

MEMORANDUM

To: The Essential Services Commission of South Australia

Date: 28 June 2006

Re: Advice in relation to SFG report on rate of return for gas distribution

A. The Brief

The Essential Services of South Australia (ESCOSA or ‘the Commission’) has requested the Allen Consulting Group to consider and advise in relation to a report by SFG Consulting titled, ‘Issues on the regulated rate of return for gas distribution assets’, which was prepared for Envestra.¹

In its report, SFG drew a number of conclusions based on its analysis of the key cost of capital parameters applied by ESCOSA in its Draft Decision on Envestra’s Gas Distribution Access Arrangement. The key issues raised by SFG, and our responses are set out below.

We note that a key issue that has arisen in the SFG submission concerns the upper limit of the so-called reasonable range for each of the inputs to the WACC, and whether the Commission’s draft decision excluded values that may be greater than what the Commission considers appropriate but nonetheless within the reasonable range. We note that, to the extent that the Gas Code requires a reasonable range to be determined, that is a matter upon which the Commission must form a view, based upon the available evidence. Accordingly, the scope of this advice is limited to addressing the finance-related arguments and evidence that have been raised, and does not address the matter of the lower and upper limits of any so-called reasonable range.

B. The ‘economically’ reasonable range

SFG argument

Two primary issues are raised in SFG’s submission:

- It is submitted by SFG that the regulated rate of return should be selected from within an ‘economically’ reasonable range that takes account of estimation uncertainty and considers the consequences of under-investment.
- SFG further suggests that an ‘economically’ reasonable range can be established by Monte Carlo simulation, and that this technique has been ‘endorsed’ by other regulators (i.e. the Australian Competition and Consumer Commission (ACCC), the Independent Pricing and Regulatory Tribunal (IPART) and the Queensland Competition Authority (QCA)).

¹ Strategic Finance Group (3 May, 2006), *Issues on the regulated rate of return for gas distribution assets*, report for Envestra (SFG Envestra Submission).

Analysis

Concept of 'economically' reasonable range

The concept of 'economically' reasonable range proposed by SFG is not defined in the Gas Code, and is not defined in financial economics in relation to rate of return issues. Instead, as noted by SFG, section 8.30 refers to providing 'a return which is commensurate with prevailing conditions in the market for funds and the risk involved in delivering the Reference Service.' The Australian Competition Tribunal's (ACT) GasNet decision stated that the regulator's task is to assess whether 'the rate determined falls within the range of rates commensurate with prevailing market conditions and the relevant risk.'

In the final analysis, it is a matter for the Commission, based on available evidence and advice, to make a judgement on the rate of return including, to the extent relevant, consideration of any range in estimates of the rate of return that may be determined by reasonable minds acting reasonably. The definition of any such range is one of legal interpretation, and need not equate to a range that is derived through a Monte Carlo simulation.

Monte Carlo analysis

Application of the Monte Carlo technique, as proposed by SFG, does not resolve the problem of uncertainty in setting a return according to prevailing conditions in the market. The assumptions applied in a Monte Carlo analysis are critical to the outcome. ACG does not support the use of Monte Carlo analysis in the determination of regulatory rates of return. The values of key parameters (market risk premium (MRP), beta and gamma) are all unobservable, and therefore assumptions as to the values of these parameters must be based on judgement, which is informed by theory and market evidence. In work that we have undertaken, we have found that the results derived from a Monte Carlo analysis are highly sensitive to the degree of spread that is assumed for the key inputs into the rate of return as well as the central estimate. As such, the reliance on subjective judgement is magnified – we consider that attempting to determine the degree of spread for an input is highly speculative, given that many different sources of information are typically drawn upon in order to establish the best estimate. As a result, we do not consider the probability distribution that is derived by inserting these speculative inputs into a Monte Carlo simulation to be sufficiently robust to provide any useful guidance to a regulator when deciding upon the rate of return. We note that the reason that SFG derives a probability factor of less than 50 per cent with respect to the Commission's Draft Decision is that the ranges of several of the key parameters (i.e. beta, MRP and gamma) chosen by SFG are either higher (or in the case of gamma, lower) or wider than those assessed by the Commission.

The regulators applying Monte Carlo analysis have not applied it to determine the appropriate rate of return, but rather to establish where, in the range of rates of return determined by the assumptions made, the chosen rate of return lies. Nonetheless, to the extent that other regulators have adopted such an approach, it is subject to the same criticism as above (namely, that the probability distribution derived is too dependent upon inputs that are essentially speculative to provide a robust guide to

regulatory decision making), and we would recommend to the Commission that those other practices not be followed.

C. Equity beta

SFG argument

It is submitted that there is no evidence to support using an equity mid-point estimate of less than one for a gas distribution business. In fact, SFG submits that the form of regulation applied to gas implies that Envestra has higher systematic risk than electricity distribution in South Australia, and therefore concludes that a point estimate of Envestra's equity beta is 'at least 1.0.' Given that there is a degree of imprecision, SFG considers the 'economically plausible' range to be 0.90 to 1.1.

Analysis

While ACG's earlier report proposed that a range of 0.80 to 1.10 (with a best point estimate of 1.0) is appropriate to apply to Envestra, we make some observations in relation to SFG's submission.

Inconsistency in SFG's proposed beta range

First, we note that SFG proposes a range from 0.90 to 1.1, but then states, inconsistently, that Envestra's beta must be at least 1.0, which would suggest that the range actual range being proposed by SFG is 1.0 to 1.1.

Revenue cap vs price cap

As a general matter, ACG does not believe that it is possible to "fine tune" beta estimates in order to meaningfully distinguish between gas and electricity, or revenue-cap and price-cap regulated energy businesses. This is because standard errors of beta estimates are high, and there is a considerable degree of measurement error. SFG points to a statement in ACG's report that 'since Envestra is subject to a price cap it may be expected to have a higher level of systematic risk relative to utilities that are subject to revenue cap regulation (such as the Queensland electricity distribution businesses)'. ACG recommended a 60 per cent geared beta of 0.90 for the Queensland electricity distribution businesses and a best point estimate of 1.0 for Envestra's South Australian (and Queensland) gas businesses. However, the differential in Queensland between gas and electricity was not based on a revenue cap *per se* and price cap regulation, but on the *specific* regulatory arrangements applied by the QCA to Queensland electricity distribution, which included a government policy of absorbing changes in distribution prices rather than allowing these to be passed through to customers.

SFG's submission offers support to Envestra's submission that:²

² Envestra (2005), *Weighted average cost of capital for the South Australian regulated gas distribution network*, p.15. See SFG (2006), p.10.

Regulatory arrangements that pass volume risk and capital expenditure risk to the business, such as the price cap proposed by Envestra, are systematically riskier than those with a revenue cap and this needs to be reflected in the equity beta.

However, in SFG's submission to the QCA on behalf of Ergon, it was submitted that:³

While [a revenue cap] reduces the correlation with market, compared to the operation of a price cap, it increases the volatility of firm returns, which occurs when forecast and actual volumes differ. As it is the product of the correlation with market returns and volatility of returns that affects beta, it is not necessarily the case that the Queensland regulatory arrangements reduce the asset beta in this way.

In other words, SFG is not consistent in its views about the effect of the regulatory framework on the systematic risk of the regulated business. This also demonstrates that there are arguments in both directions, and supports ACG's proposition that such fine distinctions in beta should not be drawn between revenue-cap and price-cap regulated energy businesses.

Blume adjustment

SFG submits that recent evidence shows that the Blume adjustment estimates future returns better than raw betas.⁴ However, there are a number of reasons why the Blume adjustment is not appropriate in the context of a regulated business:

- The betas of regulated business cannot be expected to regress to unity, as the benchmark firm is constrained to a single business, which is geared at a constant 60 per cent. The empirical evidence is based on market-wide analysis that looks at dynamic companies engaged in strategic shifts (including mergers and acquisitions) and changes in gearing levels.
- To the extent that it is proposed to combine a beta estimate with other information to improve the precision of the beta estimate, the preferable means of doing this is by combining that beta estimate with other beta estimates from the same industry (and adjusting for known determinants of beta, namely gearing), such as by taking an average of a proxy group.

Adjustment for outliers

SFG (whose Principal is Professor Stephen Gray) relies on a study of betas undertaken by professors Stephen Gray and Bob Officer, which was commissioned by ETSA Utilities.⁵ Hence, this evidence has already been considered by the Commission. In this regard, we note that the Commission previously concluded that the effects of the Blume adjustment should be removed from the estimates and that the most relevant betas are those that include the largest number of firms, which are propositions with which we agree.

³ Strategic Finance Group (21 February, 2005), *Response to QCA Electricity Distribution Draft6 Determination*, Report for Ergon Energy, p.52.

⁴ Gray, Stephen, Jason Hall, Jerry Bowman, Tim Braisford, Robert Faff and Bob Officer (May 2005), *The performance of alternative techniques for estimating equity betas of Australian firms*, Report prepared for the Energy Networks Association.

⁵ Stephen Gray and Bob Officer (17 April, 2005), *The Equity Beta of an Electricity Distribution Business*, Report prepared for ETSA Utilities.

Turning to the specific technique that was employed by Gray and Officer, we note that Gray and Officer's study applies only one technique to adjust for outliers, and does not demonstrate that the technique of eliminating outliers based on standard errors is appropriate, consistent and unbiased. The application of the specific technique applied by Gray and Officer to beta estimation is not standard practice. Gray and Officer reference Brailsford et al. (1997), a leading Australian authority on beta estimation, but do not follow their advice regarding the treatment of outliers. Brailsford et al. recognised that significant differences in beta could be observed by elimination of outliers.⁶ They recommended that 'Cook's distance' should be used to select outliers, that a dummy variable should be applied to capture the effect of the outlier, and that regard should be had to both the raw and outlier-adjusted values. None of these methodological matters are discussed by Gray and Officer, who simply adopt the outlier-adjusted beta estimates. In addition, in a recent study, Martin and Simin (2003) have proposed a two-dimensional approach for eliminating outliers to derive a 'resistant beta', and find that these are better predictors of future beta than OLS betas.⁷ The methodology applied in this study is not referenced by Officer and Gray.

Thus, while there are a number of methodologies that could produce different 'outlier adjusted' betas – and a leading authority concludes that such estimates should not be considered in isolation – Officer and Gray have applied only one approach. Accordingly, while we would not recommend the Commission to ignore the estimates (at least after the effect of the Blume adjustment is removed), the above matters would also caution against placing sole weight on these estimates.

D. Market Risk Premium

SFG argument

The key submission made by SFG in relation to the Market Risk Premium (MRP) is that it should not be capped at 6 per cent as the historical mean is 7 per cent, and should not be ignored. SFG holds that the forward-looking research which concludes that the MRP is now in the range of 4 per cent-5 per cent assumes that the market anticipates long-term growth equal to the historical mean. SFG submits that forward-looking research has a methodological flaw in that it requires an estimate of an unobservable variable, long-term growth. SFG submits that an alternative view is to consider that the market's expectations for growth have increased markedly.

SFG also submits that the qualitative argument that the MRP has reduced as equity markets are now less volatile does not accord with the fact that the level of market volatility (measured as the standard deviation of returns on the All Ordinaries Index over periods of 20 years) has been higher during the most recent half century (1953 to 2005) than in the half century that preceded it (1901 to 1952).

⁶ Brailsford, Timothy, Robert W. Faff, and Barry R. Oliver (1997), *Research Design Issues in the Estimation of Beta*, Volume 1, The McGraw-Hill Companies Inc., pp. 21-22.

⁷ Also see Sangit Chatterjee and William E. Jacques (September/October 1994), "An Outlier-Resistant Approach to Risk Estimation, *Financial Analysts Journal*, pp. 69-75. They apply a re-weighted least median squares methodology, which also tends to produce lower beta estimates compared with unadjusted OLS estimates.

Analysis

Critique of Fama and French and Jagannathan et al studies

The forward-looking research that SFG refers to is not forward-looking estimation, but rather longitudinal studies using historical data for the US over periods ranging from 129 years in the case of Fama and French (2002)⁸ to 73 years in the case of Jagannathan *et al.* (2000)⁹. According to SFG, these researchers assume that the market forms expectations of long-term growth based on historical experience, but that expectations for long-term returns are not based on historical data. SFG maintains that it could equally be hypothesized that required returns have remained unchanged, but investors' expectations of long term growth could have increased.

The difference between the Fama and French method for estimating the historical equity premium and the use of the simple average of realised returns is that the former uses the realised growth in dividends per share as the estimate of the expected capital gain rather than the actual capital gain. The benefit of using this alternative measure of the expected capital gain is that it removes the potential bias that would emerge if a significant portion of the realised capital gains were unexpected. As the Fama and French method estimates the equity premium for a historical period, the concern raised by SFG about whether the assumed dividend yield and dividend growth were consistent does not exist – they must be consistent because they are realised (historical) values.

They concluded:¹⁰

Our evidence suggests that much of the high return for 1951 to 2000 is unexpected capital gain, the result of a decline in discount rates.

In 2003 SFG undertook a forward-looking analysis of the Australian MRP, and derived an MRP range of 5.63 per cent to 5.93 per cent.¹¹ It should be noted, however, that this methodology is not the methodology that was applied longitudinally by Fama and French and Jagannathan et al.

SFG also criticises the Fama and French study (covering 1951-2000) for having a lower bound below the yield spread on BB-rated corporate bonds during 1990-2004. but does not apply the same test to historical Australian stock returns, which also have a lower bound below this level. In any case, there are other problems with SFG's approach:

- First, the yield spread on BB bonds does not take account of the default risk premium impounded in these bonds, which is likely to be in the order of 1% (and thereby increases the spread to the Fama and French study).

⁸ Fama, Eugene F. and Kenneth R. French (April, 2002), "The Equity Premium", *Journal of Finance*, Vol. LVII, No. 2, pp.637-659.

⁹ Jagannathan, Ravi, Ellen R. McGrattan and Anna Scherbina (Fall 2000), "The declining U.S. Equity Premium," *Quarterly Review of Federal Reserve Bank of Minneapolis*.

¹⁰ Fama and French (April, 2002), p.640.

¹¹ SFG Consulting (September 2003), *Issues in Cost of Capital Estimation*.

- Secondly, the time periods are not consistent and therefore any comparisons are unlikely to be indicative of relative risks.

Finally, SFG's submission that the spread between BB rated bonds and the lower bounds of a US study estimating MRP is misplaced when the MRP being provided by the Commission in the Draft Decision is 6%.

Easton et al. study

SFG proposes that the study by Easton et al. (2002)¹² is superior to the Fama and French and Jagannathan studies, since it simultaneously estimated the expected rate of return and the rate of growth beyond the forecast horizon. Using this approach, Easton et al. derived an equity risk premium of 5.3 per cent for the US market for the period 1981 to 1998. Easton et al. considered their finding to be above, but relatively consistent with the findings of Fama and French. Importantly, Easton et al.'s central estimate is below the 6 per cent MRP that has been adopted by the Commission in the Draft Decision.

Change in market volatility

The chart of market volatilities reproduced by SFG is based on 20 year averages of volatility in share prices and implies that the current level of market volatility is at the average of the entire period from 1901. We note that, as SFG's estimate of volatility extends over the previous 20 year period, it will mask any changes in volatility over recent years (i.e. the volatility from his chart that is implied for today is the average volatility over the last 20 years).

It is our view that a more meaningful view of how volatility has changed over time – and how current volatility compares to history – is obtained from calculating volatility over the shorter period. We note that Neville Hathaway of Capital Research Pty Ltd, an experienced and well-regarded researcher in this field, considered volatility measured over the previous 5 years to be an appropriate measure of volatility, and demonstrated that current market volatility is below the long term average.¹³ Accordingly, we consider it appropriate to assume that the current volatility of the Australian share market is lower than the long term average, rather than at the long term average, as argued by SFG.

Current research programmes on the Market Risk Premium

We would draw the Commission's attention again to the fact that there is a growing body of financial economics literature that has as a central belief that the current (expected) market risk premium is lower than the long run (historical) average of the premium to equity. By way of example, the most comprehensive study of historical equity returns ever undertaken is that of Dimson Marsh and Staunton. Importantly, while the authors consider historical returns as a starting point for deciding on the current MRP, they do not conclude that the historical MRPs should be used in

¹² Easton, Peter, Gary Taylor, Pervin Shroff and Theodore Sougannis (June, 2002), *Journal of Accounting Research*, Vol. 40, No. 3., pp. 657-676.

¹³ Hathaway, Neville (January, 2005), *Australian Market Risk Premium*, Capital Research Pty. Ltd.

valuation, but rather that adjustments should be made to address certain relevant differences between the past and the present (most notably, the belief that the volatility of markets has fallen).¹⁴

In the academic literature there are few participants who now dispute that the MRP has fallen to low historical levels. This literature analyses a number of factors that are thought to have contributed to the decline in the MRP, including: the reduction in transaction costs (deregulation of broking, internet trading, internationalisation, development of mutual funds), which has been estimated by some market observers as reducing the MRP after all costs by several percentage points, and institutional and capital market developments that provide much greater and cost-effective diversification positions.¹⁵

In the recent academic literature dealing with the market risk premium, it is rare to find papers justifying the application of an MRP above 6 per cent. Instead, the major research question has turned to the issue of why the MRP has declined substantially relative to historically observed, or realised, MRPs. Recent and current papers that belong to this research programme include the following:

- Lettau, Ludvigson and Wachter (2004)¹⁶ find ‘evidence of a shift to a substantially lower consumption volatility at the beginning of the 1990s’. In their view macroeconomic risk plays a direct role in determining the equity premium, with lower consumption volatility implying a lower premium.
- Sill (2005)¹⁷ also concludes that ‘lower macroeconomic risk post 1984 can account for a substantial fraction of the decline in the equity premium’.
- Freeman (2006) concludes on the basis of income data for high net worth individuals in the US that ‘the ex-ante equity premium at the start of the twenty-first century is significantly below the average historical values.’¹⁸

The reasons put forward for a declining MRP have not been disputed by SFG on an empirical or theoretical level – they have simply not been addressed. While the historical record of realised MRP estimates indicates that a value of greater than 6 per cent may be justified, the weight of empirical evidence (including evidence relied upon by SFG) and market practice indicates that the market is currently applying an expected MRP that is below 6 per cent. ACG believes that an MRP point estimate of 6 per cent is probably conservative (in that it possibly overcompensates investors), but

¹⁴ Dimson, Elroy, Paul Marsh and Mike Staunton (2002), *Triumph of the Optimists: 101 Years of Global Investment Returns*, Princeton University Press, Princeton, New Jersey and Oxford.

¹⁵ Siegel, Jeremy J. (1999) “The shrinking equity premium”, *Journal of Portfolio Management*, Fall, Vol. 26, p.10.

¹⁶ Lettau, Martin, Sydney C. Ludvigson, and Jessica A. Wachter (2004), “The declining equity premium: What role does macroeconomics play?”, National Bureau

¹⁷ Sill, Keith (28 December, 2005), “Macroeconomic volatility and the equity premium”, Working Paper No. 06-1, Research Department, Federal Reserve Bank of Philadelphia.

¹⁸ Freeman, Mark (2006), “An explanation of the declining ex-ante equity risk premium”, University of Exeter Centre for Finance and Investment, Paper Number 06/03.

is appropriate to apply for regulatory purposes. We also note for completeness that we do not consider the use of an MRP of 6 per cent to imply that the information from historical returns is being ignored, but rather that historical information is being combined with other sources of information to generate a more informed estimate.

E. Consistency of gamma with the market risk premium and the dividend yield

SFG argument

It was argued that with a corporate tax rate of 30 per cent, setting a gamma of 0.50 and an MRP of 6 per cent mathematically requires a dividend yield (DY) of around 14 per cent, which is three times the observed value. In SFG's opinion, this anomaly can be corrected by setting gamma equal to zero.

Analysis

The actual argument and source of inconsistency that has been identified by SFG in its current submission was not entirely clear. Nevertheless, we are familiar with the arguments that SFG has presented elsewhere (including to the Victorian ESC), and have drawn upon that material to assist in shedding light on the arguments being raised.

In essence, SFG's proposition of is that the assumed value of franking credits and the assumptions that sit behind a gamma value of 0.50 are not consistent with the other assumptions that are routinely adopted by regulators. Some of the key assumptions that various regulators have noted sit behind their assumption of a 'gamma' value of 0.50 and the market risk premium of 6 per cent include that:

- the value of credits distributed is 50 to 60 per cent of the face value (what we have described as 'theta', θ);
- on average, 70 to 80 per cent of franking credits are distributed (which is relevant to the market risk premium, but not necessarily relevant to the 'gamma' that is adopted for a particular firm); and
- the average proportion of franked to unfranked dividends is 70 to 80 per cent.

Observed market variables – namely dividend yields – are also a key input. The precise magnitude of these parameters is not crucial to the argument presented to SFG.

Central to the apparent inconsistencies that SFG has identified is the fact that there are two mathematically equivalent expressions for deriving the portion of the return that investors are assumed to receive from franking credits (the franking return, or FR), which are as follows:¹⁹

¹⁹ We agree that the expressions are mathematically equivalent – demonstrating the equivalence is a relatively simple exercise.

$$FR=R_e\left(\frac{\gamma T_c}{1-T_c(1-\gamma)}\right) \quad (1)$$

and

$$FR=\mathcal{G}.D.F.\left(\frac{T_c}{(1-T_c)}\right) \quad (2)$$

where:

- R_e is economic income (dividends, capital gains and franking credits) from holding the market portfolio;
- T_e is the effective tax rate (defined as company tax paid as a proportion of economic income);
- T_c is the prevailing statutory tax rate;
- D is the dividend yield;
- θ is the value of franking credits created as a proportion of their face value;
- F is the proportion of franked to unfranked dividends; and
- γ (gamma) is the value of imputation credits in the hands of shareholders (θ multiplied by the assumed rate of distribution of franking credits).

It should be noted here that the ease of use of the two equations differs.

- The key parameters in equation 1 – the expected return (R_e) and the effective tax rate – cannot be observed, but rather must be estimated. This implies a degree of imprecision with the application of this formula.
- In contrast, the key inputs into equation 2 – the dividend yield, ratio of franked to unfranked dividends and the statutory tax rate – can all be observed relatively simply.

The potential sources of inconsistency that could exist include that:

- The franking return that is derived from equation 1 is much larger than the franking return that is calculated using equation 2 (the Commission used the latter equation in its draft decision to calculate the franking return that should be built into the market risk premium), which would imply that the market risk premium is understated. This is the inconsistency that SFG identified in submissions to the Victorian ESC's recent review of the distribution charges for the electricity distributors; or
- Given the franking credits that are created and assumed to be distributed in equation 1, the dividend yield that is required to distribute 70-80 per cent of those credits (which features in equation 2) is much larger than the dividend yield that is

observed. This is what SFG appears to be stating in the current matter, particularly where it is observed that:²⁰

In summary, the assumed value of gamma implies that a certain amount of franking credits must be distributed and this requires a certain amount of dividends.

We consider that this matter was addressed comprehensively by the Victorian Essential Services Commission when these matters were raised, the response from which we do not consider SFG to have refuted.

In essence, the Victorian ESC noted that SFG's results derive from using equation 1 above (which we note is the equation that requires inputs that are more difficult to observe), and were dependent upon the critical assumption that SFG assumed that the amount of company tax that companies pay is equal to 30 per cent of their economic income (i.e. the statutory rate), which SFG did not justify with any empirical evidence.²¹ We note here that the *effective* tax rate only features in equation 1, but not in equation 2. We also note that it is the *effective* tax rate that determines the quantity of franking credits that are created – and hence the return that can be earned from franking credits – because a firm has to pay tax to generate a franking credit.

Regarding the appropriateness of SFG's assumption that firms pay 30 per cent of their economic income in taxation, the Victorian ESC identified information already provided to its review suggested that the ratio of company tax paid to economic income is likely to be 15 per cent, rather than the 30 per cent assumed by SFG.²² While we note that SFG has claimed that the ESC's finding that the amount of taxation paid as a proportion of economic income is less than 15 per cent 'is itself quite extraordinary',²³ our analysis suggests that the ESC's conclusions were consistent with the evidence. In particular:²⁴

- our estimate is that the average tax payments by firms listed on the ASX 200 in the most recent financial year for the firm was approximately 22 per cent of pre tax earnings (weighted by market capitalisation, excluding loss making companies); however
- the current ratio of average pre tax earnings to market capitalisation of firms listed on the ASX 200 is approximately 9 per cent (weighted by market capitalisation, excluding loss making companies), which compares to SFG's assumption about expected after tax economic returns of 11.3 per cent (which translates into an expected pre tax return of 13.4 per cent, after allowing for the Commission's assumption about franking credits); hence

²⁰ SFG Envestra Submission, p.34.

²¹ The Victorian ESC also noted that a second key assumption of SFG was that the MRP was 6 per cent, and that the inconsistency identified by SFG could also be resolved (in part) by using a lower MRP.

²² Hathaway, Neville (January, 2005) *Australian Market Risk Premium*, Capital Research Pty Ltd.

²³ SFG Envestra Submission, p.34.

²⁴ Data obtained from Bloomberg.

- the ratio of tax payments to the expected economic return on the ASX 200 is approximately 14.9 per cent.²⁵

It follows from our comments already made above that we consider that the use of an estimate of the effective tax rate that is based upon empirical evidence – rather than one that is merely assumed – remedies the inconsistencies that SFG has identified. More generally, we would caution against making strong conclusions about the expected return from franking credits from equation 1 that contradict the inference that would be derived from equation 2, given that the latter uses inputs that are more easily observed (and hence less speculative in nature).

To illustrate the errors in the SFG analysis further, we note that SFG presents a formula that is claimed to demonstrate that 82 per cent of the return from any share (or the market as a whole) should come from dividends and capital gains and the remaining 18 per cent from franking credits, if the assumption of a gamma of 0.50 is correct, and states that ‘there is no estimation or interpretation here, this is just logic or algebra’.²⁶

We consider that this calculation of SFG’s and the statement that there is no interpretation of estimation involved is incorrect. The formula that SFG has stated includes a term that (to be logical) must be the effective tax rate for the firm, but which is merely assumed without discussion to be the statutory tax rate of 30 per cent. The proposition that investors always get 18 per cent of their economic income from a firm from franking returns – which is implied by the SFG formula and discussion – cannot be correct. The amount of franking credits that a firm creates depends upon the amount of taxation that it pays – and so a firm that pays no tax will not be able to deliver any return through franking credits.

Lastly and for completeness, we note that the inconsistency that SFG has identified in its most recent submission is that it is difficult to reconcile the assumed high rate of distribution of franking credits (of 70-80 per cent) with the observed dividend yields (of close to 4 per cent), given that quantity of franking credits that SFG considers are created (using equation 1). However, SFG has proposed that the remedy to this inconsistency is to assume that franking credits created have no value (i.e. a zero θ value in the equations above). We do not see any logic behind the proposition that, because the number of franking credits being distributed cannot be explained, the value of each credit that is distributed must therefore be assumed to be zero. Accordingly, even if the purported inconsistency existed, we would not consider the proposed solution to have any logical basis.

F. Estimation of gamma

SFG argument

It is submitted that the research methodology used by ACG to estimate the value of gamma is subject to potentially severe statistical methodology problems. SFG submits that the dividend drop-off methodology used by ACG is methodologically identical to

²⁵ I.e., $22.0\% \times 9.0\% / 13.4\%$.

²⁶ SFG Envestra Submission, p.33.

the regression analysis applied by Hathaway and Officer (2004)²⁷, and therefore suffers from the same problem of multi-collinearity. It is claimed that this problem is recognised by ACG. Thus, ACG's evidence on gamma should be ignored, the Hathaway and Officer estimate of 0.35 should form the upper boundary of any reasonable range, and a gamma estimate of zero obtained by Cannavan, Finn and Gray (2001)²⁸ is the best point estimate.

Analysis

Our previous report did not claim that its research had settled the issue of gamma measurement, and noted that its finding of recent periods in which no gamma valuation effect could be found indicates that caution should be exercised by regulators. At the same time the finding of a relatively high and statistically robust theta in the most recent years leads us to conclude that a 0.50 gamma continues to be the best point estimate given current taxation arrangements, and its continued application is justified in the absence of conclusive evidence to the contrary.

We undertook its own analysis of gamma due to the following difficulties associated with past studies that have been relied upon by SFG and Envestra:

- The results of the Cannavan, Finn and Gray (CFG) study have been made redundant by the tax changes that have taken place since the period covered in the study (1995-1999). CFG concluded that in the period leading up to the introduction of the 45-day rule (which eliminated the benefits of franking credit arbitrage), franking credits were valued at 50 per cent of face value, but afterwards (following 1 July 1997) they had a zero value.
- The Hathaway and Officer study spanned a long period in which a number of tax changes had been applied.

Neither of these studies looked at the latest tax conditions, in particular the introduction on 1 July 2000 of a rebate for taxpayers on a tax rate of less than the corporate rate (such as financial institutions) to tax paid at the corporate level.

Econometric issues

Our approach was to isolate a sample of large companies (market cap of more than \$500 million) with high dividend yields because this is closer to the benchmark conditions of a regulated business, and reduces the statistical noise associated with low dividend yield companies, which typically have large growth prospects (options).²⁹ The approach kept to a simple calculation of the difference of means

²⁷ Hathaway, Neville and Bob Officer (2 November, 2004), *The Value of Imputation Credits – Update 2004*, Capital Research Pty Ltd.

²⁸ Cannavan, Damien, Frank Finn and Stephen Gray (2004), "The value of dividend imputation tax credits in Australia", *Journal of Financial Economics*, Vol. 73, pp.167-197.

²⁹ See Leonie Bell and Timothy Jenkinson (June 2002), "New Evidence of the Impact of Dividend Taxation on the Identity of the Marginal Investor", *Journal of Finance*, Vol. LVII, No. 3, pp. 1321-1346. Their study found that only in the large cap/high dividend yield sub-sample was a statistically significant DOR found.

between companies paying 100 per cent franked dividends and 0 per cent franked dividends. This difference was highly statistically significant, and indicated that the franked dividends created were being valued at around 74 per cent of their theoretical value given a corporate tax rate of 30 per cent.

We agree with SFG that our approach is (almost) formally equivalent to a simple regression along the lines undertaken by Hathaway and Officer. However, applying a simple regression is equivalent to assuming that the variance of the two samples (100 per cent and 0 per cent franking) are equal. Our reported statistics assumed that the variances were not equal. We have now applied Levene's test, which yields an F value of 0.601, and indicates that we cannot reject the null hypothesis that the variances are equal ($p=0.439$). In either case, the difference in means for the financial years 2004 and 2005 is highly statistically significant, and indicates a theta value of 0.74.

SFG's submission suggests that we agree with it that the methodology applied by Hathaway and Officer (and by implication us) is not reliable because of multicollinearity. Our report does not mention multicollinearity, and SFG's assertion that our approach (and Hathaway and Officer's study) suffers from multicollinearity is not correct. The classic symptoms of multicollinearity are low t-ratios and a high R^2 . Running the simple regression on the data used in our report indicates the opposite: an R^2 of 0.0294 and a t-ratio of 2.979, which is significant at the 1 per cent level.

In the attached Appendix to this note we show the results of further tests that we undertook to demonstrate the robustness of the finding that during the last two years (2004 and 2005) the estimated theta is well above 0.50. The fact that our analysis arrived at the same theta estimate that would be obtained by a simple regression does not invalidate the result. We have confirmed the result we found in its initial analysis of the data. We have found that the theta estimate of 0.74 obtained in our original report is relatively robust, and that statistical problems such as multicollinearity and heteroskedasticity are not present in a way that would invalidate the result. For different sub-samples of large cap firms, and for a different sample of smaller cap firms, the results confirm that for the period covering the financial years 2004-2005, there appears to have been a relatively strong valuation effect based on dividend imputation.

Apart from our previous report, the only study we are aware of that has specifically examined the period of the most recent tax changes concluded that 'the most recent tax regime change, that finally allowed a tax rebate on unused franking credits, significantly increased the value of franking credits to the marginal investor.'³⁰

³⁰ Beggs, David and Christopher L. Skeels (September, 2005), 'Market Arbitrage of Cash Dividends and Franking Credits', Research Paper Number 947, University of Melbourne, Department of Economics. This research also found no statistically significant imputation effect for the 1998-1999 period studied by Cannavan, Finn and Gray (2004).

The timing puzzle

The fact that our methodology did not find a dividend imputation valuation effect immediately after the introduction of the imputation tax rebate from 1 July 2000 remains a puzzle, and we accept SFG's comment in this regard.

We note, however, that we are not the first to find a lag between a change to the tax law and the effect being reflected in estimates of the value of franking credits. As noted in our previous report, Brown and Clarke (1993) found a relatively low valuation effect (θ) for imputation in the period immediately after introduction (1987 to 1989), and a much higher value of 0.63 for the period from 1989 to 1991.³¹

However, the fact that such unexplained phenomena continue to exist, as well as fact that estimates of the value of franking credits have differed substantially between methods and across time, underscores the imperative for regulators to be cautious about the amount of weight that is placed upon any estimate of the value of franking credits.

G. Inconsistency of CAPM model and dividend drop-off results

SFG argument

It is submitted that in common with other Australian regulators, the Commission applies the Officer-CAPM, which is based on the assumption that dividends and capital gains are valued equally by investors. Both the Hathaway and Officer, and the ACG dividend drop-off studies suggest that cash dividends are worth only 76.5 per cent or 80 per cent of capital gains, and the only reason that this could occur is because dividends are taxed at a higher rate. Therefore it is inconsistent to use the results of studies indicating that γ is positive in a CAPM framework in which dividends and capital gains are expected to be equally valued. To maintain consistency:

- If the Officer CAPM is retained, the value of γ should be estimated on the basis of an assumption that a dollar of dividends is worth a dollar, which is likely to result in a γ estimate of zero.
- Alternatively, a CAPM model specifically incorporating differential taxation on dividends and capital gains such as that developed by Lally and Van Zijl (2003) should be applied.³²

³¹ Brown, P. and A. Clarke (1993), "The Ex-Dividend Day Behaviour of Australian Share Prices Before and After Imputation", *Australian Journal of Management*, Vol. 18.

³² Lally, Martin and Tony van Zijl (2003), 'Capital gains tax and the capital asset pricing model', *Accounting and Finance*, Vol.43, pp.187-210.

Analysis

The Officer CAPM and gamma estimation

First, we confirm that where franking credits have been taken into account when valuing an entity or when setting regulated revenues, it has been the standard practice in Australia to adopt the approach that has been employed by the Commission. A key part of this standard approach has been to estimate the value of franking credits in a manner that is ‘unconstrained’ and which, amongst other things, permits cash dividends to be valued less than fully. We note that SFG appears to assert that while Hathaway and Officer provide estimates of gamma derived in an unconstrained manner, they do not suggest to anyone that these estimates should be used in the Officer-form of the WACC.³³ We consider this statement to be inconsistent with the clear statements of Hathaway and Officer (two leading authorities in the area) that they do indeed expect their estimate of gamma to be used in the relevant reports:³⁴

The gamma factor in the various Officer WACC formulae represents that part of tax paid by companies as company tax but is in reality a pre-payment of personal tax. ... The Australia-wide average gamma over all companies and over the entire period 1988-2002 is **0.355**. [Emphasis in original]

Irrespective of the theoretical merits of the SFG approach, therefore, adopting the recommendations proposed would imply a significant departure from established practice. We advise regulators generally that, given the clear need for an appropriate degree of stability and predictability in regulated outcomes, significant changes to existing approaches should be contemplated only where the flaws in the current approach are identified clearly and the alternative is demonstrated to be superior, both in theoretical and practice terms.

We do not consider that the treatment of this matter in the SFG submission meets this standard. In particular, there is no demonstration that material errors do indeed exist under the existing approach or that using an estimate of gamma that has been estimated in a constrained manner (and, as a consequence, would be expected to understate the true value of franking credits) would correct those material errors (and indeed improve the estimate of the cost of capital). Indeed, SFG’s concern that the existing approach for incorporating gamma into the WACC logically must be based upon the belief that a more theoretically correct version of the CAPM/WACC would deliver better estimates of required returns. Yet in a submission on a previous matter, SFG has also argued the more theoretically correct approaches for dealing with the complexities of the personal income taxation regime would be very difficult to implement and would deliver predictions about the cost of capital that are not well supported by empirical evidence – which is discussed further below.

Regarding the correction that SFG has proposed, we are concerned that SFG’s approach may well generate a systematic bias in the estimated cost of capital. The general outcome of dealing with any particular aspect of the personal income taxation regime (such as dividend imputation) is that two effects occur, namely:

³³ SFG, p.30, footnote 44.

³⁴ Hathaway, Neville and Bob Officer (2 November, 2004), *The Value of Imputation Credits – Update 2004*, Capital Research Pty Ltd, pp.6-7.

- *Step 1*: the market risk premium is adjusted to reflect the effect of the relevant feature of the personal income taxation on the returns to the market portfolio (i.e., so that if the feature reduces the tax burden – like dividend imputation – a higher MRP, namely one that is the sum of the value of expected cash returns and non cash returns through franking credits, is adopted); and
- *Step 2*: the benefit that a particular firm obtains from the relevant feature of the personal income taxation regime is then deducted from its required return.

These two adjustments mean that the act of taking account of features like dividend imputation should only affect the ordering of expected returns around the average – and firms that are similar to the average firm should be largely unaffected by a CAPM/WACC model that takes account of the relevant feature of personal income taxation. In contrast, SFG appears to propose that the current market risk premium of 6 per cent be used (which the Commission has calculated to include the value of franking credits consistent with a gamma of 0.50, corresponding to step 1 above), but then to adopt a ‘constrained’ estimate of gamma (which SFG considers to be zero or close to it) for step 2 above. Clearly, such an approach would introduce its own inconsistency, and be likely to overstate the required return for all firms, and even those that are essentially identical to the average firm.

SFG’s alternative approach of using a personal tax level CAPM

The alternative models that SFG suggests could be applied, from Brennan (1970) to Lally and van Zijl (2003), were in the past heavily criticised by SFG as lacking any empirical foundation, being unanimously rejected by academics and practitioners, and introducing more variables and assumptions that, in SFG’s opinion, would needlessly add to the complexity of regulatory processes.³⁵ For example, the Lally and van Zijl model predicts that the rate of return required should increase with dividend yield, since this increases the proportion of return that comes to investors in a manner that is tax-disadvantaged. However, as pointed out by SFG, there is no empirical support for this proposition.

ACG agrees with SFG that the alternative CAPM model of Lally and van Zijl (and other similar models based at the personal tax level) is extremely complex, and would result in the need to estimate or assume values for a number of unobserved inputs. This would needlessly increase the cost of regulatory proceedings, as the proponents of such models have not demonstrated that errors have been made by regulators applying the Officer CAPM.

The value of a dollar of dividends vs capital gains

Elsewhere, SFG has relied on a summary statement of US evidence by Boyd and Jagannathan (1994):³⁶

³⁵ SFG (2004), *Response to the QCA Paper: Cost of Capital for Regulated Entities*, Submission prepared for ENERGEX Limited and Ergon Energy Corporation Limited.

³⁶ Boyd, John, and Ravi Jagannathan (1994), “Ex-Dividend Price Behavior of Common Stocks”, *Review of Financial Studies*, Vol. 7, pp.711-741.

In a variety of tests, marginal price drop is not significantly different from the dividend amount. Thus, over the last several decades, one-for-one marginal price drop has been an excellent rule of thumb.

This evidence is for the US and not Australia, where there are different tax laws and institutional differences that can lead to different results. In the period of the last two years, when ACG find a highly statistically significant theta value, there is strong empirical support for the proposition that among high yield companies that pay non-franked dividends (and are therefore subject to classical taxation conditions) there is no “one-for-one marginal price drop”. In ACG’s sample, we found that for 2004 and 2005 the difference between the average drop-off and unity was statistically significant at the 1 per cent level.

SFG has not reviewed the evidence that would appear most relevant, which is Australian evidence. Reviewing the Australian evidence we find that there is a broad consensus that, prior to the introduction of dividend imputation, there was no one-for-one marginal price drop. Writing around the same time as Boyd and Jagannathan, Brown and Clarke (1993)³⁷ reviewed the Australian and New Zealand evidence, citing Brown and Walter’s (1986)³⁸ study, which had concluded that:

The average drop-off ratio of Australian shares was about 0.75, suggesting that the Australian share market had discounted dividends relative to capital gains by approximately 25%.

Brown and Walter were reluctant to attribute this finding to a tax differential, noting that, “anything is possible at the margin”. However, in a New Zealand study by Bowman, Cliffe and Navisse (1990)³⁹, such caution was not exercised, as they concluded that the results were consistent with the tax differential hypothesis. Whatever the reason, it must be concluded that in Australasia the finding of a drop-off ratio in the order of 0.75 to 0.85 has been a statistical regularity, which led Hathaway and Officer to set their estimate at 0.80.⁴⁰

To artificially set a hypothesised value of dividends based on empirical findings in the US as suggested by SFG, in the face of statistically significant Australian empirical evidence to the contrary appears misplaced.

³⁷ Brown, P. and A. Clarke (1993), “The Ex-Dividend Behaviour of Australian Share Prices Before and After Dividend Imputation”, *Australian Journal of Management*, Vol. 18, Vol. 1, pp. 1-40.

³⁸ Brown, P. and T. Walter (1986), “Ex-dividend behaviour of Australian share prices”, *Australian Journal of Management*, Vol. 11, No. 2, pp.139-152.

³⁹ Bowman, R.G., C. Cliffe, F. Navasse (1990), *Ex-dividend day pricing under alternative tax regimes: New Zealand evidence*, Paper presented at the Australian Banking and Finance Conference, University of New South Wales, Kensington.

⁴⁰ It should be noted, however, that in the sample of large cap high yield companies examined by ACG, a dividend drop-off statistically lower than unity was not apparent in the period from 1997 to 2003.

APPENDIX A:

Further tests of ACG's data for 2004 and 2005

The simple regression model equivalent to the test shown in ACG's report is:

$$\frac{\Delta P_i}{D_i} = \alpha + \beta FC_i + \varepsilon_i$$

Where, FC_i is a dummy variable taking a value of 0 if there are no franking credits and 1 if the dividend is 100 per cent franked. There is no multicollinearity in this model unless $FC_i = 0$ for all observations in the data, or $FC_i = 1$ for all observations in the data. Alternatively, multicollinearity would be present if there were two dummy variables where the sum of the dummy variables was 1 in all circumstances. The classic symptoms of multicollinearity are low t-ratios and a high R^2 . Running the simple regression on the data used in ACG's report indicates the opposite: an R^2 of 0.0294 and a t-ratio of 2.979, which is significant at the 1 per cent level.

The low R^2 reflects the fact that there are many other factors influencing the movement in share price during the ex-dividend period that is being studied. For example, by adding another variable to control for general market movement over the period of the dividend drop-off (which is equivalent to an assumption that all companies have an equity beta of unity) we can increase the explanatory power of the regression. For this purpose we define a variable IDIFF, based on the ASX30 Index at the Cum-dividend (I_1) and Ex-dividend (I_2) dates for each drop-off event:

$$IDIFF = 2 \frac{(I_2 - I_1)}{(I_1 + I_2)}$$

Applying this multiple regression we find (in Table 1 below) that the R^2 rises to 0.057, the statistical significance of the coefficient increases (the t-ratios are higher), and the franking credit dummy implies a gamma value of 0.82.

One econometric problem in dividend drop-off studies that ACG was aware of in our previous report was that arising from heteroskedasticity. This problem was discussed in Hathaway and Officer, as in their data the error term was found to be inversely proportional to the dividend yield.

For ACG's regression equation shown in Table 1 we tested for heteroskedasticity using the procedure proposed by Hal White, and found White Heteroskedasticity-consistent standard errors and covariance. ACG's sample is not likely to suffer from heteroskedasticity since it is confined to companies with dividend yields above 5 per cent, for which the error term is not strongly proportional to yield. Even if heteroskedasticity were present, however, it would influence the estimates of the standard errors of the parameters, while the estimates of the regression parameters would remain unbiased.

Table 1: Multiple regression – dependent variable is DOR

Adj.R ² = 0.057	Intercept	100% Franking credit dummy	IDIFF
Coefficient	0.751	0.353	-30.8
T - ratio	10.121*	3.333*	-2.967*

Note: based on the same 261 observations sample for the financial years 2004 and 2005 that was applied in ACG's report. * Indicates statistical significance at the 1 per cent level.

Another claim made in SFG's submission was that "multicollinearity often manifests itself as wildly different parameter estimates being produced in different subsets of the data when there is no economically plausible reason for such differences"⁴¹. In Table 2 we have provided a sensitivity analysis based on the difference in means approach used in ACG's previous report. We have also included a sample of smaller market capitalisation companies (less than \$500 million in June 2005) to test whether the result we found is robust with respect to firm size. Table 2 shows that the theta estimate for smaller cap companies with a relatively high dividend yield is slightly higher than for the large cap sample. For the large cap sample, exclusion of dividend drop-off outliers does not change the result significantly. With various sub-samples based on dividend yield ranges, we find theta estimates that are higher than the base case, and all estimates are highly statistically significant.

Table 2: Sensitivity analysis - Mean theta estimates for FY 2004 and 2005

	Base case	Exclude DOR outliers		Dividend Yield Sensitivity		
		Top/ bottom 5	Top/ bottom 10	More than 6%	5% to 10%	6% to 9%
Large cap >\$500m	0.743 129/132	0.707 119/122	0.714 109/112	0.865 61/111	0.756 123/126	1.073 50/95
Medium /Small cap <\$500 m	0.855 311/130	0.903 301/120	0.959 291/110	0.892 210/116	0.787 261/100	0.933 141/61

Source: Data from Aspect Huntley and Bloomberg. Notes: All statistically significant at 1 per cent level or better (1 tail T test). All observations (N(100 per cent franking/0 per cent franking)) for companies with market capitalisation of greater than \$500 million at June 2005 and dividend yield greater than 5 per cent.

SFG also submitted that ACG's theta estimate result could not be relied upon as 'the majority of the increase in θ over the recent two years stems from a fall in the drop-off associated with unfranked dividends rather than an increase in the drop-off for franked dividends. That is, it is not so much that franking credits have become more valuable, but that cash dividends have become less valuable.'⁴² This claim is not

⁴¹ SFG Envestra Submission, p.26.

⁴² SFG Envestra Submission, p.27.

correct. Taking the overall mean drop-off in 2000-2003 as the base, around 60 per cent of the rise in theta during 2004-2005 can be traced to a rise in the drop-off associated with 100 per cent franking. In any case, the methodology is cross-sectional, and it is the difference in means in each time period (for 0 per cent and 100 per cent franked dividends) that must be compared.

If the analysis were repeated using median drop-offs rather than mean drop-offs, virtually the entire increase in theta can be traced to a rise in the drop-off observed for 100 per cent franked companies, even across time. In Table 3 we find an implied theta of approximately zero in the period 2000-2003, and an implied theta of 0.592 for the period 2004-2005, and find that the theta in the second period is statistically different from zero at the 1 per cent level (i.e. 99 per cent confidence) using the non-parametric Mann-Whitney U-Test.

Table 3: Dividend drop-off – Median theta estimates for FY 2001 to 2005

Dividend Drop-Off	July 2000 to June 2003	July 2003 to June 2005
Median for 100% franked dividends	0.893	1.100
Median for zero franked dividends	0.890	0.846
Difference	.003	0.254
Implied theta	0.007	0.592*
No. of observations	145/182	129/132

Note: * Application of the non-parametric Mann-Whitney U test indicates statistical significance at the 1 per cent level. All observations (N(100 per cent franking/0 per cent franking)) for companies with market capitalisation of greater than \$500 million at June 2005 and dividend yield greater than 5 per cent.