on February 10th 2010, the AER stated its view that JGN's proposed use of the Fama–French model did not meet the requirements of the National Gas Rules (NGR). In its Draft Determination, the AER stated that this was on the basis of a number of reasons, including limited use of the Fama–French model by both regulators and finance practitioners; concerns about the model's theoretical foundations; lack of consistent findings in the empirical literature; and the absence of well-established parameter inputs in the context of the Australian market.

On March 19th 2010 JGN responded to the matters raised in the AER's Draft Decision on JGN's Revised Access Arrangement Revisions, providing additional evidence in support of the Fama–French model meeting the requirements of the NGR. JGN's submissions (both its proposal and response) included expert evidence by NERA Economic Consulting (hereafter, NERA) to estimate the cost of equity for gas distribution networks.

JGN has engaged Oxera Consulting Ltd (hereafter, Oxera) to provide an expert analysis of the evidence put forward by NERA. In particular, JGN has commissioned Oxera to consider the appropriateness of NERA's choice of model to estimate the cost of equity, and of NERA's application of the Fama–French model.

In order to undertake the review of NERA's expert evidence, Oxera has undertaken a thorough review of the academic literature on asset pricing models—in particular, the capital asset pricing model (CAPM) and the Fama–French model. Oxera has also undertaken a critical assessment of NERA's approach to derive the cost of equity from the Fama–French model applied in the Australian market.

Oxera's review of the academic literature finds that the Fama–French model and the CAPM are well-accepted models. However, both models have been the subject of critical analysis by relevant experts, with some more supportive of the Fama–French model and others more supportive of the CAPM. In the Australian market context, the evidence is mixed: some studies reject the CAPM as a pricing model; some find that the Fama–French model outperforms the CAPM; and other studies are less supportive of Fama–French. On balance, the evidence reviewed does not suggest that either the Fama–French model or the CAPM is better at explaining Australian stock returns; instead, there is evidence that both models are useful in doing this.

Overall, results from Oxera's statistical tests find that the specification of NERA's model correctly follows the Fama–French procedure. Oxera has replicated and critically assessed NERA's estimates of the beta, the risk premia and the resulting estimate of JGN's cost of equity, derived from the Fama–French model. While a few minor statistical issues have been identified, these have been found not to have a material impact on the resulting estimate of the cost of equity. This suggests that the concerns raised by the AER regarding NERA's specification and application of the Fama–French model may not be fully grounded.

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1 Introduction

As part of its submission to the Australian Energy Regulator (AER), Jemena Gas Networks (NSW) Ltd (hereafter, JGN) proposed the use of the Fama–French model to estimate the required return on equity, and put forward an estimate of the post-tax (nominal) cost of equity of 12.06% on this basis.¹ This estimate was derived from NERA’s analysis of the cost of equity, based on applying the Fama–French model to Australian market data.²

JGN’s use of the Fama–French model to derive the cost of equity was motivated on the basis that the model is well accepted, with weight given to the model by academics, financial market practitioners and regulators alike. As stated in JGN’s submission to the AER, the Fama–French model has been estimated on a ‘reasonable basis’, in accordance with the National Gas Rules (NGR).³ These rules state that the rate of return should:

- be determined using a well-accepted approach that incorporates the cost of equity and debt (Rule 87 (2) (b));
- be commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services (Rule 87 (1));
- be determined on a basis that assumes that the service provider meets benchmark levels of efficiency (Rule 87 (2) (a) (i));
- in so far as the rate of return is in the nature of a forecast or estimate, be arrived at on a reasonable basis and represent the best forecast or estimate possible in the circumstances (Rule 74 (2)).

However, in its Draft Decision, the AER argued that the Fama–French model, as specified by NERA, did not meet the requirements of the NGR.⁴ Concerns raised by the regulator against the proposed use of the Fama–French model were stated to be whether the Fama–French model is a well-accepted financial model; NERA’s specification and application of the model; the statistical soundness of the estimation; and a lack of testing the forecasting ability of the model.

In a subsequent report (the second NERA report),⁵ NERA provided additional evidence to support the claim that the estimate of the cost of equity for an Australian gas distribution company as advanced in the first NERA report satisfies the NGR.

Oxera’s review considered whether NERA correctly applied the Fama–French model to the Australian market context. In particular, the following areas, which build on each other, have been examined, in order to assess NERA’s approach.

- **Is Fama–French a well-accepted model?** This addresses whether there is academic literature that i) supports the capital asset pricing model (CAPM) as a model for pricing risk; ii) supports multi-factor models, in particular, the Fama–French model, as a model for pricing risk; and iii) evidence on the applicability of the Fama–French model in the Australian market.

¹ JGN (2010), ‘Initial Responses to the Draft Decision’, March 19th.

² JGN (2009), ‘Jemena Gas Networks (NSW)—Access Arrangement Information—Appendix 9.1, NERA Cost of Equity—Fama–French Model’, August 26th.

³ Australian Energy Market Commission, ‘National Gas Rules: Current Rules’, Rules version 2, effective from July 1st 2009.

⁴ AER (2010), ‘Jemena Access Arrangement Proposal for the NSW Gas Networks July 1st 2010 to June 30th 2015: Draft Decision—Public’, February.

⁵ NERA (2010), ‘Jemena Access Arrangement Proposal for the NSW Gas Networks: AER Draft Decision: A Report for Jemena’, March 19th.

- **Has NERA correctly applied the model?** This analysis considers whether NERA has correctly formulated and estimated the parameters of the Fama–French model.
- **Are NERA’s estimates robust?** Oxera’s replication of NERA’s results revealed some statistical issues relating to the estimates of factor betas and the Fama–French factors. This step of the analysis therefore investigates whether NERA’s cost of equity estimate is sensitive to these issues.
- **Does the dataset used by NERA reveal any statistical issues?** After having assessed whether the model has been formulated correctly and whether the results are robust, this step investigates whether the dataset underlying the analysis is appropriate.
- **Does the CAPM have superior forecasting ability to the Fama–French model?** The forecasting performance of the Fama–French model has been evaluated against the performance of the CAPM.

The report is structured as follows:

- section 2 assesses the acceptance of the Fama–French model as a financial model;
- section 3 reviews NERA’s approach to applying the Fama–French model in the Australian context;
- section 4 summarises the main results and concludes;
- Appendix 1 presents further detail on the empirical analysis undertaken by Oxera;
- Appendix 2 presents the CVs of the authors;
- Appendix 3 replicates the terms of reference for this study.

1.1 Compliance with the Federal Court Guidelines

In preparing this report, each of the joint authors (here referred to as ‘Oxera’) confirms that all inquiries that we believe to be desirable and appropriate have been made, and no matters of significance that we regard as relevant have, to our knowledge, been withheld from this report.

We have been provided with a copy of the Federal Court ‘Guidelines for Expert Witnesses in Proceedings in the Federal Court of Australia’ dated September 25th 2009. We have reviewed those guidelines and this report has been prepared consistently with the form of expert evidence required by those guidelines.

2 Is Fama–French a well-accepted model?

Key observations

The three questions, outlined in section 1, relating to evidence from the academic literature about whether the Fama–French model is a well-accepted model can be answered as follows.

- There is evidence providing support for multi-factor models, including the Fama–French model.
- There is a substantial body of evidence that questions the adequacy of the CAPM as a model for pricing risk. However, there are also concerns about the Fama–French model.
- In the Australian context, the evidence is mixed: some studies reject the CAPM as a pricing model, some find that the Fama–French model outperforms the CAPM, while others are less supportive of the Fama–French model.

Each of the above points is examined further below.

2.1 Is there academic evidence that supports multi-factor models, in particular the Fama–French model, as a model for pricing risk?

A number of studies indicate that risk factors—other than market risk—are important in explaining returns on equity.⁶ Existing studies on multi-factor models provide some support for the arbitrage pricing theory and for the Fama–French model.⁷ In particular, according to Cochrane (2005), ‘the Fama–French model is one of the most popular multi-factor models that now dominates empirical research.’⁸ Other studies have also reported that other characteristics can explain returns, including leverage (Bhandari, 1988) and earning yields (Basu, 1983). However, it is generally found that these factors lose their explanatory power in explaining returns when the Fama–French factors are included.

2.2 Is there academic evidence that supports the CAPM as a model for pricing risk?

There is evidence in some empirical studies that the CAPM does not perform well in explaining returns on equity. For example, there is a large body of literature that documents the ‘size effect’ (ie, small firms outperform predictions from the CAPM), going back to Banz

⁶ The CAPM is well grounded in portfolio theory. Although there are some theoretical concerns about the Fama–French model, there is evidence to suggest that stocks with high book-to-market ratios have significantly higher returns than stocks with low book-to-market ratios.

⁷ Chen, Roll and Ross (1986) find evidence of five priced characteristics that affect average stock returns, including interest rates, inflation and a measure of productivity. Chen, N., Roll, R. and Ross, S.A. (1986), ‘Economic Forces and the Stock Market’, *The Journal of Business*, **59**: 3, pp. 383–403.

⁸ Cochrane, J.H. (2005), *Asset Pricing: Revised Edition*, Princeton University Press. Note, however, that Cochrane refers mainly to empirical research on ex post portfolio performance rather than to the determination of the cost of capital, where the application of multi-factor models is less common.

(1981), who concluded that ‘the evidence presented in this study suggests that the CAPM is mis-specified’.⁹

Fama and French (1993) also found ‘evidence that factors relating to size and book-to-market equity proxy for sensitivity to common risk factors in stock returns.’¹⁰ The size and book-to-market factors have also been tested by various authors using different samples. For instance, Barber and Lyon (1997) find that the relationship between these two risk factors and returns also holds for financial firms, which were excluded from Fama and French (1992). In particular, the authors conclude that ‘firm size and book-to-market ratios explain in an economically meaningful way cross-sectional variation in security returns’.¹¹

2.3 In the Australian context, what is the evidence on the applicability of the Fama–French model?

In the Australian context, the limited evidence on the Fama–French model is mixed. There is some evidence that the Fama–French model outperforms the CAPM in the Australian context—although this cannot be conclusive as a result of the limited number of relevant studies. For example, Gaunt (2004) finds that ‘the three factor model provides a better explanation of observed Australian stock returns than the CAPM’.¹² Gharghori, Chan and Faff (2007) find that ‘in a series of comparative tests, the three-factor model is found to be consistently superior to the CAPM.’¹³ O’Brien, Brailsford and Gaunt (2008) document that both the size and book-to-market effects ‘are present in the Australian market’.¹⁴

Other studies are, however, less supportive about the performance of the Fama–French model in the Australian market. Gharghori, Lee and Veeraraghavan (2009) conclude that ‘while the Fama–French model has been shown to work well in the USA, this study reveals the inadequacy of the Fama–French model in Australia’.¹⁵

While Faff (2004) does not dismiss the Fama–French model, the size factor premium is found to be negative, and he concludes that ‘we may have to seriously contemplate applying a Fama and French model which permits a positive premium in favour of large firms over small firms’.¹⁶ However, Faff’s conclusions are based on only three years of data—over the period 1996 to 1999—which is likely to be far too short a period over which to identify accurately the factor premia. Faff (2001) points out a practical limitation of the Fama–French model, stating that ‘a feature of the Fama–French model which reduces its appeal (when

⁹ Banz, R.W. (1981), ‘The Relationship between Return and Market Value of Common Stocks’, *Journal of Financial Economics*, **9**, p.16. Empirical studies that have documented the size effect since Banz (1981) include Keim (1983), Lamoureux and Sanger (1989) and Fama and French (1992, 1993, 1996). Keim, D.B. (1983), ‘Size Related Anomalies and Stock Market Seasonality: Further Empirical Evidence’, *Journal of Financial Economics*, **12**, pp. 13–32. Lamoureux, C.G. and Sanger, G.C. (1989), ‘Firm Size and Turn-of-the-Year Effects in the OTC/Nasdaq Market’, *The Journal of Finance*, **44**, pp. 1124–1245. Fama, E.F. and French, K.R. (1992), ‘The Cross-Section of Expected Stock Returns’, *The Journal of Finance*, **47**:2, June, pp. 427–465. Fama, E.F. and French, K.R. (1993), ‘Common Risk Factors in the Returns on Stocks and Bonds’, *Journal of Financial Economics*, **33**, September, pp. 3–56. Fama, E.F. and French, K.R. (1996), ‘Multifactor Explanations of Asset Pricing Anomalies’, *The Journal of Finance*, March, pp. 55–84.

¹⁰ Fama, E. and French, K. (1993), ‘Common Risk Factors in Stock and Bond Returns’, *Journal of Financial Economics*, **33**, p. 5.

¹¹ Barber, B.M. and Lyon, J.D. (1997), ‘Firm Size, Book-to-Market Ratio, and Security Returns: A Holdout Sample of Financial Firms’, *The Journal of Finance*, **52**, No. 2, June, p. 883.

¹² Gaunt, C. (2004), ‘Size and Book to Market Effects and the Fama French Three Factor Asset Pricing Model: Evidence from the Australian Stockmarket’, *Accounting and Finance*, **44**, 27–44.

¹³ O’Brien, M., Brailsford, T. and Gaunt, C. (2008), ‘Size and Book-to-market Factors in Australia’, 21st Australasian Finance and Banking Conference.

¹⁴ Ibid., Section 6.2, p. 19.

¹⁵ For further details, see Gharghori, P., Lee, R. and Veeraraghavan, M. (2009), ‘Anomalies and Stock Returns: Australian Evidence’, *Accounting and Finance*, **49**, pp. 555–76. However, Oxera notes NERA’s (2010) comment about a potential error in the empirical work by Gharghori et al. (2009), which may affect some of the authors’ conclusions.

¹⁶ Faff, R. (2004), ‘A Simple Test of the Fama and French Model Using Daily Data: Australian Evidence’, *Applied Financial Economics*, **14**, pp. 90–91.

compared to its simpler counterpart, the capital asset pricing model (CAPM)) is difficulties surrounding the nature and construction of the size and book-to-market factors'.¹⁷

It should be noted that some papers have been found to reject the use of the CAPM in explaining returns for Australian stocks. For example, Beedles, Dodd and Officer (1988) found evidence that contradicts the CAPM, concluding that 'the size effect appears remarkably robust'.¹⁸ In their test of the CAPM model, O'Brien, Brailsford and Gaunt (2008) find that 'the market risk premium is not a priced factor', indicating that the CAPM fails to explain stock returns with Australian data,¹⁹ and Kassimatis (2008) finds that 'the static CAPM is rejected for the Australian stock market'.²⁰

In conclusion, Oxera finds that the Fama–French model and the CAPM are well-accepted models, both of which have been the subject of critical analysis by relevant experts in the field of financial economics, with some more supportive of the former and others of the latter. On balance, the academic literature reviewed does not suggest that either the CAPM or the Fama–French model is better at explaining cross-sections of Australian equity returns; instead, there is evidence that both models are useful in doing this.

¹⁷ Faff, R. (2001), 'An Examination of the Fama-French Three-Factor Model Using Commercially Available Factors', *Australian Journal of Management*, 26: 1, June, p. 2.

¹⁸ Beedles, W. Dodd, P. and Officer, R.R. (1988), 'Regularities in Australian Share Returns', *Australian Journal of Management*, 13, 1, p. 17.

¹⁹ O'Brien, M., Brailsford, T. and Gaunt, G. (2008), 'Size and Book-to-market Factors in Australia', 21st Australasian Finance and Banking Conference, Section 6.2, p. 19.

²⁰ Kassimatis, K. (2008), 'Size, Book to Market and Momentum Effects in the Australian Stock Market', *Australian Journal of Management*, June, 33:1, p. 154.

3 Assessment of NERA's approach

3.1 Has NERA correctly specified and applied the Fama–French model to the Australian context?

Key observations

Overall, Oxera has found that the specification of NERA's model correctly follows the Fama–French procedure.

Using NERA's dataset, Oxera has replicated its beta estimates and the cost of equity derived from these estimates, based on the factor risk premia reported by NERA. This has not revealed any significant issues. This suggests that the concerns raised by the AER regarding NERA's specification and application of the Fama–French model may not be fully grounded.

In its Draft Decision, the AER finds that the specification of the Fama–French model proposed by NERA is inconsistent with the legislative framework. In particular, the regulator concludes that:

the FFM seeks to adjust for business specific risks, but the regulatory framework for assessment is a benchmark exposure to risks. That is, the FFM posits that a business' return should be based on its specific characteristics—the business size and book-to-market ratio. ... recognising that the FFM needs to be adapted to the regulatory framework, the NERA report on the FFM proposes a form of the FFM which is a variant on the original specification. This means that even if the AER was to accept that the (original) FFM is a well accepted model, the NERA report on the FFM does not use the original specification.²¹

In this assessment of the specification of the Fama–French model by NERA, the AER appears not to distinguish entirely adequately between two distinct types of financial model:

- multi-factor models of risk, such as the Fama–French model, which relate the required return of a company to risks that cannot be diversified away and that are captured by different portfolios (eg, the Fama–French portfolios); and
- 'characteristic-based' models of returns that link required returns to specific characteristics of a company that together determine the firm's risks and returns.²²

In particular, the AER raises concerns that the Fama–French model should not be used to estimate returns required on equity for a benchmark business, as returns derived from the Fama–French model would depend on a company's unique characteristics.²³ However, this concern by the AER is not fully clear because, under Fama–French's procedure, the factors that explain returns are derived from diversified portfolios, rather than company-specific characteristics.

Given the role of the Fama–French model as a multi-factor model of risk—and NERA's application of the model in the Australian regulatory context—in order to review whether

²¹ AER (2010), op. cit., p. 109.

²² For a discussion of the differences between these two types of model, see Berk, J. and DeMarzo, P. (2006), *Corporate Finance*, Pearson Education.

²³ AER (2010), op. cit., p. 109.

NERA correctly applied the Fama–French model to the Australian market, it is necessary to establish that:

- the formulation of the model corresponds to the Fama–French model; and
- the estimation of the model parameters (factor betas, factor premia) is undertaken correctly.

To assess these issues, Oxera has replicated the results provided by NERA in both the two reports submitted to the AER, as well as the data provided to Oxera.

The results of this analysis are as follows.²⁴

- The formulation of the model corresponds to the Fama–French three-factor model as commonly found in the academic literature as well as in finance textbooks. The model estimated by NERA seeks to explain returns on diversified portfolios through the following three factors:
 - i) returns on the market portfolio;
 - ii) the difference between returns on a diversified portfolio of stocks with a high book-to-market ratio and corresponding returns on a portfolio of stocks with low book-to-market ratio (denoted by HML); and
 - iii) the difference between returns on a diversified portfolio of small stocks and corresponding returns for larger stocks (denoted by SMB).
- The SMB and HML portfolios have been inferred from Australian indices for large/small cap and value/growth stocks,²⁵ in order to proxy returns for the corresponding Fama–French portfolios.²⁶ Overall, this appears to be a valid approach as in multi-factor models such as the Fama–French model the factor portfolios together are intended to capture all systematic (undiversifiable) risk; the portfolios themselves can be thought of as either a risk factor itself or a portfolio of stocks correlated with an unobservable risk factor. As such, the portfolios employed in NERA’s analysis reflect the difference in returns between portfolios comprising small versus large cap stocks, and value versus growth stocks.
- The factor risk premia for the SMB and HML portfolios have been calculated as the historical average of annual data over the period 1975 to 2008 for the HML premium, and 1980 to 2008 for the SMB premium. Overall, this approach appears to be appropriate: factor risk premia such as the value and growth risk premia account for undiversifiable risks and can be best assessed by using historical average returns on the factor portfolios.²⁷
- Oxera has replicated the calculations of the factor risk premia provided by NERA (see the results presented in section A1.1). This has revealed minor differences between the average risk premia, calculated as historical averages of the annual estimates, and those estimates reported by NERA.²⁸ However, these differences have only a minor impact on the resulting estimate of the cost of equity, bearing in mind the degree of

²⁴ The calculations of the portfolio returns and the resulting factor premia take into account adjustments for the use of imputation tax credits. Oxera has not undertaken a review of the appropriateness of NERA’s calculations for the purposes of this analysis.

²⁵ SMB denotes the difference between returns on small cap versus large cap stocks; HML denotes the difference between returns on stocks with a high book-to-market compared with low book-to-market value.

²⁶ Oxera understands that the data underlying the construction of the Fama–French portfolios has been sourced from Dimensional Fund Advisors (DFA), Kenneth French’s website, Bloomberg and Factset. The returns on the Fama–French portfolios have been calculated taking into account imputation tax credits as set out in the first NERA report.

²⁷ See Berk, J. and P. DeMarzo (2006), op. cit.

²⁸ JGN (2009), op. cit., Appendix 9.1, ‘Cost of Equity—Fama-French Three Factor Model’, August 12th, p. 39.

statistical uncertainty that surrounds any estimates.²⁹ In particular, using the factor risk premia in NERA's reports yields a cost of equity estimate of 11.57%³⁰ (based on weekly data); while using Oxera's estimates of risk premia results in a cost of equity estimate of 11.62%.³¹ (See the results presented in section A1.2 for further detail).

In sum, Oxera considers that NERA's specification of the model corresponds to the Fama–French model, and that the estimation of the model parameters has been undertaken correctly. Any discrepancy between NERA's estimation and Oxera's replication of NERA's results has been found to be immaterial. Putting this immaterial discrepancy to one side indicates that the AER's concerns regarding NERA's specification and application of the Fama–French model are unfounded.

²⁹ There will be a degree of statistical uncertainty associated with any estimates from an econometric model. From a technical point of view, this uncertainty is captured by the standard error associated with each estimate.

³⁰ *Ibid.*, p. 50. This cost of equity estimate differs from the estimate proposed by JGN (12.06%) as NERA uses a different assumption about the risk-free rate. It is understood that this is due to JGN updating its estimate of the risk-free rate in line with the latest market data, reflecting standard practice.

³¹ This scenario corresponds with sensitivity 8 reported in Table A1.2.

3.2 Are NERA's estimates robust?

Key observations

Oxera has undertaken a number of sensitivity checks to assess whether the statistical issues identified in the review materially affect the resulting cost of equity estimate. The analysis suggests that the issues are relatively minor, and do not have a material impact on the resulting estimate of the cost of equity.

The AER reports that NERA's implementation of the Fama–French model relies on empirical analysis that is not sound.³² In particular, it concludes that:

no statistical diagnostic tests are undertaken to demonstrate that the error structures implied by the data are consistent with efficient estimation of the parameters.³³

Oxera's review of the parameter estimation undertaken by NERA has therefore included an assessment of the statistical diagnostic tests of NERA's regression analysis.

This review has revealed some issues such as:

- insignificant estimates; and
- statistical problems relating to the uncertainty associated with the beta estimates.

These issues are outlined in further detail in sections A1.2 and A1.3.

Although these statistical issues might potentially affect the estimates of the cost of equity derived from the Fama–French model because of the reasons outlined below, the sensitivity checks undertaken by Oxera indicate that they do not materially affect the resulting estimate of the cost of equity (as shown in section A1.2). As such, this does not cast doubt over NERA's estimates of the parameters associated with the Fama–French model.

First, NERA has estimated the factor betas of the Fama–French model by averaging beta estimates obtained from regressions of required returns for individual comparator companies as well as for two portfolios of these comparators.³⁴ The method followed by NERA is broadly consistent with Henry's reports for the AER (2008, 2009).³⁵ NERA has included beta estimates that were found to be statistically significant, as well as estimates that were statistically insignificant. By definition, insignificant parameter estimates are not different from zero at conventional significant levels. As such, inclusion of such values into the calculation of average beta estimates might distort those averages.

To examine the impact of this approach, statistically insignificant beta estimates have been set equal to zero. The rationale behind this approach assumes that the respective betas do not influence returns in these particular circumstances. Assuming that statistically insignificant beta estimates are equal to zero does not lead to material changes in the estimates of the cost of equity (see Table 3.1).³⁶ These results suggest that NERA's approach of including statistically insignificant estimates is appropriate in this context.

³² AER (2010), *op.cit.*, p. 110.

³³ *Ibid.*, p. 119.

³⁴ These two portfolios are constructed as an equally weighted and value weighted portfolio, respectively. The beta estimates of the equally weighted portfolios should correspond to the average of the company betas and therefore inclusion of both estimates in the cost of equity calculation might introduce 'double counting'. However, calculations based on average beta estimates of the equally weighted and value-weighted portfolios alone does not lead to a materially different cost of equity estimate (12.25%).

³⁵ Henry, O.T. (2008), 'Econometric Advice and Beta Estimation', University of Melbourne, November 28th. Henry, O.T. (2009), 'Estimating Beta', University of Melbourne, April 23rd.

³⁶ Further detail explaining these results is also reported in Table A1.2.

Table 3.1 Estimates of the post-tax nominal cost of equity (based on tests of statistical significance unadjusted for parameter uncertainty)

Alternative scenarios	Estimates of the post-tax nominal cost of equity (%)
NERA's estimate	11.57
Beta estimates only based on statistically significant estimates	11.47
Statistically insignificant SMB premium set to zero	11.94
Statistically insignificant SMB premium set to zero, and average beta values based only on significant estimates	11.76

Note: Alternative scenarios are estimated by first estimating the Fama–French model on all three factors. In a second step, the beta estimates—and, where appropriate, the SMB premium—that have been found insignificant are set equal to zero in the calculation of the cost of equity. NERA's estimate differs from the estimate of the cost of equity proposed by JGN as a result of a different assumption on the risk-free rate.

Source: Oxera analysis, based on NERA (2009).

Second, in addition to insignificant betas, the estimate of the size risk premium (SMB) is found not to be statistically significantly different from zero, as has been noted by NERA and highlighted by the AER. However, excluding the insignificant SMB factor from the calculation of the cost of equity does not lead to major alterations in the cost of equity estimates (as shown in Table 3.1). This provides further indication of the appropriateness of the approach adopted by NERA.

Overall, the results illustrate that, even after taking the statistical significance of the estimates into account, this leads to only minor alterations in estimates of the cost of equity, bearing in mind the uncertainty surrounding the estimates. For example, Table 3.1 shows that the cost of equity estimates, across the different scenarios, range from 11.47% to 11.94%, where the estimate proposed by NERA lies closer to the lower bound of this range.

A further issue that has been identified by Oxera in the review of NERA's approach relates to the assessment of the significance of the beta estimates itself. In a number of regressions, diagnostic tests indicate statistical problems associated with the estimates (as shown in section A1.3).³⁷ Although these statistical issues will not bias the beta estimates themselves, they might lead one to judge betas to be statistically significant when they are actually too weak to be confidently distinguished from zero. The most robust approach would be to apply adjustments to the statistical tests that are used to assess the significance of the beta estimates in order to account for these issues. However, Oxera's analysis has found that failure to do this does not have a material impact on the resulting estimates of the cost of equity.

Using estimation methods that are robust to this problem might result in a different assessment of the statistical significance of individual beta estimates; this might lead to different values of average betas across estimates and therefore affect the cost of equity estimates. However, as indicated in Table 3.2, accounting for these issues (by making adjustments to tests for statistical significance for parameter uncertainty) tends to lead only to higher estimates of the cost of equity.

³⁷ The statistical problems relate to the variability in the error from the regression model. In technical terms, this is referred to as heteroscedasticity.

Table 3.2 Estimates of the post-tax nominal cost of equity (based on tests of statistical significance adjusted for parameter uncertainty)

Alternative scenarios	Estimates of the post-tax nominal cost of equity (%)
NERA's estimate	11.57
Beta estimates based only on statistically significant estimates using robust standard errors	12.33
Statistically insignificant SMB premium set to zero, and average beta values based only on significant estimates using robust standard errors	12.54

Note: Alternative scenarios are estimated by first estimating the Fama–French model on all three factors. In a second step, the beta estimates—and, where appropriate, the SMB premium—which have been found to be insignificant are set equal to zero in the calculation of the cost of equity. The statistical tests have been adjusted such that they are robust to parameter uncertainty—specifically, the Huber White sandwich estimator has been used.

Source: Oxera analysis, based on NERA (2009).

Therefore, the analysis suggests that, overall, NERA's estimates are robust, even after having regard to the statistical issues set out above, and concerns raised by the AER that the analysis is not statistically sound are unlikely to be appropriate, and should not lead the AER to reject the work undertaken by NERA. The issues identified have only minor effects, and in a number of cases, actually lead to higher estimates of the cost of equity. For example, in those instances where Oxera would have adopted a different approach, the resulting estimate of the post-tax (nominal) cost of equity would have ranged from 11.47% to 12.54%, as opposed to NERA's estimate of 11.57%.³⁸

3.3 Does the dataset used by NERA reveal any statistical issues?

Key observations

The AER raises concerns regarding the uncertainty associated with estimates of the factor premia of the Fama–French model. However, it should be noted that the market risk premium used in the CAPM is subject to similar uncertainty, as indicated by Oxera's assessment of the dataset used by NERA.

In its review of the literature on the Fama–French model in Australia, the AER concludes that the HML premiums reported in the academic literature:

vary from 14.6 per cent to 6 per cent, a range that is considered too large to be able to confirm its presence as a risk factor in Australia. The SMB premiums are even more of a problem, since they range from 17.2 per cent to negative 9 per cent, a result that is completely at odds with the original Fama–French model. These contradictory outcomes for the SMB premiums in overlapping periods are a key limitation in demonstrating whether the risk factor is relevant in an Australian market context.³⁹

Despite the AER's concerns about the variability in the estimates, the absolute size of the HML premium suggests that it is an important factor in explaining returns.

A critical review of the dataset adopted by NERA does not suggest that there are particular issues that are more likely to affect the Fama–French model to a greater extent than the CAPM, as used by the AER in its Draft Decision.

³⁸ See Table A1.2 for further details.

³⁹ AER (2010), op. cit., p. 115. It is noted that the HML premia found in the literature of between 6% and 14.6% will have a sizeable impact on the cost of equity.

The factor risk premia have been calculated by NERA using Australian data from 1975 to 2008 for the HML premium and from 1980 to 2008 for the SMB premium. The estimates of the Fama–French factor premia are subject to a certain degree of uncertainty, as noted by the AER. This is due to the inherent statistical difficulties that are typically associated with explaining returns; however, this affects not only the Fama–French model, but also the CAPM.

In particular, there is likely to be a degree of uncertainty around the estimates of the market risk premium, as well as the SMB and HML risk premia. This is a result of the volatility of returns on the portfolios (including the market portfolio which is the only portfolio included in the CAPM). This could be due to a number of reasons, including changes to the profile of business risk over time as well as exogenous market shocks, which may lead to a degree of variation in individual estimates. However, this will affect both the estimates from the CAPM as well as Fama-French.

Therefore, cost of equity estimates based on the CAPM, which calculates the required return as a function of the market risk premium only, are in principle subject to similar uncertainty as a multi-factor model of risk such as the Fama–French model.

For illustrative purposes, Oxera has examined the degree of uncertainty associated with the estimates from the Fama–French model. Table 3.3 shows Oxera’s estimates of the market, HML and SMB risk premia as well as the uncertainty surrounding those estimates, based on the dataset used by NERA, and applying the same tax adjustments to stock returns as adopted by NERA.⁴⁰ As shown in Table 3.3, Oxera’s estimates of the risk premia are similar to those obtained by NERA.⁴¹

Table 3.3 Estimates of the risk premia and associated uncertainty

Risk factor	Risk premium (%)	Standard error
Market risk (1981–2008)	4.20	4.25
HML risk (1975–2008)	6.32	3.11
SMB risk (1980–2008)	–1.20	2.27

Note: The market risk premium is calculated as the difference between the annual returns on the All Ordinaries Index of Australian stocks and the 10-year Australian Commonwealth Government Bonds. Stock returns take into account imputation tax credits. Estimates that are not statistically significant at the 5% level are shaded. Sources: Data for the All Ordinaries Index and the SMB and HML portfolios was provided by NERA. Data for the 10-year Australian Commonwealth Government Bonds was sourced from Datastream. Risk premia and standard errors are calculated by Oxera.

As shown by Table 3.3, estimates of the market risk premium are potentially subject to similar uncertainties as the factor risk premia, reflecting the general volatility of portfolio returns.

In sum, the dataset underlying the estimates appears to be appropriate; although there is a certain degree of uncertainty associated with estimates of both factor betas as well as risk premia. However, it should be borne in mind that not only risk premia of the Fama–French factors are subject to such uncertainty, but also that estimates of the market risk premium are affected by similar uncertainty.

Estimates of factor betas and risk premia, as used by NERA, are derived from recent Australian data, and drawn from a period which may be considered to be generally

⁴⁰ The statistical measure of the uncertainty of the estimates is referred to as the standard error of the estimates. This measure is shown in Table 3.3.

⁴¹ NERA’s (2010) estimates of the HML and SMB risk premium are 6.24% and –1.23% respectively. See NERA (2010), op. cit., p. 49.

representative of prevailing conditions in the market.⁴² Therefore, NERA's estimate of the return of capital can be considered to be commensurate with prevailing conditions in the market for funds, and the risks involved in providing reference services, and thus in compliance with rule 87 (1) of the NGR.

3.4 Does the CAPM have superior forecasting ability to the Fama–French model?

Key observations

An assessment of the predictive accuracy of both the CAPM and the Fama–French model in the Australian market context, based on the dataset used by NERA, does not suggest that the CAPM has superior forecasting performance to the Fama–French model in the context under investigation.

The purpose of a financial model such as the Fama–French model or the CAPM in the regulatory context faced by the relevant service provider and the AER is to provide an estimate of the cost of equity for the forthcoming price control period. In other words, the model is used to make ex ante forecasts of the required future return on equity of the regulated business.

Given this backdrop, the AER emphasises that the particular implementation of the Fama–French model in the NERA report does not include a statistical analysis that tests for the forecasting ability of the proposed Fama–French model.⁴³ In particular, the regulator states that:

the NERA report on the Fama–French model does not examine return prediction performance but rather within sample return outcomes. The regression analyses are undertaken on the entire sample period (1980 to 2009) to determine the best possible fit for the data. To test the predictive power of a model, the standard approach is to take the regression coefficients determined in-sample and test them against out-of-sample data. This basic experimental examination is not attempted in the NERA report on the Fama–French model.⁴⁴

However, it has to be acknowledged that the forecasting performance of any contending financial model cannot be judged on its own, but only in comparison to an alternative. Only through such comparison is it possible to make an informed decision about which model can provide better ex ante estimates.

To assess the forecasting performance of the CAPM relative to the Fama–French model, Oxera has analysed out-of-sample (ex ante) forecasts of both models, based on the approach and dataset used by NERA. In particular, the CAPM and Fama–French model have been estimated to forecast the returns of the comparator companies, as well as of two portfolios of these comparators corresponding to the companies and portfolios used in the NERA report. (The results are shown in section A1.4.)

Each model has been estimated on the sample adopted by NERA, leaving aside the last six months of data to assess forecasting performance.⁴⁵ Based on these parameter estimates, ex ante (out-of-sample) forecasts of returns of comparator companies/portfolios have been calculated. The forecasting performance of the two models has been assessed for:

⁴² Risk premia are derived from data up to 2008, and factor betas up to May 2009.

⁴³ AER (2010), op. cit., p. 110.

⁴⁴ Ibid., p. 118f.

⁴⁵ To ensure the robustness of this test, the longest period as possible has been used to estimate the model. For some of the series, the increased volatility in 2008 might affect the forecasting performance of the models; however, this would be likely to affect the CAPM and the Fama–French model to the same extent.

- **one-step-ahead forecasts**—where current values of the factors have been used to predict returns;
- **multi-step-ahead forecasts**—where out-of-sample predictions of the factors derived from within-sample data only have been used. These predictions of the market, SMB and HML factors have been calculated in two different ways:
 - as the historical averages of the factors over the sample period (excluding the post-estimation sample); and
 - as predictions from an econometric model which has been estimated over the same sub-sample as the CAPM and Fama–French model.⁴⁶

The analysis then tested whether the forecast performance of the competing models is statistically significantly different.⁴⁷

The assessment undertaken by Oxera finds no evidence, in the majority of cases, to suggest that the CAPM provides significantly better forecasts of market returns than the Fama–French model. In the majority of cases, no statistically significant outperformance of one of the two models can be identified. Only in eight of the 33 comparisons undertaken was significant superiority of one of the models found at conventional significance levels. However, in these cases, no clear indication of outperformance of one model can be established.⁴⁸ On this basis, there is no clear evidence that the CAPM provides significantly better forecasts of market returns, and therefore, there is no reason to suggest that the CAPM should be preferred over the Fama–French model.

⁴⁶ The econometric model used to calculate the predictions is a vector-autoregressive (VAR) model. The VAR model identifies time patterns in the data, which are then used to predict the future evolution of the factors.

⁴⁷ To assess the statistical significance, the Diebold-Mariano test of comparing the predictive accuracy of two models has been employed. See Diebold, F. and Mariano, R. (1995), 'Comparing Predictive Accuracy', *Journal of Business and Economic Statistics*, **13**:3, pp. 253–63.

⁴⁸ In five of the 33 cases examined, the forecasts of the CAPM outperform the Fama–French model, whereas in three cases, the forecasts of the Fama–French model are superior to those of the CAPM. However, based on both the predictions of returns of the equally weighted and value-weighted portfolios of comparator companies, a statistically significant forecasting outperformance has not been found.

4 Conclusions

Oxera's review of academic literature has found that both the Fama–French model and the CAPM are well-accepted models. However, both models have been the subject of critical analysis by relevant experts in the field of financial economics, with some more supportive of the Fama–French model, and others more supportive of the CAPM.

In the Australian market context, the evidence is mixed: some academic studies reject the CAPM as a pricing model; some find that the Fama–French model outperforms the CAPM; but other studies are less supportive of Fama–French. On balance, the academic literature reviewed does not suggest that either the CAPM or the Fama–French model is better at explaining Australian equity returns; instead, there is evidence that both models are useful in doing this.

In its Draft Decision, the AER argued that the Fama–French model as implemented by NERA did not meet the requirements of the NGR. In particular, the regulator raised concerns regarding:

- whether NERA has correctly specified and applied the model;
- a lack of statistical checks to assess estimation results;
- uncertainty about the estimates of the Fama–French factors; and
- a lack of testing the forecasting ability of the Fama–French model.

Overall, the review of both the programming code and the dataset provided by NERA suggests that NERA has broadly correctly specified and applied the Fama–French model to the regulatory context in the Australian market. Some minor discrepancies are observed; however, these do not have a material impact on NERA's overall estimate of the post-tax cost of equity.

Some minor issues have been identified regarding the estimation of factor betas and risk premia. However, the estimates of the post-tax cost of equity, as derived by NERA, are broadly robust to changes that take into account these issues. Indeed, the impact of these issues on the cost of equity is relatively minor.

Although, there is some uncertainty around the estimates associated with the Fama–French factors, it should be noted that estimates of the market risk premium, the unique factor used in the CAPM to predict the required cost of equity, are subject to similar issues. This is primarily a reflection of the volatility of returns underlying such estimates.

As regards the forecasting ability of the CAPM relative to the Fama–French model, analysis based on data used by NERA reflecting the Australian regulatory context of JGN's gas networks suggests that there are no statistically significant differences between the ex ante forecasting performance of the two models; the Fama–French model broadly performs as well as the CAPM in forecasting the required return of an efficient comparator company.

Therefore, it can be concluded that NERA has, with some minor exceptions, correctly implemented the Fama–French model; the results derived from the estimation are robust to statistical issues identified; and there is little evidence to suggest that the CAPM provides more robust forecasts of the cost of equity than the Fama–French model.

A1 Results from Oxera's empirical analysis

This appendix presents further detail on the main statistical tests undertaken by Oxera, using NERA's dataset. This includes:

- results from Oxera's replication of NERA's estimates of the factor risk premia;
- assessment of the robustness of the estimates of the cost of equity;
- investigation of the statistical properties associated with the beta estimation; and
- evaluation of the forecasting performance of the CAPM and the Fama–French model.

A1.1 Estimates of the factor risk premia

Oxera has replicated NERA's calculations of the HML and SMB risk premia, which have been derived from the historical averages of differences in annual returns between value and growth stocks, as well as between small and large cap stocks.⁴⁹

As shown in Table A1.1, although Oxera has broadly replicated NERA's estimates of the annual risk premia associated with the HML and SMB factors, there are some minor differences with the estimates reported by NERA.⁵⁰

Table A1.1 Estimates of the factor risk premia

Risk premium	Oxera		NERA	
	Risk premium (%)	Standard error	Risk premium (%)	Standard error
HML	6.32	3.11	6.24	3.07
SMB	-1.20	2.27	-1.23	2.24

Note: Estimates that are not statistically significant at the 5% level are shaded.

Source: Oxera calculations, based on NERA (2009), and estimates reported by NERA (2009).

The impact of these marginal differences in the estimates of the risk premia on the cost of equity is minor. For example, using the same risk-free rate, market risk premium and factor betas used in the NERA report, the estimate of the post-tax (nominal) cost of equity based on Oxera's replication (11.62%) is only slightly higher than NERA's estimate (11.57%).

A1.2 Sensitivity of estimates of the cost of equity

Oxera has also replicated NERA's estimates of the post-tax nominal cost of equity. This has revealed some potential issues relating to the inclusion of insignificant estimates in the cost of equity calculations, and possible statistical issues relating to the uncertainty of the beta estimates, as measured by their standard errors.

To assess the impact of these issues on estimates of the cost of equity, Oxera has undertaken a number of sensitivity checks. Oxera's analysis has found that taking into account these issues leads only to marginal changes in estimates of the post-tax cost of equity, as reported in Table A1.2.

⁴⁹ Oxera's calculations have taken into account the imputation tax credits, as estimated by NERA.

⁵⁰ NERA (2009), op. cit., p. 39.

Table A1.2 Sensitivity of estimates of the post-tax nominal cost of equity to key assumptions

	Risk free rate (%)	Market risk premium (%)	HML-risk premium (%)	SMB-risk premium (%)	Market beta	HML beta	SMB beta	Post-tax (nominal) cost of equity (%)
NERA's results	5.11	6.50	6.24	-1.23	0.59	0.48	0.30	11.57
Sensitivity 1: average beta based only on significant estimates; insignificant beta estimates assumed to be equal to 0	5.11	6.50	6.24	-1.23	0.59	0.45	0.24	11.47
Sensitivity 2: insignificant SMB premium set to 0; average beta based on all estimates including insignificant estimates (as per NERA's approach);	5.11	6.50	6.24	0.00	0.59	0.48	0.30	11.94
Sensitivity 3: insignificant SMB premium set to 0 and average beta based only on significant estimates; insignificant estimates are assumed to be equal to 0	5.11	6.50	6.24	0.00	0.59	0.45	0.24	11.76
Sensitivity 4: average beta based only on significant estimates (using robust standard errors); insignificant beta estimates assumed to be equal to 0	5.11	6.50	6.24	-1.23	0.63	0.53	0.17	12.33
Sensitivity 5: insignificant SMB premium set to 0 and average beta based only on significant estimates (using robust standard errors); insignificant beta estimates assumed to be equal to 0	5.11	6.50	6.24	0.00	0.63	0.53	0.17	12.54
Sensitivity 6: beta estimates with variable risk free rate (from NERA's dataset); insignificant estimates included	5.11	6.50	6.24	-1.23	0.64	0.55	0.34	12.28
Sensitivity 7: beta estimates with variable risk free rate (from NERA's dataset); average beta based only on significant estimates (using robust standard errors); insignificant beta estimates assumed to be equal to 0	5.11	6.50	6.24	-1.23	0.63	0.53	0.17	12.33
Sensitivity 8: based on Oxera's estimates of the risk premia	5.11	6.50	6.32	-1.20	0.59	0.48	0.30	11.62
Sensitivity 9: based on the average beta of the equally weighted and value-weighted portfolio only	5.11	6.50	6.24	-1.23	0.62	0.57	0.32	12.25

Source: Oxera calculations, based on NERA (2009).

Overall, Table A1.2 indicates that NERA's estimates of the cost of equity are broadly robust to the issues identified. Indeed, in a number of cases, taking the identified statistical issues into account actually leads to higher estimates of the cost of equity.

A1.3 Statistical properties associated with beta estimation

Oxera's replication of NERA's estimates of the cost of equity has identified a number of instances where the econometric model(s) used to derive the beta estimates do not pass standard diagnostic tests. However, this has not been found to have a material impact on the resulting estimates of the post-tax cost of equity.

Based on Oxera's analysis, Table A1.3 reports the diagnostic tests associated with the OLS estimates based on NERA's dataset.

- For a number of companies, the betas associated with the HML and SMB risk factors are not statistically significant. However, adjusting for the statistical significance of the estimates does not appear to have a material impact on the cost of equity, as reported in section A1.2.⁵¹
- For a number of companies, there is evidence of heteroscedasticity—namely, variability in the error from the econometric model. This will affect the interpretation of the statistical significance of the resulting estimates, and may indicate potential issues with the underlying specification of the econometric models. However, similar issues have also been reported by Henry (2008, 2009) in reports for the AER. Furthermore, adjusting for these issues, as shown in section A1.2, does not have a significant impact on the cost of equity.
- For all companies, there is no evidence to indicate the presence of autocorrelation in the errors from the econometric model (as indicated by the results for the Ljung–Box statistic).⁵²

⁵¹ The R-squared—the proportion of returns that can be explained through the econometric model—may appear to be relatively low. However, this finding is broadly consistent with the estimates reported by Henry (2009) in his paper for the AER.

⁵² Autocorrelation is defined by correlation between the errors from the econometric model across different time periods.

Table A1.3 Statistical properties associated with the estimation of beta by company

	Alinta Limited	The Australian Gas Light Company	APA Group	Duet Group	Envestra Limited	GasNet	Hastings Diversified Utilities Fund	Spark Infrastructure Group	SP AusNet	Equally weighted portfolio	Value-weighted portfolio
Market beta	1.24	0.70	0.65	0.34	0.36	0.39	1.71	0.60	0.18	0.66	0.57
	(0.24)	(0.19)	(0.08)	(0.06)	(0.05)	(0.10)	(0.23)	(0.16)	(0.09)	(0.05)	(0.06)
HML beta	0.33	-0.30	0.22	0.18	0.45	0.06	2.69	0.63	0.40	0.71	0.43
	(0.45)	(0.36)	(0.13)	(0.10)	(0.08)	(0.19)	(0.36)	(0.24)	(0.14)	(0.08)	(0.10)
SML beta	0.36	0.13	0.33	0.29	0.46	0.19	1.02	0.48	-0.01	0.41	0.23
	(0.32)	(0.25)	(0.14)	(0.11)	(0.09)	(0.13)	(0.41)	(0.28)	(0.17)	(0.08)	(0.10)
Constant	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Breusch–Pagan test statistic	5.75	0.33	7.86	39.41	0.01	4.49	52.32	5.06	0.00	82.54	6.44
p-value	0.02	0.57	0.01	0.00	0.94	0.03	0.00	0.03	0.95	0.00	0.01
Ljung–Box test statistic	4.46	6.80	10.33	16.12	5.39	3.98	20.54	9.38	5.30	10.03	4.74
p-value	1.00	1.00	1.00	0.91	1.00	1.00	0.72	1.00	1.00	1.00	1.00
R-squared	0.09	0.07	0.15	0.13	0.19	0.06	0.29	0.16	0.05	0.36	0.19
Number of observations	290	248	384	248	386	253	233	117	180	386	386

Note: Standard errors are reported in parentheses. Estimates that are not statistically significant at the 5% level are shaded. A p-value associated with the Breusch–Pagan test statistic that is lower than 0.05 indicates evidence of heteroscedasticity (as indicated by the shading). The R-squared indicates the proportion of returns that can be explained by the econometric model.

Source: Oxera calculations, based on NERA (2009).

A1.4 Comparison of the models' forecasting abilities

To assess the forecasting ability of the CAPM relative to the Fama–French model, Oxera has analysed the out-of-sample (ex ante) forecasting ability of both models in the Australian market, using NERA's dataset.

The CAPM and the Fama–French model have been estimated on the dataset used by NERA excluding the last six months of data (referred to as 'within-sample' values). The last six months of data (referred to as 'out-of-sample' values) is used to assess the forecasting performance of both models. Oxera has investigated the forecasting ability of the CAPM and the Fama–French model under three different approaches.

- 1) The (known) out-of-sample values for the factors are used to calculate out-of-sample predictions of returns of the nine comparator companies, as well as the two portfolios analysed by NERA. These out-of-sample predictions are commonly referred to as 'one-step-ahead forecasts'.
- 2) The out-of-sample values of the factors are excluded from the information available to derive the forecasts. Instead, out-of-sample values of the factors are calculated from historic averages over the (within-sample) estimation period. These historic averages are then used as the out-of-sample predictions of the factors.
- 3) Out-of-sample values of the factors are calculated from the predictions of an econometric model—a vector-autoregressive model—that has been estimated over the same sub-sample as the CAPM and Fama–French models.⁵³

For each of the above approaches, statistical tests have been undertaken to compare the forecasting ability of the CAPM and the Fama–French model in explaining the returns of the nine comparator companies or the two portfolios of these companies. To assess the statistical significance of the model's forecasting performance, the Diebold–Mariano test has been used.⁵⁴

An overview of the findings from the test is shown in Table A1.4. These results indicate that, based on the analysis of the dataset used by NERA, there is no evidence that the CAPM provides significantly better forecasts of market returns than the Fama–French model. Indeed, in three of the eight cases in which a significant difference in forecasting performance is found, the Fama–French model outperforms the CAPM. On this basis, there is no robust empirical evidence to suggest that the CAPM should be preferred over the Fama–French model or that the CAPM will provide better ex ante estimates of market returns than the Fama–French model.

⁵³ Vector autoregressive (VAR) models focus on the relationship between observations of a set of variables at different points in time. The distinguishing feature of such pure time series models—as opposed, say, to a deterministic econometric model—is that such models are not based on a behavioural relationship between the variable under consideration and other, potential explanatory, variables. Instead, the historic pattern of the data is used to derive the predictions.

⁵⁴ Diebold, F. and Mariano, R. (1995), 'Comparing Predictive Accuracy', *Journal of Business and Economic Statistics*, 13:3, pp. 253–63.

Table A1.4 Forecasting ability of the CAPM and Fama–French model in the Australian context

	One step ahead forecasts	Historic average	VAR forecasts
Alinta Limited	n.s.	CAPM***	n.s.
The Australian Gas Light Company	n.s.	n.s.	n.s.
APA Group	CAPM***	n.s.	n.s.
Duet Group	n.s.	n.s.	n.s.
Envestra Limited	FFM**	n.s.	CAPM***
GasNet	CAPM*	n.s.	FFM**
Hastings Diversified Utilities Fund	FFM*	n.s.	CAPM***
Park Infrastructure Group	n.s.	n.s.	n.s.
SP AusNet	n.s.	n.s.	n.s.
Equally weighted portfolio	n.s.	n.s.	n.s.
Value-weighted portfolio	n.s.	n.s.	n.s.

Note: n.s. denotes that no statistically significant difference in the forecasting performance between the CAPM and the Fama–French model can be identified. CAPM denotes that the forecasts from the CAPM have statistically significantly lower forecasting errors than the Fama–French model; FFM denotes that the forecasts of the Fama–French model have statistically significantly lower forecasting errors than the CAPM. *** denotes statistical significance at the 1% level; ** denotes statistical significance at the 5% level; * denotes statistical significance at the 10% level.

Source: Oxera calculations, based on NERA (2009).

Dr Luis Correia da Silva

Managing Director



Luis leads the Corporate Finance and Regulation teams at Oxera and applies his economic expertise to **finance**, **competition**, **regulation** and **policy** issues across a wide range of industries. His areas of specialisation are financial markets, corporate finance, financial regulation, the impact of corporate taxation, corporate governance and econometric modelling. He has also directed policy and research studies for both the Competition Commission and the Office of Fair Trading in the UK, and published on economics and finance matters. He has been involved in UK Competition Commission cases and European Commission regulatory and competition analysis, and has provided written and oral evidence.

Qualifications

- DPhil Economics, University of Oxford
- MBA European Studies, Solvay Business School, Belgium
- MSc Economics, Université Libre de Bruxelles, Belgium
- BA Economics, Université Libre de Bruxelles, Belgium

Selected project experience

Financial services

- | | |
|--|---------|
| – Advising banks and insurers on restructuring aid and regulation | Ongoing |
| – Since 2006, has directed studies on trading and post-trading in securities markets for the European Commission | Ongoing |
| – Author and Project Director of many assignments in asset management | Ongoing |
| – Directed numerous studies for the UK Financial Services Authority on regulatory issues of design and cost–benefit analysis | Ongoing |

Corporate finance

- | | |
|---|---------|
| – Leads Oxera’s economic advice to key clients in transport, water, energy and communications sectors | Ongoing |
| – Directed a project for the UK communications regulator, Ofcom, in relation to its investigation into the pay-TV market | 2009 |
| – Directed projects for the European Commission and for financial services players in restructuring aid | 2009 |
| – Has published extensively in finance and is co-author of the OFT report, ‘Assessing profitability in competition policy analysis’ | 2009 |
| – Since 2006 has directed Oxera’s consulting work on trading and post-trading in securities markets in the EU | 2009 |

Selected publications

- ‘Asset Management in Europe’, with J. Franks and C. Mayer, in Freixas, X., Hartmann, P. and Mayer, C., *Handbook of European Financial Markets and Institutions*, chapter 13. Oxford: Oxford University Press, 2008
- ‘An Incentive Regime for Quality of Service of Universal Service Providers in the Postal Sector’, with L. Mautino, P. Dudley and E. Payling, part IV, chapter 16 in *Competition and Regulation in the Postal and Delivery Sector*, 2008
- ‘Trends in Dividends, Payers, Payouts and Yields’, with M. Goergen, C. Andres and A. Betzer, in Baker, K. (ed), *Blackwell Companion on Dividends*, chapter 3, 2008
- ‘Occupational Retirement Provision: Are the Risks of Defined-contribution Schemes Overstated?’, with F. Barnes, *Revue Bancaire et Financière*, 4, 2008
- ‘External Financial Markets Policy: Europe as Global Regulator?’ with M. Becht, in Sapir, A. (ed), *Fragmented Power: Europe and the Global Economy*, chapter 7, 2007
- ‘The Cost of Capital: An International Comparison’, City of London Corporation and the London Stock Exchange, 2006
- ‘Is Debt Replacing Equity in Regulated Privatised Infrastructure in LDCs?’, with A. Estache and S. Jarvela, *Utilities Policy*, 14, pp. 90–102, 2006
- ‘When do German Firms Change their Dividend?’, with M. Goergen and L. Renneboog, *Journal of Corporate Finance*, 11, 1–2, pp. 375–99, 2005
- *Corporate Governance and Dividend Policy*, with M. Goergen and L. Renneboog, Oxford: Oxford University Press, 2004
- ‘Assessing Profitability in the Context of Competition Law’, with G. Niels and S. Chua, *Competition Law Journal*, 2:3, pp. 248–58, 2004
- *Asset Management and Investor Protection: An International Analysis*, with C. Mayer and J. Franks, Oxford: Oxford University Press, 2003
- ‘RPI – X Price Control Regulation in The Postal Sector’, with L. Mautino, P. Dudley and S. Richard, in Crew, M. and Kleindorfer, P. (eds), *Competitive Transformation of the Postal and Delivery Sector*, Boston, MA: Kluwer Academic Publishers, 2003
- ‘Assessing profitability in competition policy analysis’, Office of Fair Trading, 2003
- ‘The Capital Structure of Utilities’, with T. Jenkinson and C. Mayer, in Helm, D. (ed), *Water, Sustainability and Regulation*, chapter 10. Oxford: Oxera, 2003
- ‘Regulation and Asset Management’, with C. Mayer and J. Franks, *Financial Times Mastering Investments*, 2001

Language skills

English, French, Portuguese and Spanish



Professor Julian Franks

Director

Julian is Professor of Finance, London Business School, and Academic Director of London Business School's Centre for Corporate Governance. An expert in **corporate finance**, his research focuses on bankruptcy and financial distress, corporate ownership and control, cost of capital and regulation. Recently his work on ownership and control (with Colin Mayer and Stefano Rossi) has won two international prizes. Two of his other papers have won best paper awards by the *Journal of Financial Intermediation*. He is Associate Editor of five finance journals, a member of various advisory boards and consults widely. He served as a member of the DTI–Treasury committee reviewing the UK's insolvency code and was a member of one of the Company Law Review's committees on corporate governance.

Julian is an adviser to Ofcom and BAA on regulatory matters and is on an expert panel for the New Zealand Commerce Commission. Recently, he advised (with Professor Brealey) the Office of Constitutional Affairs on the issue of outside equity for law firms, and provided advice to a Treasury committee chaired by Paul Myners on a review of the governance of mutuals. He is on the international advisory boards of Stern Stewart and S&P, and has been Visiting Professor at the University of California at both Berkeley and Los Angeles.

Qualifications

- PhD, London University
- MBA, Columbia University Graduate School of Business
- BA, Economics, Sheffield University

Selected publications

Julian serves on the board of numerous economics and finance journals, including the *Journal of Financial Services Research*, *Financial Management*, and *Journal of Corporate Finance*. In addition, he has published widely, with some of his most recent publications detailed below.

- 'Indexation, Investment, and Utility Prices', with R. Brealey, *Oxford Review of Economic Policy*, **25**:3, 435–50, 2009
- 'Do Bankruptcy Codes Matter? A Study of France, Germany and the UK', with S. Davydenko, *Journal of Finance*, forthcoming
- 'The Origins of the German Corporation—Finance, Ownership and Control', with C. Mayer and H.F. Wagner, *The Review of Finance*, **10**:4, 2006
- 'Financial Innovations and Corporate Insolvency', with O. Sussman, *The Journal of Financial Intermediation*, 2005
- 'Financial Distress and Bank Restructuring of Small to Medium Size UK Companies', with O. Sussman, *The Review of Finance*, **9**:1, 65–96, 2005
- 'Spending Less Time with the Family: The Decline of Family Ownership in the United Kingdom', chapter 10 in R. Morck (ed), *A History of Corporate Ownership Around the World*, National Bureau of Economic Research, 2005
- 'How Firms Fare in Workouts and Chapter 11 Reorganizations', with W. Torous, Institute of Finance and Accounting, 2004

- *Risks and Regulation in European Asset Management*, with C. Mayer and L. Correia da Silva, Oxford University Press, 2003
- ‘Shareholder Wealth Effects of Corporate Takeovers: the UK experience 1955–85’, with R. Harris, *Journal of Financial Economics*, **23**:225–249. Reprinted in Keasey, Thompson and Wright (eds), *Corporate Governance in the New Global Economy*, Cheltenham: Edward Elgar
- *Asset Management and Investor Protection*, with C. Mayer and L. Correia da Silva, Oxford: Oxford University Press, 2002
- ‘Managerial Disciplining and the Market for (Partial) Corporate Control in the UK’, with C. Mayer and L. Renneboog, reprinted in J. McCahery et al (eds), *Corporate Governance Regimes—Convergence and Diversity*, Oxford University Press, 2002
- ‘A Comparison of English and American Bankruptcy Procedures’, with W. Torous, published in Renneboog, et al., *Convergence and Diversity of Corporate Governance Regimes and Capital Markets*, Oxford: Oxford University Press, 2002
- ‘Ownership and Control in Germany’, with C. Mayer, *Review of Financial Studies*, October 2001
- ‘Disciplining of Management in Under-performing Companies’, with C. Mayer and L. Renneboog, *Journal of Financial Intermediation*, July–September 2001 (winner of JFI Best Paper Prize)
- ‘Shareholders’ Wealth Effects of Corporate Takeovers: The UK Experience 1955–85’, with R. Harris, *Journal of Financial Economics*, **23**, 225–49. Reprinted in A. Cosh and A. Hughes (eds), *Takeovers Vol II*, Dartmouth Publishing Co, 2001
- ‘Lessons from Comparison of US and UK Insolvency Codes’, with W. Torous, in J.S. Bhandari and L.A. Weiss (eds), *Corporate Bankruptcy—Economic and Legal Perspectives*, Cambridge: Cambridge University Press, 2001

Language skills

English

Nicole Robins

Senior Consultant



Nicole specialises in **corporate finance** and **modelling**. She has experience in a number of sectors, including water, transport and communications.

In corporate finance, her work covers issues relating to the cost of capital, financeability, financial modelling and cost allocation across a range of industries.

In modelling, she has worked across a range of projects involving Excel modelling and statistical and econometric analysis. Her recent work includes analysis, using advanced econometric techniques, of the drivers of firms' business performance.

Qualifications

- MSc Economics and Finance, Warwick Business School
- BSc Business Economics with Computing, University of Surrey

Selected project experience

- Financial analysis relating to counterfactual scenarios to restructuring state aid 2009–10
- Provision of advice to a regulated water company on financial issues, including the cost of capital and financeability 2008–10
- Constructed a regulatory price control model that examined the financial implications of different scenarios 2008–09
- Modelling of cost allocation in the defence sector 2008–09
- Assessment of the long-run marginal cost for an investment in the transport sector 2008
- Advice to a regulated incumbent on a range of financial issues, including cost of capital, financeability and asset valuation 2008
- Economic analysis of the impact of alternative corporate structures on access to capital 2007
- Demand elasticity parameter advice using panel data and discrete choice econometric techniques to assist a train operating company in its bid for a rail franchise 2007
- Financial analysis and modelling of capital structures and their impact on the cost of capital 2006
- Quantitative assessment of the impact of announcements of corporate actions on the financial markets 2006
- Feasibility study to assess the potential for using econometric analysis to evaluate the effectiveness of tax incentives for research and development 2006

Language skills

English

Vincent Poirier-Garneau

Senior Consultant

Vincent specialises in **corporate finance** and financial issues relating to the **energy sector**. He also has expertise in other regulated sectors, including transport and communications. Vincent has worked on cost of capital assessments, estimation of the cost of debt financing, financial modelling, and profitability analysis. Prior to joining Oxera in 2008, he worked as an investment banking analyst in mergers and acquisition (M&A), equity and debt capital markets. In addition, he worked in corporate finance and M&A with a large Canadian aerospace company. Vincent has experience in, among other sectors, energy, aerospace, consumer products, media, retail and technology.

Qualifications

- MSc Finance and Economics, London School of Economics and Political Science
- BCom Honours Economics and Finance, McGill University, Montreal, Canada
- Chartered Financial Analyst

Selected project experience

- Developed a framework to estimate the impact of asymmetric risk on regulated prices for heat networks in The Netherlands 2009
- Analysis of the cost of capital for energy companies in The Netherlands, including considerations on inflation and gearing 2009
- Profitability analysis in the context of a competition investigation for a transport client 2009
- Built a financial model to estimate the cost of embedded debt, including sensitivities to significant market risk factors, and drafted accompanying report for a regulated energy transmission company 2009
- Developed case studies and conducted interviews with insolvency practitioners for a project on the counterfactuals to state aid in companies in financial difficulty 2009
- Analysis of cost of capital and compensation for inflation for a large European communications company 2009
- Determination of hypothetical tenant's required return in the context of rating valuation for a communications company 2008–09
- Conducted a literature review on the determinants of liquidity for small stocks and the relationship between liquidity and cost of capital 2008
- Analysis of cost of debt financing in the transportation sector, and preparation of supporting material for the Competition Commission 2008
- Built a financial model to determine the impact of pre-funding treatments related to large capital investment programme for a regulated transportation company 2008
- Analysis of profitability, risk differentials and cost of capital in the communications sector 2008
- Built a financial model and contributed to negotiations with lenders and lawyers in a non-recourse financing deal on assets relating to two aircraft pilot training centres in the US and UK 2007
- Developed detailed financial models and was involved in due-diligence for several tuck-in acquisitions in the aerospace industry 2006–07
- Responsible for determining the fiscal and accounting impact of research and development (R&D) tax credits on valuation of a potential acquisition, according to several growth and profitability scenarios 2006

- Responsible for financial modelling and researching of comparable transactions in a fairness opinion for a management buyout in the consumer products sector 2006
- Participated in the writing of an IPO prospectus in the technology sector, and worked on due-diligence alongside the client and lawyers 2005
- Built a detailed financial model for a \$1.8 billion acquisition in food retail industry, and prepared a presentation to Standard & Poor's for rating of acquisition-related debt financing 2005
- Analysed the impact of changes in dividend policy for a travel company, and proposed alternatives to redistribute excess cash to shareholders, including substantial issuer bid (share repurchase) 2004

Language skills

English, French, Spanish

Dr Michael Scheidgen

Consultant

Michael specialises in **regulation and competition** in the **communications** and **transport** sectors. In communications he has experience in broadcasting, communications infrastructure and the postal sector. In transport he has experience in the rail and aviation sectors and in demand forecasting.

He also has broad experience in the econometric analysis of time-series data and consumer choice modelling, and has provided economic and econometric analysis in damages litigations. Prior to joining Oxera, he was a consultant with European Economic and Marketing Consultants in Germany.

Qualifications

- PhD Economics, Johannes Gutenberg University Mainz
- Diplom Economics, Johannes Gutenberg University Mainz

Selected project experience

- Advice to the European Commission on counterfactual scenarios to restructuring State Aid 2009–10
- Advising on a cartel damages claim at the UK Competition Appeal Tribunal 2009–10
- Advising a client in the paper industry in relation to a damages claim 2009–10
- Training course on insurance guarantee schemes to the German financial services regulator (BaFin) 2009
- Advising the Department for Transport on elasticity-based approaches to transport demand forecasting 2009
- Advising a UK construction company on the short-, medium- and long-term trends in the UK road transport sector 2009
- Advising the Department for Transport on the applicability of the almost-ideal-demand-system (AIDS) econometric modelling approach to forecasting rail demand 2009
- Advising the BBC Executive on revisions to its Fair Trading Guidelines 2008
- Assisting Royal Mail during its fourth price control review on regulatory issues related to the recoverability of regulatory costs 2008
- Advising ComReg, the Irish telecoms and postal regulator, on options to incentivise eircom’s investment in next generation networks 2008
- Advising Royal Mail on its proposal to liberalise mail products of fulfilment mail 2008
- Advising Royal Mail with respect to the definition of postal markets 2008
- Advising LOVEFiLM on its acquisition of Amazon’s online DVD rental business, including assisting with survey design and conducting quantitative analysis for market definition 2007–08

- Advising the Passenger Demand Forecasting Council on the dynamic impact of the introduction of new rolling stock on rail passenger demand
2007–08
- Advising Arriva plc in its acquisition of the Cross Country Passenger Rail Franchise, and analysing passenger survey data to assess inter-modal competition on specific rail routes
2007
- Advising O2 on the likelihood that, following the liberalisation of 2G spectrum, the trading and roaming markets could lead to a wider availability of 900MHz spectrum among mobile network operators
2007
- Advising Royal Mail on its application to introduce ‘zonal pricing’ for bulk mail products
2007
- Advising Ofcom on the economics of company and industry incentives to participate and comply with co- and self-regulatory schemes
2007
- Assisting a train operating company with its damages claim relating to the collapse of a rail tunnel. Providing econometric analysis of the time series of the company’s revenues to establish estimates of the counterfactual and the damage incurred by the tunnel collapse
2007
- Review of regulatory schemes to incentivise CAPEX in UK regulated industries to assist National Grid Wireless in its negotiations with Arqiva and Ofcom
2007
- Advising the BBC in regulatory and competition issues related to the introduction of new online services (iPlayer); and the BBC’s Fair Trading Guidelines
2007
- Comparative review of airports regulation in the UK, Ireland, France, Germany and the Netherlands for Copenhagen Airport to assist in its negotiations with the government about the future of its economic regulatory regime
2007
- Analysing stated- and revealed-preference data to support a train operating company in relation to the New Cross Country franchise bid
2006

Publications

‘Evidencing remedies: Lessons from the decision of the CAT’, in *Tesco plc v Competition Commission*, with Fod Barnes, *Competition Law Journal*, **8**:4, 2009

‘Private actions for damages in Europe’, *Competition Law Journal*, **6**:3, 2007

Language skills

English, German, Italian and Spanish

A3 Terms of reference

JEMENA GAS NETWORKS (NSW)
ACCESS ARRANGEMENT 2010

ASSET & PROJECT

EXPERT TERMS OF REFERENCE –
COST OF EQUITY EXPERT – INTERNATIONAL
EXPERT

DOCUMENT TITLE

AA10-SR-77722

DOCUMENT NUMBER

1 BACKGROUND

Jemena Gas Networks (JGN) is the major gas distribution service provider in New South Wales (NSW). JGN owns 24,000 kilometres of natural gas distribution system, delivering approximately 100 petajoules of natural gas to over one million homes, businesses and large industrial consumers across NSW. Jemena Asset Management (JAM) undertakes the majority of JGN's operating, maintenance, and capital works activity.

The relevant provisions relating to the economic regulation of natural gas distribution networks in NSW are set out in the National Gas Law and National Gas Rules, which are available at <http://www.aemc.gov.au/Gas/National-Gas-Rules/Current-Rules.html>.

JGN is currently engaged with the Australian Energy Regulator (AER) in the AER's review of its Access Arrangement (AA). JGN submitted its original revisions to the AA in August 2009. JGN then submitted revised AA revisions to the AER on 19 March 2010 which, if approved, will cover the period 2010/11-2014/15 (July to June financial years).

Under the National Gas Rules, total revenue for a relevant service provider is determined for each regulatory year of the access arrangement using a "building blocks" methodology (Rule 76). The building blocks include, amongst others, a return on the projected capital base for the year (Subrule 76(a)).

Subrule 87(1) provides that the rate of return on capital is to be commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services. Subrule 87(2) provides:

In determining a rate of return on capital:

- (a) it will be assumed that the service provider:
 - (i) meets benchmark levels of efficiency; and
 - (ii) uses a financing structure that meets benchmark standards as to gearing and other financial parameters for a going concern and reflects in other respects best practice; and
- (b) a well accepted approach that incorporates the cost of equity and debt, such as the Weighted Average Cost of Capital, is to be used; and a well accepted financial model, such as the Capital Asset Pricing Model, is to be used.

Rule 72(1)(g) provides that the access arrangement information for a full access arrangement proposal must include the proposed rate of return, the assumptions on which the rate of return is calculated and a demonstration of how it is calculated.

Under the National Gas Law (section 28), in making a decision on whether to approve Jemena's AA proposal, the AER must have regard to the National Gas Objective (in section 23 of the National Gas Law), which is:

to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas.

The AER may also take into account the pricing principles in section 24(2) of the National Gas Law, and must do so when considering whether to approve a reference tariff:

A service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs in—

- (a) providing reference services; and
- (b) complying with a regulatory obligation or requirement or making a regulatory payment.

It may also be relevant to note that Rule 74, which applies to forecasts and estimates, provides:

- (1) Information in the nature of a forecast or estimate must be supported by a statement of the basis of the forecast or estimate.
- (2) A forecast or estimate:
 - (a) must be arrived at on a reasonable basis; and
 - (b) must represent the best forecast or estimate possible in the circumstances.

In its revised AA (August 2009), JGN proposed using a domestic version of the Fama-French three factor model (the Fama-French model) as its cost of equity model based on an independent expert report by NERA—the NERA August 2009 report.¹ The form of this model is (in nominal terms):

$$R_e = R_f + b_e MRP + h_e HMLP + s_e SMLP$$

Where: R_e is the post-tax cost of equity, R_f is the risk free rate, b_e is the market beta, MRP is the market risk premium, h_e is the high minus low (HML) beta, $HMLP$ is the HML risk premium, s_e is the small minus big (SMB) beta and $SMLP$ is the SMB risk premium.

On 10 February 2010 the AER published its draft decision on JGN's AA revision proposal.² JGN submitted a revised proposal in response to the AER's draft decision and an initial response to this decision in a submission to the AER on 19 March 2010. Public submissions on the AER's draft decision and JGN's revised proposal close on 28 April 2010.

In section of 5.5 of its draft decision, the AER considered that JGN's proposed cost of equity model did not meet the requirements of rule 87. Further, in this section, the AER required JGN to amend its AA to use the Sharpe-Lintner CAPM to estimate the cost of equity.

In section 5.3.3 of its initial response, JGN reaffirmed its proposal to use the Fama-French model to estimate the cost of equity as per the NERA August 2009 report. JGN based this proposal on a second independent expert report by NERA—the NERA March 2010 report—which responds to a number of concerns raised in the AER draft decision.³

¹ NERA, 12 August 2009, *Cost of equity: Fama-French three-factor model: Jemena Gas Networks (NSW)*. This report was submitted as appendix 5.2 of JGN's initial response to the AER draft decision..

² Australian Energy Regulator, *Draft decision, Jemena, Access arrangement proposal for the NSW gas networks*, 1 July 2010 – 30 June 2015 (**draft decision**), February 2010, can be found at <http://www.aer.gov.au/content/index.phtml/itemId/730676>.

³ NERA, 19 March 2010, *Jemena Access Arrangement Proposal for the NSW Gas Networks: AER Draft Decision*. This report was submitted as appendix 5.1 of JGN's initial response to the AER draft decision.

Accordingly, JGN is seeking the opinion of a recognised independent expert to support the specification of the cost of equity for a gas distributor that complies with the requirements of the National Gas Law and Rules in the revised access arrangement.

2 SCOPE OF WORK

The independent expert will provide a report including:

1. *Acceptability of Fama-French model*—an opinion on whether the Fama-French three factor model is a well accepted financial model among experts in the field, including opinions in response to the following questions:
 - (a) is there academic evidence that supports multi-factor models, in particular the Fama-French model, as a model for pricing risk?
 - (b) is there academic evidence that supports the CAPM as a model for pricing risk?
 - (c) in the Australian context, what is the evidence on the applicability of the Fama–French model?
2. *Review of NERA's reports*—an assessment of whether, in its August 2009 and March 2010 reports, NERA correctly specifies and applies the Fama-French three factor model to an Australian market context and whether NERA's cost of equity estimate is: (a) a return on capital that is commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services; and (b) a forecast or estimate that is arrived at on a reasonable basis
3. *Comparison of the Fama-French model with the CAPM*—an assessment of the predictive capacity of the Fama-French model used by NERA, compared to the CAPM as used by the AER.

3 INFORMATION FROM JGN

JGN will make the following information available to the expert:

- the public version of the AER's draft decision
- the public version of JGN's original AA submission, including the August 2009 NERA report
- the public version of JGN's revised AA submission, including the March 2010 NERA report
- excel files, computer code and other data supporting the August 2009 NERA report.

4 OTHER INFORMATION TO BE CONSIDERED

The expert is also expected to draw upon the following additional information:

- the National Gas Law and the National Gas Rules in relation to the economic regulation of gas networks

- the National Electricity Law and National Electricity Rules in relation to the economic regulation of electricity networks
- the AER's Final "Electricity and Distribution Network Service Providers Statement of Revised WACC Parameters (transmission) Statement of regulatory intent on the revised WACC parameters (Distribution)" dated 1 May 2009
- the AER's recent regulatory decisions
- historic share data for the Australian market, including returns and other financial information;
- published econometric, statistical, economic, financial and other relevant literature
- such information that, in expert's opinion, should be taken into account to address the questions outlined above.

5 DELIVERABLES

At the completion of its review the expert will provide an independent expert report which:

- is of a professional standard capable of being submitted to the AER
- is prepared in accordance with the Federal Court Guidelines for Expert Witnesses set out in Attachment 1 and acknowledges that the expert has read the guidelines and has prepared the report in accordance with these guidelines⁴
- summarises the expert's experience and qualifications and attaches relevant curriculum vitae
- identifies any person and their qualifications, who assists in the preparation of the report or in carrying out any research or test for the purposes of the report
- provides or makes available copies of all citations relied upon in the preparation of the report
- summarises JGN's instructions and attaches these term of reference
- (without limiting the points above) carefully sets out the facts that the expert has assumed in putting together his or her report and the basis for those assumptions.

The expert report will include the findings for each of the three parts defined in the scope of works (Section 2).

6 TIMETABLE

The independent expert will deliver the final report to JGN by **27 April 2010**. The full list of deliverables and their due dates are shown in the table below.

⁴ Available at: http://www.fedcourt.gov.au/how/prac_direction.html.

Deliverable	Due Date
Draft report	23 Apr 2010
JGN feedback on adherence to scope and factual accuracy of draft report	26 Apr 2010
Final report	27 Apr 2010

At the completion of this phase of work, the expert will provide an opinion report which:

- provides a summary of their opinions;
- sets out their findings for each of the parts defined in the scope of works (Section 2);
- includes detailed reasons for these opinions;
- fully documents the methodology used in detail and discusses the results obtained;
- lists the facts, matters and assumptions on which their opinions are based and the source of those facts, matters and assumptions, and lists all reference material and information on which they have relied; and
- list any limitations, incomplete matters or qualifications to the expert's opinion.

ATTACHMENT 1: FEDERAL COURT GUIDELINES

EXPERT WITNESSES IN PROCEEDINGS IN THE FEDERAL COURT OF AUSTRALIA

1. Practitioners should give a copy of the following guidelines to any witness they propose to retain for the purpose of preparing a report or giving evidence in a proceeding as to an opinion held by the witness that is wholly or substantially based on the specialised knowledge of the witness (see **Part 3.3 - Opinion** of the *Evidence Act 1995* (Cth)).
2. The guidelines are not intended to address all aspects of an expert witness's duties, but are intended to facilitate the admission of opinion evidence⁵, and to assist experts to understand in general terms what the Court expects of them. Additionally, it is hoped that the guidelines will assist individual expert witnesses to avoid the criticism that is sometimes made (whether rightly or wrongly) that expert witnesses lack objectivity, or have coloured their evidence in favour of the party calling them.

Guidelines

1. General Duty to the Court⁶

- 1.1 An expert witness has an overriding duty to assist the Court on matters relevant to the expert's area of expertise.
- 1.2 An expert witness is not an advocate for a party even when giving testimony that is necessarily evaluative rather than inferential⁷.
- 1.3 An expert witness's paramount duty is to the Court and not to the person retaining the expert.

2. The Form of the Expert Evidence⁸

- 2.1 An expert's written report must give details of the expert's qualifications and of the literature or other material used in making the report.
- 2.2 All assumptions of fact made by the expert should be clearly and fully stated.
- 2.3 The report should identify and state the qualifications of each person who carried out any tests or experiments upon which the expert relied in compiling the report.
- 2.4 Where several opinions are provided in the report, the expert should summarise them.

⁵ As to the distinction between expert opinion evidence and expert assistance see *Evans Deakin Pty Ltd v Sebel Furniture Ltd* [2003] FCA 171 per Allsop J at [676].

⁶ See rule 35.3 Civil Procedure Rules (UK); see also Lord Woolf "Medics, Lawyers and the Courts" [1997] 16 CJQ 302 at 313.

⁷ See *Sampi v State of Western Australia* [2005] FCA 777 at [792]-[793], and *ACCC v Liquorland and Woolworths* [2006] FCA 826 at [836]-[842]

⁸ See rule 35.10 Civil Procedure Rules (UK) and Practice Direction 35 – Experts and Assessors (UK); *HG v the Queen* (1999) 197 CLR 414 per Gleeson CJ at [39]-[43]; *Ocean Marine Mutual Insurance Association (Europe) OV v Jetopay Pty Ltd* [2000] FCA 1463 (FC) at [17]-[23]

- 2.5 The expert should give the reasons for each opinion.
- 2.6 At the end of the report the expert should declare that “[the expert] has *made all the inquiries that [the expert] believes are desirable and appropriate and that no matters of significance that [the expert] regards as relevant have, to [the expert’s] knowledge, been withheld from the Court.*”
- 2.7 There should be included in or attached to the report: (i) a statement of the questions or issues that the expert was asked to address; (ii) the factual premises upon which the report proceeds; and (iii) the documents and other materials that the expert has been instructed to consider.
- 2.8 If, after exchange of reports or at any other stage, an expert witness changes a material opinion, having read another expert’s report or for any other reason, the change should be communicated in a timely manner (through legal representatives) to each party to whom the expert witness’s report has been provided and, when appropriate, to the Court⁹.
- 2.9 If an expert’s opinion is not fully researched because the expert considers that insufficient data are available, or for any other reason, this must be stated with an indication that the opinion is no more than a provisional one. Where an expert witness who has prepared a report believes that it may be incomplete or inaccurate without some qualification, that qualification must be stated in the report (see footnote 5).
- 2.10 The expert should make it clear when a particular question or issue falls outside the relevant field of expertise.
- 2.11 Where an expert’s report refers to photographs, plans, calculations, analyses, measurements, survey reports or other extrinsic matter, these must be provided to the opposite party at the same time as the exchange of reports¹⁰.

3. Experts’ Conference

- 3.1 If experts retained by the parties meet at the direction of the Court, it would be improper for an expert to be given, or to accept, instructions not to reach agreement. If, at a meeting directed by the Court, the experts cannot reach agreement about matters of expert opinion, they should specify their reasons for being unable to do so.

M E J BLACK
Chief Justice
25 September 2009

⁹ The “*Ikarian Reefer*” [1993] 20 FSR 563 at 565

¹⁰ The “*Ikarian Reefer*” [1993] 20 FSR 563 at 565-566. See also Ormrod “*Scientific Evidence in Court*” [1968] Crim LR 240

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Jemena Gas Networks (NSW) Ltd – Further response to the draft decision

Attachment 1b

PricewaterhouseCoopers: Cost of debt

28 April 2010

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Ms. Sandra Gamble
Group Manager Regulation
Regulatory Team
Jemena Gas Networks (NSW) Ltd
Level 14, 1 O'Connell Street
Sydney
NSW 2000

28 April, 2010

Dear Sandra,

Re: Update of cost of debt methodology analysis in light of the AER's ActewAGL decision

You engaged PricewaterhouseCoopers (PwC) to respond to the Australian Energy Regulator's (AER's) recent final decision on the access arrangement for the ACT, Queanbeyan and Palerang gas distribution network (ActewAGL decision). This decision includes further elaboration from the AER on how it considers a debt risk premium should be estimated, including discussion on how best to extrapolate the Bloomberg fair value curve to obtain a 10 year BBB+ debt risk premium. Our terms of reference (which are at Attachment B) seek our view on whether the new work undertaken by the AER would cause us to change the conclusions we reached on this matter in our recent report, *Jemena Gas Networks (NSW) – The benchmark cost of debt for a gas distributor*.¹

Having reviewed the AER's methodology and empirical findings in its ActewAGL decision, we conclude that there is nothing in it that would lead us to change the conclusions that were reached in our previous report.

In our March 2010 report for Jemena Gas Networks (NSW) Ltd (JGN), we derived tests of whether the Bloomberg and CBASpectrum could be seen to provide reliable estimates of the cost of debt and tests of the relative merits of both services.² We also addressed how best to

¹ PricewaterhouseCoopers (March, 2010), *Jemena Gas Networks (NSW) – The benchmark cost of debt for a gas distributor*.

² This work built upon our report of November 2009 for the Victorian electricity distributors that sought to explain why the Bloomberg service appeared to provide unreliable estimates of the debt risk premium during the worst of the global financial crisis (that is, the period after September 2008 until about mid 2009) and to test whether those issues were still present (PricewaterhouseCoopers (November, 2009), *Victorian Distribution Businesses – Methodology to Estimate the Debt Risk Premium*). The same tests were applied in our March 2010 JGN report to assess the reliability of both the Bloomberg and CBASpectrum services.

extrapolate the Bloomberg curve to obtain a predicted yield for debt with a 10 year term to maturity, noting that Bloomberg now only provides an estimated yield out to 7 years for the BBB (and A) ratings. The conclusions of this analysis included that:

- *There were a number of problems with the CBASpectrum service* – these problems include that the yields that it assumed for the bonds on issue differed materially to those of its financial institution peers and that its estimates of yields were affected by its (in our view) inappropriate assumption about the functional form of the relationship between the debt risk premium and term. These problems led us to conclude that the CBA Spectrum service should not be relied upon to estimate a benchmark cost of debt for a gas network.
- *The Bloomberg service provided a better estimate in the circumstances* – in any event, during the period we analysed the Bloomberg service provided a better prediction of the yields of the bonds on issue than the CBASpectrum service when a more complete analysis of the relative accuracy of the services was performed and attention was directed to the fact that an accurate estimate of a debt risk premium for a long dated (10 year) corporate bond is required.
- *Linear extrapolation is the best method for extrapolating Bloomberg fair value yields* – while noting the weaknesses, we considered that the best method of extrapolating Bloomberg 7 year BBB debt risk premium to a 10 year premium was to linearly extrapolate the observed premium (more specifically, add on to the 7 year premium one and a half times the difference between 7 year and 5 year premiums). We also noted that the AAA curve could be used to extrapolate the BBB curve as a cross check of the reasonableness of the above method.

The AER's recent final decision for ActewAGL has again conducted a test of the accuracy of the Bloomberg service compared to the CBASpectrum service using the tests that the AER has previously employed. It has further commented on how best to extrapolate the Bloomberg BBB curve were it to use this service, commented on proposals to expand the sample of bonds and has commented on how outlier bonds should be identified and removed. Amongst other things, the AER concluded that the CBASpectrum service provided a better fit of the yields of the bonds on issue during the period that it tested. It also concluded that if it was to use the Bloomberg BBB curve to derive the benchmark debt risk premium then the Bloomberg AAA fair value curve should be used to extrapolate the BBB curve (and it noted that the a linear extrapolation of the Bloomberg BBB fair value curve was the least accurate of the methods that it tested). This was based upon a test conducted over the period 10 November 2005 to 9 October 2007.

Statement of authorship

This report has been prepared by Jeff Balchin and Matt Santoro. Our curriculum vitae are at Attachment A to this report. We have been assisted in its preparation by Michael Lawriwsky, and Steven Hong.

As a professional services firm, PwC has an ongoing relationship with Jemena. This relationship includes advising on matters pertaining to the regulatory review that is the subject of this report. Further details of PwC's relationship with the businesses can be provided if necessary.

We confirm that, in preparing this report, we have made all the inquiries that we believe are desirable and appropriate and that no matters of significance that we regard as relevant have, to our knowledge, been withheld. We have been provided with a copy of the Federal Court's 'Guidelines for Expert Witnesses in Proceeding in the Federal Court of Australia' and this report has been prepared in accordance with those Guidelines.

2. Summary of findings

Tests of the Bloomberg service compared to the CBASpectrum service

While time has precluded us from replicating the AER testing of the relative accuracy of the CBASpectrum and Bloomberg services for the average period in question, we note that the AER's approach is largely the same as it has adopted before and that it has not responded to the issues that we raised in our previous report for JGN. We observe that:

- it is quite likely that, even when using the AER test, the relative accuracy of the CBASpectrum service for predicting the yields of the bonds on issue is marginal;
- there are flaws in the AER's method of testing, in particular that the AER's reliance on squared difference between the relevant curve and the yields of the bonds on issue using all bonds that have a term of more than 2 years masks the fact that the CBASpectrum service materially under-predicts the yields of the longer-dated bonds on issue;³ and
- we remain of the view that the problems with the CBASpectrum service that were summarised above and discussed at length in our previous report mean that it should not be used to derive a benchmark cost of debt in any event.

There is nothing in the AER's more recent report, therefore, that would lead us to change our earlier conclusions.

³ See PricewaterhouseCoopers (March, 2010), Jemena Gas Networks (NSW) – The benchmark cost of debt for a gas distributor, Table 5.4, p.48, which shows that the CBASpectrum BBB+ curve tends to understate the observed bond yields.

Inclusion of additional observations and detection of outliers

The AER's final decision addresses a number of issues that do not impact our conclusions in this letter, nor the conclusions of our March 2010 report:

- *Bonds included in the analysis* – The AER reiterated that it would exclude bonds that are not represented in all three data sources: Bloomberg, CBA Spectrum and UBS. We maintain that the AER's approach does not recognise that the Bloomberg service is based on yield data feeds from many financial institutions, and CBA Spectrum and UBS yields represent the opinions of only two financial institutions. Notwithstanding that both CBA and UBS are experienced practitioners, a broader and more relevant benchmark of the current state of the market is to rely upon the professional opinions on prevailing yields for the bonds on issue from as many financial institutions as possible (for which the Bloomberg feeds can be used as a practicable proxy). This is the approach we used in our previous report. We note, however, that the sample of bonds that we analysed is the same as that adopted by the AER, and so this issue does not have a practical implication.
- *Floating rate notes and bonds in different ratings bands* - In addition, the AER has rejected the proposal to adjust the yields of floating rate notes to a fixed rate equivalent and include these bonds in the sample. We note that we only observed fixed rate bonds in our earlier report and so the AER's views on this matter do not have a practicable implication for our report in this particular circumstance. That said, as we have not undertaken an in depth analysis of the merits of considering floating rate bonds converted to fixed rate bonds, we make no remark about the relative merits of their inclusion. Another issue raised by the AER was the question of including bonds from another rating in the analysis. Again, as we only included BBB+ bonds in our analysis, this has no practical implication for our earlier analysis.
- *Treatment of outliers* - Finally, the AER applied a Chow test to identify outliers, whose yields it felt should be excluded from the sample. We have not considered at length the relative merits of alternative methodologies for detecting outliers. However, we note that this issue is not material to our results given that the AER has examined the same sample of five bonds that we employed in our previous report.

Method of extrapolating the Bloomberg BBB curve

We approximately replicated the AER's results for testing the different extrapolation methods. We have extended the AER's analysis by: including a measure of absolute bias (in addition to the AER's 'goodness of fit' test), which is important for a regulator to consider; extending the time period to investigate two earlier periods when Bloomberg published a 10 year BBB fair value yield; and testing the methodology for extrapolating the Bloomberg BBB debt risk premium that we suggested in our earlier reports (i.e. linear extrapolation of the Bloomberg BBB 5 and 7 year debt risk premiums rather than the total yield, the latter of which is what the AER tested).

Our findings show that the AER's conclusions that the AAA curve should be used to extrapolate the BBB curve is sensitive to the time period chosen.

- Using data from the period investigated by the AER (10 November 2005 to 9 October 2007), extrapolating the Bloomberg 7 year BBB curve by using the Bloomberg AAA curve (7 to 10 years) is found to provide the best estimate of the actual Bloomberg 10 year BBB fair value yield (as was found by the AER).
- However, using data from the earliest period for which Bloomberg estimated a 10 year BBB fair value yield (4 December 2001 to 14 March 2002), the linear extrapolation of the Bloomberg 5 year and 7 year BBB debt risk premium provides the best estimate.

We consider that there are arguments for preferring the results from the earlier (2001-02) period, given that this coincided with a period of higher perceptions of risk and (as a consequence) higher debt risk premiums. In contrast, the period considered by the AER is one where perceptions of risk and observed risk premiums were very low by historical and current standards. Accordingly, we consider there to be a sound basis for preferring the linear extrapolation of the Bloomberg BBB debt risk premiums (not the total yield) as we concluded in our earlier report and would not change our earlier conclusion on this matter.

However, we acknowledge that the early period (4 December 2001 to 14 March 2002) contained considerably fewer observations than the latest period that was tested by the AER, and that the views of reasonable people on this matter may differ. That said, the issue is not currently one that is material in economic terms as the difference between the AAA-curve extrapolation and the linear extrapolation of the BBB debt risk premium currently is in the order of 10 to 15 basis points. The more important question is whether the CBASpectrum or Bloomberg service is used to derive the benchmark debt risk premium, which was addressed already above.

Remainder of report

Of the matters that were addressed in the recent AER final decision on ActewAGL, the one that is material to our analysis and that presents new material is the appropriate method for extrapolating the Bloomberg BBB debt risk premium. Our further consideration of this issue is set out below.

2. The AER's proposed methodology for extrapolation of the Bloomberg fair value yield

The AER considered a number of possible new data sources to overcome current data limitations (i.e. the absence of 10 year Bloomberg BBB and A fair value curves). The data sources considered were:

- Bloomberg's AA and AAA fair value curves
- Bloomberg's CGS fair value curve

- Bloomberg's semi-government fair value curves (NSW, Vic, Qld and WA)
- Bloomberg's interest rate swap curve
- A linear extrapolation based on the spread between the Bloomberg five and seven year BBB fair value estimates.

The AER chose to undertake tests of these alternative data sources using data for the period from 10 November 2005 to 9 October 2007. The AER justified its use of this period on the grounds that it was the most recent period for which Bloomberg 10 year BBB fair value yields were available. The data source providing the lowest daily average squared error from the actual Bloomberg yield estimate was considered by the AER to provide the best estimate.

The AER concluded that the best data source for extrapolating Bloomberg's BBB fair value curve to a term of 10 years is Bloomberg's AAA curve (as the average squared error was lowest). On the same basis, the linear extrapolation of the Bloomberg 5 and 7 year fair value estimates was found to have the worst fit, and the other data sources had fits that were in between the AAA curve and the Bloomberg linear extrapolation.

3. Critique of the AER's proposed approach

We have a number of concerns about the methodology used by the AER in its final decision for ActewAGL.

AER's test statistic (measure of relative error)

In the final decision, the AER's test statistic was the average squared error, which is the squared difference between the estimated yield and the actual Bloomberg 10 year BBB yield. Formally, it is defined as:

$$\frac{1}{n} \sum (Estimated\ 10\ year\ BBB\ +\ yield - Bloomberg\ 10\ year\ BBB\ yield)^2$$

Where, n is the number of days in the period. As this measure is an average squared differential, it does not bear any absolute relationship to the actual yields (which are measured in percentage points or basis points).

The strength of the AER's average squared error approach is that it allows for a tradeoff between statistical bias and efficiency in estimation of the Bloomberg BBB 10 year yield. If there is a low variance around the estimated parameter value then the estimate is said to be efficient. However, an efficiently estimated parameter is said to be statistically biased if the estimate is far from the actual value.

While the average squared error approach has positive attributes, its failing in relation to the issue at hand is that it does not provide an estimate of the absolute bias, which is the average difference between the estimate obtained using a given data source, and the actual observation (in this case, the Bloomberg BBB 10 year yield estimate when it was available). If a measure is efficient but biased downwards, then the appropriate debt risk premium is likely to be understated. Hence, a regulator should be concerned with the degree of absolute bias associated with alternative estimation data sources.

We have therefore included an additional measure - the average error (alternative estimate less Bloomberg 10 year BBB yield), defined as follows:

Average error:

$$\frac{1}{n} \sum (Estimated\ 10\ year\ BBB\ +\ yield - Bloomberg\ 10\ year\ BBB\ yield)$$

Where, n is the number of days in the period. The data were adjusted to eliminate those days that were public holidays (i.e. non-trading days) on the basis of an alignment with the days for which the Reserve Bank of Australia (RBA) did not provide yield estimates for CGS.

The time period analysed by the AER

The time period chosen by the AER was from 10 November 2005 to 9 October, 2007, and was justified on the grounds that this was the most recent period when Bloomberg published a 10 year BBB fair value yield estimate. However, this was not the only time that Bloomberg published a 10 year BBB fair value yield estimate. The other periods were, and we have labelled them as:

- Period 1: 4 December 2001 to 14 March 2002 (69 daily observations)
- Period 2: 11 June 2003 to 20 October 2004 (349 daily observations)
- Period 3: 10 November 2005 to 9 October, 2007 (483 daily observations)

We consider that the period including 4 December 2001 to 14 March 2002 was associated with greater perceptions of market risk than the later periods.⁴ The period chosen by the AER as the benchmark for its analysis was a period reflecting unusually low perceptions of risk in

⁴ For example, the Reserve Bank of Australia's (RBA) 2002 *Annual Report*, at page 19 noted that during 2001-02 'a series of unprecedented shocks to the global financial system, beginning with the September 11 terrorist attacks in the United States, hit an already fragile world economy.' In a short space of time, Enron collapsed and Argentina defaulted. While the direct effects on the Australian economy were relatively muted owing to the continuing growth of China as a major trading partner, the RBA reported that growth in credit to business was at its lowest for some years.

debt markets.⁵ The 2001 to 2002 period, by contrast, overlaps the period in which markets were subjected to the uncertainty associated with the September 11, 2001 attacks in New York, and subsequent uncertainty about the threat of terrorism. Hence, the AER relied on the most recent period. Table 1 below shows that during period 1, which was subject to perceptions of higher market risk both Bloomberg and CBA Spectrum estimated higher debt risk premiums than in period 3.

Table 1: Bloomberg and CBA Spectrum - debt risk premiums by period (basis points)

Debt risk premium / Period	Bloomberg BBB 10 years	CBA Spectrum BBB+ 10 years
1	165.6	133.0
2	135.1	122.0
3	119.6	104.2
1 - 3	129.1	113.3

Source: Bloomberg and CBA Spectrum

Theoretical issues related to the slopes of curves and implied default probabilities

The AER's final decision on ActewAGL used data sources that include the Bloomberg AA and AAA curves, and the curves relating to Commonwealth Government Securities (CGS) and semi-government fair value curves. Theory suggests that the slope of the debt risk premium will be related to the risk of default, with lower credit ratings being associated with a higher risk of default. Lower rated bonds should therefore have a higher slope with respect to term than AAA corporate bonds, semi-government bonds, or CGS (which does not have a risk of default). Therefore, we expect the use of these curves will tend to under-estimate the 10 year Bloomberg BBB estimated yield.

AER's failure to test the linear extrapolation of Bloomberg's debt risk premium

In our previous research we advocated that in the absence of a Bloomberg 10 year A fair value yield estimate, the Bloomberg 5 to 7 year BBB debt risk premium should be extrapolated to 10 years, noting that this would on average over-estimate the ten year Bloomberg BBB yield (albeit by only approximately 15 basis points). The AER's final decision on ActewAGL applies

⁵ The Reserve Bank of Australia's (RBA) *Financial Stability Review*, (September 2006) at page 1 reported that developments in the international economy had 'been broadly supportive of financial stability.' For Australia it concluded at page 7 that 'the strength of aggregate profits and a relatively low interest burden suggest that current developments in the business sector do not pose a near-term risk to financial stability.' More recently, the RBA commented in its *Financial Stability Review* (March, 2010) at page 25, that in the immediate pre-global financial crisis period 'risk was generally being underpriced.'

extrapolation of the Bloomberg 5 and 7 year total yield estimates to obtain a 10 year yield. This will not generally provide the same yield estimate as the extrapolation of the debt risk premium, since there is no reference to the relevant risk free rate. Therefore, the results obtained by the AER do not compare the predictive accuracy of the approach that we suggested.

5. Further analysis of the data

Replicating the AER's findings

Our first objective was to establish how our results compared to those obtained by the AER. The results relevant to this comparison are those found in the second to fifth columns under period 3 (average squared error) in Table 2 below. Comparison of these results with those obtained by the AER shows that our findings are essentially the same.⁶

⁶ Specifically, the average squared difference values obtained by the AER (PwC) were: 25 (27) for Bloomberg AAA; 41 (43) for CGS; 47 (50) for interest rate swaps; and 122 (132) for linear extrapolation of the Bloomberg BBB 5 and 7 year yield curves.

Table 2: Results of testing of extrapolation methods – replication and extension of AER’s approach using (basis points)

		<i>Debt risk premium</i>	<i>Total yield</i>			
Basis of extrapolation		5 - 7 years	5 - 7 years	7 - 10 years	7 - 10 years	7 - 10 years
	<i>Period</i>	<i>Bloomberg BBB linear extrapolated (PwC)</i>	<i>Bloomberg BBB Linear extrapolated (AER)</i>	<i>Bloomberg AAA yield difference</i>	<i>Swap rate difference</i>	<i>CGS yield difference</i>
Average squared error	1	427.4	841.2	878.9	501.0	1221.8
	2	517.8	952.6	89.6	101.2	114.2
	3	375.5	132.4	27.2	50.1	43.4
	1 - 3	434.6	504.4	116.6	104.4	161.0
Average error	1	-14.5	23.6	-28.1	-21.1	-34.0
	2	21.9	29.8	-3.0	-6.7	-8.5
	3	13.7	4.7	-0.3	-4.1	-3.0
	1 - 3	14.7	15.9	-3.5	-6.4	-7.5

Source: Bloomberg and CBA Spectrum

Sensitivity to time period

However, an examination of the results in Table 2 show that different patterns can be observed across the different periods during which the Bloomberg 10 year BBB estimates have been produced.

In the first results column of Table 2 we have used the debt risk premium rather than total yield as the basis for linear extrapolation of the Bloomberg 5 and 7 year BBB yields. This is the recommendation that we made in our previous report, and it is our preferred approach. The results for both the average squared error and average error approaches indicate that:

- For periods 2 and 3 (and all periods combined) the Bloomberg AAA curve has the lowest degree of error; and
- For period 1 the Bloomberg BBB linear extrapolation of the debt risk premium has the lowest degree of error. This is the time period when there were perceptions of higher risk

in the debt market, and is therefore more likely to be reflective of current market conditions.⁷

The results underscore the importance of the choice of time period as the benchmark, although the weight that can be placed on period 1 must be qualified by the fact that only 69 daily observations were available compared with several hundred observations for the other two periods. By contrast, the AER's analysis included no detailed consideration of the effect of choice of time period.

Materiality of alternative data sources

It is also important to consider the materiality of using alternative data sources for extrapolation from the 7 year Bloomberg BBB debt risk premium. Currently, the differential between the Bloomberg BBB and CBA Spectrum BBB+ curves at 7 years is 81 basis points, which is much higher than historically. The difference between the Bloomberg BBB debt risk premium being extrapolated on a straight line basis compared to being extrapolated using the Bloomberg AAA curve has been only approximately 10 to 15 basis points over the last few months. Hence, the most important question is whether Bloomberg or CBA Spectrum should be applied, and not whether the Bloomberg BBB 5 and 7 year debt risk premiums should be extrapolated to 10 years, instead of extrapolating the Bloomberg 7 year BBB yield by the slope of the Bloomberg AAA curve between 7 and 10 years.

* * *

Should you wish to discuss this report in any way, please do not hesitate to contact me on (03) 8603 4973.

Yours sincerely



Jeff Balchin
Executive Director



Matthew Santoro
Executive Director

⁷ The Reserve Bank of Australia's *Financial Stability Review* (March, 2010) has stated that in the global financial environment confidence 'remains fragile', even though the Australian financial systems has proven to be resilient.

PricewaterhouseCoopers is committed to providing our clients with the very best service. We would appreciate your feedback or suggestions for improvement. You can provide this feedback by talking to your engagement partner, calling us within Australia on 1300 792 111 or visiting our website <http://www.pwcfeedback.com.au/>

Attachment A

Curriculum vitae

Jeff Balchin

Executive Director

Qualifications and memberships:

- B.Ec. (Hons.) at the University of Adelaide (First Class Honours)
- CEDA National Prize for Economic Development

Recent project experience:

Jeff is an Executive Director of PricewaterhouseCoopers. Previously, he was a Director of the Allen Consulting Group, and prior to that held a number of policy positions in the Commonwealth Government:

- **Commonwealth representative on the secretariat of the Gas Reform Task Force (1995-1996)** - Played a lead role in the development of a National Code for third party access to gas transportation systems, with a particular focus on market regulation and pricing.
- **Infrastructure, Resources and Environment Division, Department of the Prime Minister and Cabinet (1994-1995)** - Played a key role in the creation of the Gas Reform Task Force (a body charged with implementing national gas reform that reports to the Heads of Government). During this time he also had responsibility for advising on primary industries, petroleum and mining industry issues, infrastructure issues, government business enterprise reform and privatisation issues.
- **Structural Policy Division, Department of the Treasury (1992-94)** – Worked on environment policy issues in the lead up to the UN Conference on Environment and Development at Rio de Janeiro, as well as electricity and gas reform issues.

Experience – Economic Regulation of Price and Service

A. Periodic Price Reviews – Major Roles for Regulators

- **South Australian default gas retail price review (Client: the Essential Services Commission, SA, 2007-2008)** - Directed a team that derived estimates of the benchmark operating costs for a gas retailer and the margin that should be allowed. This latter exercise included a bottom-up estimate of the financing costs incurred by a gas retail business.
- **South Australian default electricity retail price review (Client: the Essential Services Commission, SA, 2007)** -Directed a team that estimated the wholesale electricity purchase cost for the default electricity retail supplier in South Australia. The project involved the development of a model for deriving an optimal portfolio of hedging contracts for a prudent

and efficient retailer, and the estimate of the expected cost incurred with that portfolio. Applying the principles of modern finance theory to resolve issues of how the compensation for certain risk should be quantified was also a central part of the project.

- **South Australian default gas retail price review (Client: the Essential Services Commission, SA, 2005)** - As part of a team, advised the regulator on the cost of purchasing gas transmission services for a prudent and efficient SA gas retailer, where the transmission options included the use of the Moomba-Adelaide Pipeline and SEAGas Pipeline, connecting a number of gas production sources.
- **Victorian Gas Distribution Price Review (Client: the Essential Services Commission, Vic, 2006-2008)** - Provided advice to the Essential Service Commission in relation to its review of gas distribution access arrangements on the treatment of outsourcing arrangements, finance issues, incentive design and other economic issues.
- **Envestra Gas Distribution Price Review (Client: the Essential Services Commission, SA, 2006)** - Provided advice on several finance related issues (including 'return on assets' issues and the financial effect of Envestra's invoicing policy), and the treatment of major outsourcing contracts when setting regulated charges.
- **Victorian Electricity Distribution Price Review (Client: the Essential Services Commission, Vic, 2003-2005)** - Provided advice to the Essential Service Commission on a range of economic issues related to current review of electricity distribution charges, including issues related to finance, forecasting of expenditure and the design of incentive arrangements for productive efficiency and service delivery. Was a member of the Steering Committee advising on strategic regulatory issues.
- **Victorian Water Price Review (Client: the Essential Services Commission, Vic, 2003-2005)** - Provided advice to the Essential Services Commission on the issues associated with extending economic regulation to the various elements of the Victorian water sector. Was a member of the Steering Committee advising on strategic regulatory issues, and also provided advice on specific issues, most notably the determination of the initial regulatory values for the water businesses and the role of developer charges.
- **ETSA Electricity Distribution Price Review (Client: the Essential Services Commission, SA, 2002-2005)** - Provided advice on the 'return

on assets' issues associated with the review of ETSA's regulated distribution charges, including the preparation of consultation papers. The issues covered include the valuation of assets for regulatory purposes and cost of capital issues. Also engaged as a quality assurance adviser on other consultation papers produced as part of the price review.

- **Victorian Gas Distribution Price Review (Client: the Essential Services Commission, Vic, 2001-2002)** - Economic adviser to the Essential Services Commission during its assessment of the price caps and other terms and conditions of access for the three Victorian gas distributors. Was responsible for all issues associated with capital financing (including analysis of the cost of capital and assessment of risk generally, and asset valuation), and supervised the financial modelling and derivation of regulated charges. Also advised on a number of other issues, including the design of incentive arrangements, the form of regulation for extensions to unreticulated townships, and the principles for determining charges for new customers connecting to the system. Represented the Commission at numerous public forums during the course of the review, and was the principal author of the finance-related and other relevant sections of the four consultation papers and the draft and final decisions.
- **ETSA Electricity Distribution Price Review (Client: the South Australian Independent Industry Regulator, 2000-2001)** - As part of a team, prepared a series of reports proposing a framework for the review. The particular focus was on the design of incentives to encourage cost reduction and service improvement, and how such incentives can assist the regulator to meet its statutory obligations. Currently retained to provide commentary on the consultation papers being produced by the regulator, including strategic or detailed advice as appropriate.
- **Dampier to Bunbury Natural Gas Pipeline Access Arrangement Review (Client: the Independent Gas Pipelines Access Regulator, WA, 2000-2002)** - Provided economic advice to the Office of the Independent Regulator during its continuing assessment of the regulated charges and other terms and conditions of access for the gas pipeline, including a review of all parts of the draft decision, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Represented the Office on these matters at a public forum, and provided strategic advice to the Independent Regulator on the draft decision.
- **Goldfield Gas Pipeline Access Arrangement Review (Client: the Independent Gas Pipelines Access Regulator, WA, 2000-2004)** - Provided economic advice to the Office of the Independent Regulator

during its continuing assessment of the regulated charges and other terms and conditions of access for the gas pipeline, including a review of all parts of the draft decision, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Represented the Office on these matters at a public forum, and provided strategic advice to the Independent Regulator on the draft decision.

- **Victorian Electricity Distribution Price Review (Client: the Office of the Regulator-General, Vic, 1999-2000)** - Economic adviser to the Office of the Regulator-General during its review of the price caps for the five Victorian electricity distributors. Had responsibility for all issues associated with capital financing, including analysis of the cost of capital (and assessment of risk generally) and asset valuation, and supervised the financial modelling and derivation of regulated charges. Also advised on a range of other issues, including the design of incentive regulation for cost reduction and service improvement, and the principles for determining charges for new customers connecting to the system. Represented the Office at numerous public forums during the course of the review, and was principal author of the finance-related sections of three consultation papers, and the finance-related sections of the draft and final decision documents.
- **Victorian Ports Corporation and Channels Authority Price Review (Client: the Office of the Regulator-General, Vic, 2000)** - Advised on the finance-related issues (cost of capital and the assessment of risk generally, and asset valuation), financial modelling (and the derivation of regulated charges), and on the form of control set over prices. Principal author of the sections of the draft and final decision documents addressing the finance-related and price control issues.
- **AlintaGas Gas Distribution Access Arrangement Review (Client: the Independent Gas Pipelines Access Regulator, WA, 1999-2000)** - Provided economic advice to the Office of the Independent Regulator during its assessment of the regulated charges and other terms and conditions of access for the gas pipeline. This advice included providing a report assessing the cost of capital associated with the regulated activities, overall review of all parts of the draft and final decisions, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Also provided strategic advice to the Independent Regulator on the draft and final decisions.
- **Parmelia Gas Pipeline Access Arrangement Review (Client: the**

Independent Gas Pipelines Access Regulator, WA, 1999-2000) -

Provided economic advice to the Office of the Independent Regulator during its assessment of the regulated charges and other terms and conditions of access for the gas pipeline, including a review of all parts of the draft and final decisions, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Also provided strategic advice to the Independent Regulator on the draft and final decisions.

- **Victorian Gas Distribution Price Review (Client: the Office of the Regulator-General, Vic, 1998) -** Economic adviser to the Office of the Regulator-General during its assessment of the price caps and other terms and conditions of access for the three Victorian gas distributors. Major issues addressed included the valuation of assets for regulatory purposes, cost of capital financing and financial modelling. Principal author of the draft and final decision documents.

B. Periodic and Other Price Reviews – Other Activities

- **Equity Betas for Regulated Electricity Transmission Activities (Client: Grid Australia, APIA, ENA, 2008) -** Prepared a report presenting empirical evidence on the equity betas for regulated Australian electricity transmission and distribution businesses for the AER's five yearly review of WACC parameters for these industries. The report demonstrated the implications of a number of different estimation techniques and the reliability of the resulting estimates. Also prepared a joint paper with the law firm, Gilbert+Tobin, providing an economic and legal interpretation of the relevant (unique) statutory guidance for the review.
- **Economic Principles for the Setting of Airside Charges (Client: Christchurch International Airport Limited, 2008 ongoing) -** Provided advice on a range of economic issues relating to its resetting of charges for airside services, including the valuation of assets and treatment of revaluations, certain inputs to the cost of capital (beta and the debt margin) and the efficiency of prices over time and the implications for the depreciation of assets and measured accounting profit.
- **Treatment of Inflation and Depreciation when Setting Landing Charges (Client: Virgin Blue, 2007 2008) -** Provided advice on Adelaide Airport's proposed approach for setting landing charges for Adelaide Airport, where a key issue was how it proposed to deal with inflation and the implications for the path of prices over time. The advice also addressed the different formulae that are available for deriving an annual revenue requirement and the requirements for the different formulae to be applied consistently.

- **Application of the Grid Investment Test to the Auckland 400kV Upgrade (Client: Electricity Commission of New Zealand, 2006)** - As part of a team, undertook a review of the Commission's process for reviewing Transpower's proposed Auckland 400kV upgrade project and undertook a peer review of the Commission's application of the Grid Investment Test.
- **Appropriate Treatment of Taxation when Measuring Regulatory Profit (Client: Powerco New Zealand, 2005 2006)** - Prepared two statements for Powerco New Zealand related to how the Commerce Commission should treat taxation when measuring realised and projected regulatory profit for its gas distribution business (measured regulatory profit, in turn, was a key input into the Commission's advice to the Minister as to whether there would be net benefits from regulating Powerco New Zealand's gas distribution business). A key finding was that care must be taken to ensure that the inputs used when calculating taxation expenses are consistent with the other 'assumptions' that a regulator adopts if it applies incentive regulation (most notably, a need for consistency between assumed tax depreciation and the regulatory asset value).
- **Application of Directlink for Regulated Status (Client: Directlink, 2003 2004)** - Prepared advice on the economic issues associated with the Directlink Joint Venture's request to be converted from an unregulated (entrepreneurial) interconnector to a regulated interconnector. As with the Murraylink application, the key issues included the implications for economic efficiency flowing from its application and the appropriate application of a cost benefit test for transmission investment (and the implications of that test for the setting of the regulatory value for its asset).
- **Principles for the 'Stranding' of Assets by Regulators (Client: the Independent Pricing and Regulatory Tribunal, NSW, 2005)** - Prepared a report discussing the relevant economic principles for a regulator in deciding whether to 'strand' assets for regulatory purposes (that is, to deny any further return on assets that are partially or unutilised). An important conclusion of the advice is that the benefits of stranding need to be assessed with reference to how future decisions of the regulated entities are affected by the policy (i.e. future investment and pricing decisions), and that the uncertainty created from 'stranding' creates real costs.
- **Principles for Determining Regulatory Depreciation Allowances (Client: the Independent Pricing and Regulatory Tribunal, NSW, 2003)** - Prepared a report discussing the relevant economic and other principles for determining depreciation for the purpose of price regulation, and its application to electricity distribution. An important issue addressed was the

distinction between accounting and regulatory (economic) objectives for depreciation.

- **Methodology for Updating the Regulatory Value of Electricity Transmission Assets (Client: the Australian Competition and Consumer Commission, 2003)** - Prepared a report assessing the relative merits of two options for updating the regulatory value of electricity transmission assets at a price review - which are to reset the value at the estimated 'depreciated optimised replacement cost' value, or to take the previous regulatory value and deduct depreciation and add the capital expenditure undertaken during the intervening period (the 'rolling-forward' method). This paper was commissioned as part of the ACCC's review of its Draft Statement of Regulatory Principles for electricity transmission regulation.
- **Application of Murraylink for Regulated Status (Client: Murraylink Transmission Company, 2003)** - Prepared advice on the economic issues associated with Murraylink Transmission Company's request to be converted from an unregulated (entrepreneurial) interconnector to a regulated interconnector. The key issues included the implications for economic efficiency flowing from its application and the appropriate application of a cost benefit test for transmission investment (and the implications of that test for the setting of the regulatory value for its asset).
- **Proxy Beta for Regulated Gas Transmission Activities (Client: the Australian Competition and Consumer Commission, 2002)** - Prepared a report presenting the available empirical evidence on the 'beta' (which is a measure of risk) of regulated gas transmission activities. This evidence included beta estimates for listed firms in Australia, as well as those from the United States, Canada and the United Kingdom. The report also included a discussion of empirical issues associated with estimating betas, and issues to be considered when using such estimates as an input into setting regulated charges.
- **Treatment of Working Capital when setting Regulated Charges (Client: the Australian Competition and Consumer Commission, 2002)** - Prepared a report assessing whether it would be appropriate to include an explicit (additional) allowance in the benchmark revenue requirement in respect of working capital when setting regulated charges.
- **Pricing Principles for the South West Pipeline (Client: Esso Australia, 2001)** - As part of a team, prepared a report (which was submitted to the Australian Competition and Consumer Commission) describing the pricing principles that should apply to the South West Pipeline (this pipeline was a

new asset, linking the existing system to a new storage facility and additional gas producers).

- **Victorian Government Review of Water Prices (Client: the Department of Natural Resources and the Environment, Vic, 2000 2001)** - Prepared a report discussing the principles regulators use to determine the capital related cost (including reasonable profit) associated with providing utility services, and how those principles would apply to the water industry in particular. The report also provided an estimate of the cost of capital (and assessment of risk in general) associated with providing water services. The findings of the report were presented to a forum of representatives of the Victorian water industry.
- **Likely Regulatory Outcome for the Price for Using a Port (Client: MIM, 2000)** - Provided advice on the outcome that could be expected were the dispute over the price for the use of a major port to be resolved by an economic regulator. The main issue of contention was the valuation of the port assets (for regulatory purposes) given that the installed infrastructure was excess to requirements, and the mine had a short remaining life.
- **Relevance of 'Asymmetric Events' in the Setting of Regulated Charges (Client: TransGrid, 1999)** - In conjunction with William M Mercer, prepared a report (which was submitted to the Australian Competition and Consumer Commission) discussing the relevance of downside (asymmetric) events when setting regulated charges, and quantifying the expected cost of those events.

C. Licencing / Franchise Bidding

- **Competitive Tender for Gas Distribution and Retail in Tasmania (Client: the Office of the Tasmanian Energy Regulator, 2001 2002)** - Economic adviser to the Office during its continuing oversight of the use of a competitive tender process to select a gas distributor/retailer for Tasmania, and simultaneously to set the regulated charges for an initial period. The main issues concern how the tender rules, process and future regulatory framework should be designed to maximise the scope for 'competition for the market' to discipline the price and service offerings. Principal author of a number of sections of a consultation paper, and the regulator's first decision document.
- **Issuing of a Licence for Powercor Australia to Distribute Electricity in the Docklands (Client: the Office of the Regulator General, Vic, 1999)** - Economic adviser to the Office during its assessment of whether a second distribution licence should be awarded for electricity distribution in the Docklands area (a distribution licence for the area was already held by

CitiPower, and at that time, no area in the state had multiple licensees). The main issue concerned the scope for using 'competition for the market' to discipline the price and service offerings for an activity that would be a monopoly once the assets were installed. Contributed to a consultation paper, and was principal author of the draft and final decision documents.

D. Market Design

- **Options for the Development of the Australian Gas Wholesale Market (Client: the Ministerial Committee on Energy, 2005)** - As part of a team, assessed the relative merits of various options for enhancing the operation of the Australian gas wholesale markets, including by further dissemination of information (through the creation of bulletin boards) and the management of retailer imbalances and creation of price transparency (by creating short term trading markets for gas).
- **Review of the Victorian Gas Market (Client: the Australian Gas Users Group, 2000 2001)** - As part of a team, reviewed the merits (or otherwise) of the Victorian gas market. The main issues of contention included the costs associated with operating a centralised market compared to the potential benefits, and the potential long term cost associated with having a non commercial system operator.
- **Development of the Market and System Operation Rules for the Victorian Gas Market (Client: Gas and Fuel Corporation, 1996)** - Assisted with the design of the 'market rules' for the Victorian gas market. The objective of the market rules was to create a spot market for trading in gas during a particular day, and to use that market to facilitate the efficient operation of the system.

E. Development of Regulatory Frameworks

- **Implications of greenhouse policy for the electricity and gas regulatory frameworks (Client: the Australian Energy Market Commission, 2008 ongoing)** - Providing ongoing advice to the AEMC in its review of whether changes to the electricity and gas regulatory frameworks is warranted in light of the proposed introduction of a carbon permit trading scheme and an expanded renewables obligation. Issues addressed include the framework for electricity connections, the efficiency of the management of congestion and locational signals for generators and the appropriate specification of a cost benefit test for transmission upgrades in light of the two policy initiatives.
- **Application of a 'total factor productivity' form of regulation (Client: the Victorian Department of Primary Industries, 2008)** - Assisted the Department to develop a proposed amendment to the regulatory regime

for electricity regulation to permit (but not mandate) a total factor productivity approach to setting price caps – that is, to reset prices to cost at the start of the new regulatory period and to use total factor productivity as an input to set the rate of change in prices over the period.

- **Expert Panel on Energy Access Pricing (Client: Ministerial Council on Energy, 2005 2006)** - Assisted the Expert Panel in its review of the appropriate scope for commonality of access pricing regulation across the electricity and gas, transmission and distribution sectors. The report recommended best practice approaches to the appropriate forms of regulation, the principles to guide the development of detailed regulatory rules and regulatory assessments, the procedures for the conduct of regulatory reviews and information gathering powers.
- **Productivity Commission Review of Airport Pricing (Client: Virgin Blue, 2006)** - Prepared two reports for Virgin Blue for submission to the Commission's review, addressing the economic interpretation of the review principles, asset valuation, required rates of return for airports and the efficiency effects of airport charges and presented the findings to a public forum.
- **AEMC Review of the Rules for Setting Transmission Prices (Client: Transmission Network Owners, 2005 2006)** - Advised a coalition comprising all of the major electricity transmission network owners during the new Australian Energy Market Commission's review of the rules under which transmission prices are determined. Prepared advice on a number of issues and assisted the owners to draft their submissions to the AEMC's various papers.
- **Advice on Energy Policy Reform Issues (Client: Victorian Department of Infrastructure/Primary Industries, 2003 ongoing)** - Ongoing advice to the Department regarding on issues relating to national energy market reform. Key areas covered include: reform of cross ownership rules for the energy sector; the reform of the cost benefit test for electricity transmission investments; and the reform of the gas access arrangements (in particular, the scope for introducing more light handed forms of regulation); and the transition of the Victorian electricity transmission arrangements and gas market into the national regulatory regime.
- **Productivity Commission Review of the National Gas Code (Client: BHPBilliton, 2003 2004)** - Produced two submissions to the review, with the important issues including the appropriate form of regulation for the monopoly gas transmission assets (including the role of incentive regulation), the requirement for ring fencing arrangements, and the

presentation of evidence on the impact of regulation on the industry since the introduction of the Code. The evidence presented included a detailed empirical study of the evidence provided by the market values of regulated entities for the question of whether regulators are setting prices that are too low.

- **Framework for the Regulation of Service Quality (Client: Western Power, 2002)** - Prepared two reports advising on the framework for the regulation of product and service quality for electricity distribution, with a particular focus on the use of economic incentives to optimise quality and the implications for the coordination of service regulation coordinated with distribution tariff regulation.
- **Development of the National Third Party Access Code for Natural Gas Pipeline Systems Code (Client: commenced while a Commonwealth Public Servant, after 1996 the Commonwealth Government, 1994 1997)** - Was involved in the development of the Gas Code (which is the legal framework for the economic regulation of gas transmission and distribution systems) from the time of the agreement between governments to implement access regulation, through to the signing of the intergovernmental agreements and the passage of the relevant legislation by the State and Commonwealth parliaments. Major issues of contention included the overall form of regulation to apply to the infrastructure (including the principles and processes for establishing whether an asset should be regulated), pricing principles (including the valuation of assets for regulatory purposes and the use of incentive regulation), ring fencing arrangements between monopoly and potentially contestable activities, and the disclosure of information. Was the principal author of numerous issues papers for the various government and industry working groups, public discussion papers, and sections of the Gas Code.

F. Other Finance Work

- **Private Port Development (Client: Major Australian Bank, 2008)** - Prepared a report on the relative merits of different governance and financing arrangements for a proposed major port development that would serve multiple port users.
- **Review of Capital Structure (Client: major Victorian water entity, 2003)** - Prepared a report (for the Board) advising on the optimal capital structure for a particular Victorian water entity. The report advised on the practical implications of the theory on optimal capital structure, presented benchmarking results for comparable entities, and presented the results of detailed modelling of the risk implications of different capital structures. Important issues for the exercise were the implications of continued

government ownership and the impending economic regulation by the Victorian Essential Services Commission for the choice of – and transition to – the optimal capital structure.

Expert Witness Roles

- **Consultation on Major Airport Capital Expenditure – Judicial Review** (Client: Christchurch International Airport, 2008) - Prepared an affidavit for a judicial review on whether the airport consulted appropriately on its proposed terminal development. Addressed the rationale, from the point of view of economics, of separating the decision of 'what to build' from the question of 'how to price' in relation to new infrastructure.
- **New Zealand Commerce Commission Draft Decision on Gas Distribution Charges (Client: Powerco, 2007 08)** - Prepared an expert statement about the valuation of assets for regulatory purposes, with a focus on the treatment of revaluation gains, and a memorandum about the treatment of taxation for regulatory purposes and appeared before the Commerce Commission.
- **Sydney Airport Domestic Landing Change Arbitration (Client: Virgin Blue, 2007)** - Prepared two expert reports on the economic issues associated with the structure of landing charges (note: the evidence was filed, but the parties reached agreement before the case was heard).
- **New Zealand Commerce Commission Gas Price Control Decision – Judicial Review to the High Court (Client: Powerco, 2006)** - Provided four affidavits on the regulatory economic issues associated with the calculation of the allowance for taxation for a regulatory purpose, addressing in particular the need for consistency in assumptions across different regulatory calculations.
- **Victorian Electricity Distribution Price Review – Appeal to the ESC Appeal Panel: Service Incentive Risk (Client: the Essential Services Commission, Vic, 2005 2006)** - Prepared expert evidence on the workings of the ESC's service incentive scheme and the question of whether the scheme was likely to deliver a windfall gain or loss to the distributors (note: the evidence was filed, but the appellant withdrew this ground of appeal prior to the case being heard).
- **Victorian Electricity Distribution Price Review – Appeal to the ESC Appeal Panel: Price Rebalancing (Client: the Essential Services Commission, Vic, 2005 2006)** - Prepared expert evidence on the workings of the ESC's tariff basket form of price control, with a particular focus on

the ability of the electricity distributors to rebalance prices and the financial effect of the introduction of 'time of use' prices in this context (note: the evidence was filed, but the appellant withdrew this ground of appeal prior to the case being heard).

- **New Zealand Commerce Commission Review of Information Provision and Asset Valuation (Client: Powerco New Zealand, 2005)** - Appeared before the Commerce Commission for Powerco New Zealand on several matters related to the appropriate measurement of profit for regulatory purposes related to its electricity distribution business, most notably the treatment of taxation in the context of an incentive regulation regime.
- **Duke Gas Pipeline (Qld) Access Arrangement Review** – Appeal to the Australian Competition Tribunal (Client: the Australia Competition and Consumer Commission, 2002) - Prepared expert evidence on the question of whether concerns of economic efficiency are relevant to the non price terms and conditions of access (note: the evidence was not filed as the appellant withdrew its evidence prior to the case being heard).
- **Victorian Electricity Distribution Price Review** – Appeal to the ORG Appeal Panel: Rural Risk (Client: the Office of the Regulator General, Vic, 2000) - Provided expert evidence (written and oral) to the ORG Appeal Panel on the question of whether the distribution of electricity in the predominantly rural areas carried greater risk than the distribution of electricity in the predominantly urban areas.
- **Victorian Electricity Distribution Price Review** – Appeal to the ORG Appeal Panel: Inflation Risk (Client: the Office of the Regulator General, Vic, 2000) - Provided expert evidence (written and oral) to the ORG Appeal Panel on the implications of inflation risk for the cost of capital associated with the distribution activities.
- **Major Coal Producers and Ports Corporation of Queensland Access Negotiation (Client: Pacific Coal, 1999)** - Provided advice to the coal producers on the outcome that could be expected were the dispute over the price for the use of a major port to be resolved by an economic regulator. The main issues of contention were the valuation of the assets for regulatory purposes, whether the original users of the port should be given credit for the share of the infrastructure they financed, and the cost of capital (and assessment of risk generally). Presented the findings to a negotiation session between the parties.

Matthew Santoro

Executive Director

Qualifications and memberships:

- Bachelor of Economics (Honours), University of Adelaide
- Affiliate, Institute of Chartered Accountants

Matthew has over 20 years of corporate and institutional banking experience, including 12 years at Deutsche Bank and eight years at Citibank. At Deutsche Bank he held various senior banking positions covering the origination, structuring and syndication of debt facilities. Following this and prior to joining PwC, Matthew jointly established and was Joint National Head of KPMG's debt advisory practice for a period of five years.

Project experience:

Matthew is experienced in a wide range of financing and fundraising transactions, in particular in the area of acquisition financing, leverage financing, re-financings, project and property financing and procurement of debt capital markets instruments across the Australian, European and USA markets. His experience includes dealings with credit rating agencies such as Standard & Poor's and Moody's.

Matthew has advised numerous companies on their debt and capital management needs, including the procurement of debt across a very broad industry sector. His clients have included the following:

- CSL
- David Jones
- Boom Logistics
- Pacific Brands
- Healthscope
- Hastings Funds Management
- Future Fund

- Australian Super
- Deutsche Asset Management
- South East Water
- Computershare
- ORIX Corporation
- Toll Holdings, and
- Tabcorp

Matthew's experience covers capital management and financing applications for a wide range of structures, asset types and industries. Matthew has over 20 years of debt markets experience with extensive dealings and established relationships with key participants in the capital markets such as banks, borrowers, fund and fixed interest managers, private equity investors, credit rating agencies, legal firms, etc.

Matthew's sector experience includes:

- debt structuring, arranging and procurement, onshore and offshore
- US Private Placement, Australian and European Bond markets
- capital management, and
- credit rating agencies.

Attachment B

Terms of Reference

JEMENA GAS NETWORKS (NSW)
ACCESS ARRANGEMENT 2010

ASSET & PROJECT

EXPERT TERMS OF REFERENCE –
COST OF DEBT EXPERT

DOCUMENT TITLE

AA10-SR-77826

DOCUMENT NUMBER

1 BACKGROUND

Jemena Gas Networks (**JGN**) is the major gas distribution service provider in New South Wales (NSW). JGN owns 24,000 kilometres of natural gas distribution system, delivering approximately 100 petajoules of natural gas to over one million homes, businesses and large industrial consumers across NSW. Jemena Asset Management (**JAM**) undertakes the majority of JGN's operating, maintenance, and capital works activity.

The relevant provisions relating to the economic regulation of natural gas distribution networks in NSW are set out in the National Gas Law and National Gas Rules, which are available at <http://www.aemc.gov.au/Gas/National-Gas-Rules/Current-Rules.html>.

JGN is currently engaged with the Australian Energy Regulator (**AER**) in the AER's review of its Access Arrangement (**AA**). JGN submitted its original revisions to the AA in August 2009. JGN then submitted revised AA revisions to the AER on 19 March 2010 which, if approved, will cover the period 2010/11-2014/15 (July to June financial years).

Under the National Gas Rules, total revenue for a relevant service provider is determined for each regulatory year of the access arrangement using a "building blocks" methodology (Rule 76). The building blocks include, amongst others, a return on the projected capital base for the year (Subrule 76(a)).

Subrule 87(1) provides that the rate of return on capital is to be commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services. Subrule 87(2) provides:

In determining a rate of return on capital:

- (a) it will be assumed that the service provider:
 - (i) meets benchmark levels of efficiency; and
 - (ii) uses a financing structure that meets benchmark standards as to gearing and other financial parameters for a going concern and reflects in other respects best practice; and
- (b) a well accepted approach that incorporates the cost of equity and debt, such as the Weighted Average Cost of Capital, is to be used; and a well accepted financial model, such as the Capital Asset Pricing Model, is to be used.

Rule 72(1)(g) provides that the access arrangement information for a full access arrangement proposal must include the proposed rate of return, the assumptions on which the rate of return is calculated and a demonstration of how it is calculated.

Under the National Gas Law (section 28), in making a decision on whether to approve Jemena's AA proposal, the AER must have regard to the National Gas Objective (in section 23 of the National Gas Law), which is:

"to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas."

The AER may also take into account the pricing principles in section 24(2) of the National Gas Law, and must do so when considering whether to approve a reference tariff:

A service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs in—

- (a) providing reference services; and
- (b) complying with a regulatory obligation or requirement or making a regulatory payment.

It may also be relevant to note that Rule 74, which applies to forecasts and estimates, provides:

- (1) Information in the nature of a forecast or estimate must be supported by a statement of the basis of the forecast or estimate.
- (2) A forecast or estimate:
 - (a) must be arrived at on a reasonable basis; and
 - (b) must represent the best forecast or estimate possible in the circumstances.

In its revised AA (August 2009), JGN proposed using the Tabcorp bond April 2009 issue as the data source to estimate the cost of debt for a benchmark efficient gas network. JGN then deducts the riskfree rate to estimate its proposed debt premium. JGN's proposed data source was based on a report submitted by the Victorian electricity distributors as part of their AMI charges applications (the Tabcorp report).¹

On 10 February 2010 the AER published its draft decision on JGN's AA revision proposal.² JGN submitted a revised proposal in response to the AER's draft decision and an initial response to this decision in a submission to the AER on 19 March 2010. Public submissions on the AER's draft decision and JGN's revised proposal close on 28 April 2010.

In section of 5.10 of its draft decision, the AER rejects JGN's proposed data source because it considered that it is not appropriate to rely on a single debt issue such as the April 2009 Tabcorp bond issue. Instead, the AER relies on the CBASpectrum's BBB+ fair value curve as its data source for the decision, based on analysis that compares Bloomberg and CBASpectrum fair value yields. The AER gives two reasons for why it considers that it is not appropriate to use the Tabcorp bond, being:

- it is only a single bond; and
- it requires several adjustments to make it comparable to the benchmark corporate bond.

The AER estimates a debt premium of 4.18 per cent by averaging the 10 year CBASpectrum BBB+ fair value yield over a proxy period, being the 20 business days between 26 November and 23 December 2009—the same proxy period that the AER used to estimate the riskfree rate. The AER then adopts a debt premium estimate of 4.32 per cent. The AER does not discuss the relationship between the two estimates.

¹ Victorian electricity distribution businesses, 1 June 2009, *Debt risk premium for use in the initial AMI WACC period*. This report was submitted as part of JGN's revised AA.

² Australian Energy Regulator, *Draft decision, Jemena, Access arrangement proposal for the NSW gas networks*, 1 July 2010 – 30 June 2015 (**draft decision**), February 2010, can be found at <http://www.aer.gov.au/content/index.phtml/itemId/730676>.

In section 5.3.8 of its initial response to the AER's draft decision, JGN proposed a methodology for: (a) comparing Bloomberg and CBASpectrum fair value yields; and (b) selecting the best estimate of the debt premium in the circumstances. JGN based this methodology on an independent expert report by PricewaterhouseCoopers (**PwC**)—the PwC March 2010 report.³ Applying this methodology to JGN's sample averaging period,⁴ PwC recommended extrapolating the debt premia on five and seven year Bloomberg BBB fair value yields to estimate a debt premium of 4.48 per cent for 10 year BBB corporate bonds. JGN proposed this estimate based on the PwC methodology in its initial response to the AER's draft decision, noting that it would be updated for JGN's final averaging period.

Subsequent to JGN's initial response, the AER released its final decision for ActewAGL, which used the CBASpectrum's BBB+ fair value curve as its data source for estimating a debt premium for ActewAGL of 3.35 per cent. The AER based its decision on further analysis of Bloomberg and CBASpectrum fair value yields.

Accordingly, JGN is seeking the opinion of a recognised independent expert to support the specification of the cost of debt for a gas distributor that complies with the requirements of the National Gas Law and Rules in the revised access arrangement.

2 SCOPE OF WORK

The independent expert will provide an opinion report detailing:

1. *Review the AER's final decision for ActewAGL on the debt margin*—an assessment of the AER's analysis and conclusions on the data source and estimate of the debt margin in section 5.5 of the ActewAGL final decision, including whether the AER's methodology for comparing Bloomberg and CBASpectrum fair value curves is robust and likely to lead to: (a) a rate of return on capital that is commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services; and (b) a forecast or estimate that is arrived at on a reasonable basis and represents the best forecast or estimate possible in the circumstances.
2. *Review the PwC March 2010 report in light of the AER's final decision for ActewAGL*—an assessment of whether, in light of the AER's final decision for ActewAGL, PwC's methodology for comparing Bloomberg and CBASpectrum fair value curves is robust and likely to lead to: (a) a rate of return on capital that is commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services; and (b) a forecast or estimate that is arrived at on a reasonable basis and represents the best forecast or estimate possible in the circumstances.
3. *Propose a debt premium estimate for a BBB 10 year bond*—propose a debt premium estimate for a BBB 10 year bond over the 20 business days from 15 January to 12 February 2010 that is: (a) a return on debt capital that is commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services; and (b) a forecast or estimate that is arrived at on a reasonable basis and represents the best forecast or estimate possible in the circumstances.

³ PwC, March 2010, *Jemena Gas Networks (NSW): The benchmark cost of debt for a gas distributor*. This report was submitted as appendix 5.5 of JGN's initial response to the AER draft decision.

⁴ JGN's sample averaging period was 15 January to 12 February 2010.

3 INFORMATION FROM JGN

JGN will make the following information available to the expert:

- the public version of the AER's draft decision for JGN;
- the public version of JGN's revised AA, including the Tabcorp report;
- the public version of JGN's initial response to the AER's draft decision;
- the public version of the AER's final decision for ActewAGL; and
- the PwC March 2010 report.

4 OTHER INFORMATION TO BE CONSIDERED

The expert is also expected to draw upon the following additional information:

- the National Gas Law and the National Gas Rules in relation to the economic regulation of gas networks;
- the National Electricity Law and National Electricity Rules in relation to the economic regulation of electricity networks;
- the AER's Final "Electricity and Distribution Network Service Providers Statement of Revised WACC Parameters (transmission) Statement of regulatory intent on the revised WACC parameters (Distribution)" dated 1 May 2009;
- the AER's recent regulatory decision, including its draft decisions for ETSA Utilities, Ergon, ENERGEX and ActewAGL;
- PriceWaterhouseCoopers' recent report titled "Victorian Distribution Business: Methodology to Estimate the Debt Risk Premium" dated November 2009 and submitted to the AER as part of the Victorian EDPR;
- historic share data for the Australian market, including returns and other financial information;
- published econometric, statistical, economic, financial and other relevant literature; and
- such information that, in expert's opinion, should be taken into account to address the questions outlined above.

5 DELIVERABLES

At the completion of its review the expert will provide an independent expert report which:

- is of a professional standard capable of being submitted to the AER;

- is prepared in accordance with the Federal Court Guidelines for Expert Witnesses set out in Attachment 1 and acknowledges that the expert has read the guidelines⁵;
- summarises the expert's experience and qualifications and attaches relevant curriculum vitae;
- identifies any person and their qualifications, who assists in the preparation of the report or in carrying out any research or test for the purposes of the report;
- summarises JGN's instructions and attaches these term of reference; and
- (without limiting the points above) carefully sets out the facts that the expert has assumed in putting together his or her report and the basis for those assumptions.

The expert report will include the findings for each of the two parts defined in the scope of works (Section 2).

6 TIMETABLE

The independent expert will deliver the final report to JGN by **28 April 2010**. The full list of deliverables and their due dates are shown in the table below.

Deliverable	Due Date
Draft report	27 Apr 2010
JGN feedback on adherence to scope and factual accuracy of draft report	28 Apr 2010
Final report	28 Apr 2010

At the completion of this phase of work, the expert will provide an opinion report which:

- provides a summary of their opinions;
- sets out their findings for each of the parts defined in the scope of works (Section 2);
- includes detailed reasons for these opinions;
- fully documents the methodology used in detail and discusses the results obtained;
- lists the facts, matters and assumptions on which their opinions are based and the source of those facts, matters and assumptions, and lists all reference material and information on which they have relied; and
- list any limitations, incomplete matters or qualifications to the expert's opinion.

⁵ Available at: http://www.fedcourt.gov.au/how/prac_direction.html.

ATTACHMENT 1: FEDERAL COURT GUIDELINES

EXPERT WITNESSES IN PROCEEDINGS IN THE FEDERAL COURT OF AUSTRALIA

1. Practitioners should give a copy of the following guidelines to any witness they propose to retain for the purpose of preparing a report or giving evidence in a proceeding as to an opinion held by the witness that is wholly or substantially based on the specialised knowledge of the witness (see **Part 3.3 - Opinion** of the *Evidence Act 1995* (Cth)).
2. The guidelines are not intended to address all aspects of an expert witness's duties, but are intended to facilitate the admission of opinion evidence⁶, and to assist experts to understand in general terms what the Court expects of them. Additionally, it is hoped that the guidelines will assist individual expert witnesses to avoid the criticism that is sometimes made (whether rightly or wrongly) that expert witnesses lack objectivity, or have coloured their evidence in favour of the party calling them.

Guidelines

1. General Duty to the Court⁷

- 1.1 An expert witness has an overriding duty to assist the Court on matters relevant to the expert's area of expertise.
- 1.2 An expert witness is not an advocate for a party even when giving testimony that is necessarily evaluative rather than inferential⁸.
- 1.3 An expert witness's paramount duty is to the Court and not to the person retaining the expert.

2. The Form of the Expert Evidence⁹

- 2.1 An expert's written report must give details of the expert's qualifications and of the literature or other material used in making the report.
- 2.2 All assumptions of fact made by the expert should be clearly and fully stated.
- 2.3 The report should identify and state the qualifications of each person who carried out any tests or experiments upon which the expert relied in compiling the report.
- 2.4 Where several opinions are provided in the report, the expert should summarise them.

⁶ As to the distinction between expert opinion evidence and expert assistance see *Evans Deakin Pty Ltd v Sebel Furniture Ltd* [2003] FCA 171 per Allsop J at [676].

⁷ See rule 35.3 Civil Procedure Rules (UK); see also Lord Woolf "Medics, Lawyers and the Courts" [1997] 16 CJQ 302 at 313.

⁸ See *Sampi v State of Western Australia* [2005] FCA 777 at [792]-[793], and *ACCC v Liquorland and Woolworths* [2006] FCA 826 at [836]-[842]

⁹ See rule 35.10 Civil Procedure Rules (UK) and Practice Direction 35 – Experts and Assessors (UK); *HG v the Queen* (1999) 197 CLR 414 per Gleeson CJ at [39]-[43]; *Ocean Marine Mutual Insurance Association (Europe) OV v Jetopay Pty Ltd* [2000] FCA 1463 (FC) at [17]-[23]

- 2.5 The expert should give the reasons for each opinion.
- 2.6 At the end of the report the expert should declare that “[the expert] has *made all the inquiries that [the expert] believes are desirable and appropriate and that no matters of significance that [the expert] regards as relevant have, to [the expert’s] knowledge, been withheld from the Court.*”
- 2.7 There should be included in or attached to the report: (i) a statement of the questions or issues that the expert was asked to address; (ii) the factual premises upon which the report proceeds; and (iii) the documents and other materials that the expert has been instructed to consider.
- 2.8 If, after exchange of reports or at any other stage, an expert witness changes a material opinion, having read another expert’s report or for any other reason, the change should be communicated in a timely manner (through legal representatives) to each party to whom the expert witness’s report has been provided and, when appropriate, to the Court¹⁰.
- 2.9 If an expert’s opinion is not fully researched because the expert considers that insufficient data are available, or for any other reason, this must be stated with an indication that the opinion is no more than a provisional one. Where an expert witness who has prepared a report believes that it may be incomplete or inaccurate without some qualification, that qualification must be stated in the report (see footnote 5).
- 2.10 The expert should make it clear when a particular question or issue falls outside the relevant field of expertise.
- 2.11 Where an expert’s report refers to photographs, plans, calculations, analyses, measurements, survey reports or other extrinsic matter, these must be provided to the opposite party at the same time as the exchange of reports¹¹.
- 3. Experts’ Conference**
- 3.1 If experts retained by the parties meet at the direction of the Court, it would be improper for an expert to be given, or to accept, instructions not to reach agreement. If, at a meeting directed by the Court, the experts cannot reach agreement about matters of expert opinion, they should specify their reasons for being unable to do so.

M E J BLACK
Chief Justice
25 September 2009

¹⁰ The *“Ikarian Reefer”* [1993] 20 FSR 563 at 565

¹¹ The *“Ikarian Reefer”* [1993] 20 FSR 563 at 565-566. See also Ormrod *“Scientific Evidence in Court”* [1968] Crim LR 240