Attachment 7.14

CEG, Estimating the return on the market

May 2014

ceg COMPETITION ECONOMISTS GROUP

Estimating the return on the market

June 2013

COMPETITION ECONOMISTS GROUP

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1 Introduction

1. The authors of this report are Tom Hird and Bruce Grundy. Tom Hird has a Ph.D. in Economics and 20 years' experience as a professional Economist. Bruce Grundy has a Ph.D. in Finance and 30 years' experience in Finance academia and consulting. Our curricula vitae are attached.

1.1 Terms of reference

2. The terms of reference for this report are set out below.

The ENA requests your opinion on the expected return on the market that covers the following four main components for energy regulatory purposes:

1. Conceptual issues surrounding the expected return to the market portfolio (E[Rm])

- *Explain, by reference to the relevant finance literature, the manner in which E[Rm] and the expected market risk premium (E[MRP]) respectively play a role in asset pricing models.*

- *Provide your opinion on whether the E[MRP] can be meaningfully estimated separately from the expected return on the market.*

2. Evidence concerning indicators of the expected return on the market, (E[Rm])

- *AER practice in the past has been to estimate the forward looking expected return on the market (E[Rm]) over a 10 year period as the 10 year Commonwealth Government bond yield prevailing at the beginning of that period plus a stable (more or less invariant) estimate of the MRP. This MRP estimate has generally been set at 6% but was temporarily increased to 6.5% in early 2009 and then back to 6% in April 2012. The consultant should consider whether the AER's preferred MRP estimate of 6% can reasonably be construed as being forward-looking.*

- *Examine and provide your opinions on the contemporaneous indicators that might estimate (E[Rm]). In this context, please also provide your opinion on the potential to use realised returns on the market as a proxy for E[Rm]. In particular, your opinion on whether there is any published literature or Australian evidence to support the AER's practice. Consider whether there is any literature or Australian evidence in support of alternative methods for estimating E[Rm].*

3. Determine the best possible method for, and estimate of, the expected return to the market portfolio, (E[Rm])

The consultant should consider expert materials commissioned by the ENA, where relevant. The report should arrive at a value, or sensible range of values, for the expected return to the market portfolio that is commensurate with prevailing conditions in the market for funds.

The report should also clearly document the methods and data used and the assumptions and adjustments made, including the measurement period for observable market data.

The consultant should identify the elements of their findings that are general in nature and the elements that are specific to arriving at an estimate of (E[Rm]) in current market circumstances.

1.2 Summary of conclusions

3. The remainder of this report is set out as follows.

   - Section 2 sets out why it does not make sense to think of estimating the expected market risk premium (E[MRP]) independently of estimating the expected return on the market ($E[R_m]$);
   - section 3 explains that there is no suggestion in the finance literature that either E[MRP] or $E[R_m]$ are constant through time;
   - section 4 discusses the literature relevant to estimating variations in $E[R_m]$;
   - section 5 provides our view on the best estimate of $E[R_m]$ if it is not possible to estimate variations in $E[R_m]$;
   - section 6 sets out the implications of our analysis for regulatory policy and why this results in different recommendations to those of McKenzie and Partington.

4. We acknowledge that we have read, understood and complied with the Federal Court of Australia's *Practice Note CM 7, Expert Witnesses in Proceedings in the Federal Court of Australia".* We have made all inquiries that we believe are desirable and appropriate to answer the questions put to us. No matters of significance that we regard as relevant have to my knowledge been withheld. We have been provided with a copy of the Federal Court of Australia's *Guidelines for Expert Witnesses in Proceeding in the Federal Court of Australia*, and confirm that this report has been prepared in accordance with those Guidelines.

5. We have been assisted in the preparation of this report by Daniel Young and Johanna Hansson from CEG's Sydney office. However, the opinions set out in this report are our own.

Thomas Nicholas Hird

28 June 2013

Bruce David Grundy

28 June 2013

2 $E[R_m]$ must be defined before defining MRP

6. Asset pricing models are models of relative risk. The expected return on the market portfolio $E[R_m]$ is an input into asset pricing models, not an output. The output of the models is an estimate of a particular asset's required return *relative to* $E[R_m]$. For example, in the CAPM,[1] the return on each asset is determined as:

$$E[R_i] = E[R_{\beta=0}] + \beta_i \cdot (E[R_m] - E[R_{\beta=0}]), \qquad \textit{Equation 1}$$

where $E[R_i]$ is the expected return on the asset, $E[R_{\beta=0}]$ is the expected required return on a zero beta asset, β_i is the beta for the asset and $E[R_m]$ is the expected return on the market portfolio.

7. The inputs into this model are $E[R_{\beta=0}]$, β_i and $E[R_m]$. The above equation could just as easily and correctly be written as:

$$E[R_i] = \beta_i \cdot E[R_m] + E\left[R_{\beta=0}\right] \cdot (1 - \beta_i).$$

8. E[MRP] is not an input into this model – the E[MRP] is simply the difference between the value of $E[R_m]$ and $E[R_{\beta=0}]$.

9. Contingent on an assumption that $E[R_m]$ is an invariant value above $E[R_{\beta=0}]$ one could attempt to estimate the invariant MRP as a means to estimating $E[R_m]$ from $E[R_{\beta=0}]$. However, this process superimposes an assumption on the asset pricing model that E[MRP] is invariant.

10. The existence of an invariant MRP is in no way an assumption of asset pricing models. Indeed, it is entirely inconsistent with modern asset pricing theory that is focussed on explaining the time varying nature of both $E[R_m]$ and E[MRP] – as is explained in section 3.

2.1 AER previous approach

11. The previous approach for the AER has been to estimate $E[R_m]$ by adding a fixed premium of 6% (6.5% between mid-2009 and mid 2011) to the prevailing estimate of 10 year CGS yields (observed over a relatively short averaging period of between two weeks and one month) as the proxy for the return on a zero beta asset in the CAPM.

$$AER\ estimate\ of\ E[R_m] = E\left[R_f\right] + 6\%. \qquad \textit{Equation 2}$$

[1] Sharpe, William F. (1964). *Capital asset prices: A theory of market equilibrium under conditions of risk*, Journal of Finance, 19 (3), 425-442.

12. The effect of this is that E[Rm] has varied one-for-one with movements in the CGS yield. The 10 year CGS yield has, in the last 5 years, been highly unstable and, as noted by the Reserve Bank of Australia (RBA), has recently been at levels below those seen in the last century,[2] and materially below those prevailing throughout the last half century. Consequently, the AER's estimate of E[Rm] has also been highly unstable and recently at low levels, implying that, since the onset of the GFC, equity capital for the average Australian firm has been cheaper than in prior years.

[2] 24 August 2012, RBA Governor (Glenn Stevens), statement to the House of Representatives Standing Committee, "*This 'flight to safety' also saw market yields on Australian government debt decline to the lowest levels since Federation*".

3 E[R_m] and E[MRP] are time varying

13. Section 4 reviews the literature on estimation of E[R_m] and E[MRP] (noting that estimating one is equivalent to estimating the other for any given risk free rate estimate).

14. E[R_m] is just the average of required returns across a range of risky assets. Just like in any other market, prices in the market for risky assets are determined by supply and demand. An increase in demand for risky assets will, holding other things constant, raise asset prices and reduce expected returns on those assets. An increase in supply of those assets will, holding other things constant, lower asset prices and increase expected returns on those assets.

15. The same is true for low risk or riskless assets. An increase in demand for low risk assets will, holding other things constant, raise asset prices and reduce expected returns on those assets. An increase in supply of those assets will, holding other things constant, lower asset prices and increase expected returns on those assets.

16. *If* supply and demand conditions in all asset classes move in 'lock step'[3] then the required return on risky assets E[R_m] and riskless assets E[R_f] will also move in lock step. In this special case, E[MRP] = E[R_m] - E[R_f] will be constant through time.

17. The empirical literature contains no support for a conclusion that E[MRP] is constant. That is, the literature universally fails to find that E[R_m] and E[R_f] move in lock-step.

18. The literature is less than universal on whether these variations are predictable in advance. Most, and in our opinion the highest quality (see section 4), published literature finds that E[R_m] and (equivalently) E[MRP] are predictable. Based on this literature, we believe that the best estimate of E[R_m] at any given time will be achieved by application of the dividend growth model.

19. Nonetheless, a strand of the literature criticises some of the statistical tests used to demonstrate predictability of the E[MRP] and argues that no such predictability exists. However, these papers do not reject a null hypothesis of predictability. Rather, they fail to reject a null of no predictability at the 5% level.

20. This is an important distinction. Rejecting a null hypothesis of no predictability at the 5% level does not mean that the best (most likely) conclusion is that E[MRP] cannot be predicted. Rather, it simply means that, even if the best estimate, based on the data, is that E[MRP] is predictable, we cannot rule out the possibility (with more than 95% confidence) that we have arrived at that best estimate by chance.

[3] That is, a one-for-one movement in the two variables

21. There may in fact be only a 6% chance of observing the relevant data if returns are not predictable, but since that is greater than 5%, such analyses will fail to reject a null of no predictability. This is often poorly and incorrectly expressed as a claim that the paper finds that returns are not predictable. Further, such papers always report results for predictions based on single predictor variables. Required returns in the market for funds are the returns required by investors given all the information they use in analysing an investment, not solely, for example, the firm's dividend yield.

22. The summary of the literature is provided in section 4, along with advice, based on that literature, on how to best estimate E[MRP]. Nonetheless, we also provide advice on how to best estimate $E[R_m]$ if in fact $E[R_m]$ and E[MRP] could not be predicted. Our conclusion is then that the best estimate of the unconditional $E[R_m]$ would be the historical average return on the market. It should be noted that this is not necessarily equal to the prevailing CGS yield plus the historical average return on the market less the historical average CGS yield (as is the AER practice). Our best estimate of the $E[R_m]$ conditional on the current level of expected inflation would be the historical average real return on the market plus the current expected inflation rate. Our analysis in this regard is set out in section 5.

4 Review of the literature on the predictability of E[R_m] and E[MRP]

23. Predicting the return on the market has long been of interest to financial economists and investors. The literature almost uniformly concludes that the E[MRP] is predictable. Those few papers that do conclude that the E[MRP] is not predictable examine only single predictor variables, rather than the larger set of information actually employed by investors. When the tests that lead to a conclusion of no predictability are repeated using multiple predictors, the null hypothesis of no predictability is rejected.

24. While some research papers are written in terms of predicting the return on the market, many focus on predicting the market risk premium, namely the market return in excess of the required return on a zero beta asset. In fact, one sometimes needs to read a paper quite carefully to find the throw-away sentence that acknowledges that it uses the words "return" and "excess return" interchangeably.

25. French, Schwert and Stambaugh[4] (1987) consider one of the most basic questions in finance: Is the E[MRP] higher when the risk of investing in the market is higher? French, Schwert and Stambaugh derive forecasts at time t of future volatility, $\hat{\sigma}_{mt}$, , from an autoregressive moving average model (ARIMA) of past realized volatility values. The unpredicted component of future realized volatility is $\sigma_{mt}^{u} = \sigma_{mt} - \hat{\sigma}_{mt}$. A regression of the realized MRP (measured as the realised return on the market portfolio, R_{mt}, less the observed required return on a zero beta asset proxied by a government bond yield, R_{ft}) on the forecasted and unpredicted components of future volatility,

$$R_{mt} - R_{ft} = \alpha + \beta\, \hat{\sigma}_{mt}^{u} + \gamma \sigma_{mt}^{u} + \epsilon_t$$

yields a positive but insignificant value for β and a significantly negative value for γ with a t-stat of –10. French, Schwert and Stambaugh interpret their result as establishing that when volatility turns out to be higher than expected, the market updates and increases its forecast of future volatility. Then, given a higher forecast of future market volatility, investors require a higher reward for bearing the increase in the risk inherent in holding the market. The E[MRP] increases and the current price of the market is marked down in response to the increase in the discount rate. A strong negative γ is evidence of a positive relation between E[MRP] and predicted volatility. The fact that the β coefficient itself is insignificantly positive is because ARIMA-based forecasts of future volatility are a noisy measure of the

[4] French, Kenneth R., G. William Schwert and Robert F. Stambaugh, 1987, *Expected stock returns and volatility*, Journal of Financial Economics 19, 3-29.

volatility that investors actually forecast and the resulting errors-in-variables[5] problem biases the β coefficient toward zero. The paper's conclusion is that E[MRP] is not a constant, but instead varies with the risk of the market.

26. Consistent with the conclusion reached by French, Schwert and Stambaugh (1987) many fund managers use volatility forecasts implicit in the prices of options written on broad market indices as their forecast of future market volatility. They do so because option-implied volatility forecasts reflect all the information available to investors in the stock and options markets. These fund managers use a higher value for the E[MRP] when option-implied forecasts of future market volatility are higher. The approach is described in Bishop, Fitzsimmons and Officer (2011).[6]

27. Fama and French[7] (1989) examine the predictability of the E[MRP] on the basis of standard predictor variables such as term spreads, default spreads and yield spreads over horizons of one month, one quarter and one through four years.

$$\sum_{j=1}^{\tau} MRP_{t+j} = \alpha + \sum_{k=1}^{K} \beta predictor_{k,t} + \varepsilon_t ,$$

where τ is the length of the forecast horizon in months and *k* indexes the individual predictors. The predictor variables considered are:

- the default spread, *DEF*, being the difference between the yield on a portfolio of corporate bonds and the yield on AAA bonds;
- the term spread, *TERM*, being the difference between the yield on AAA bonds and the one-month t-bill rate; and
- *D*/*P*, the dividend yield on the market.

28. The 1989 Fama and French paper references a 1986 working paper by Robert Stambaugh (later published as Stambaugh[8] (1999)) that investigates a potential bias in ordinary least-squares that can arise when a predictor variable is autocorrelated (i.e., when its value in one period is correlated with its value in the previous period). Fama and French appropriately correct for this potential bias and conclude that the E[MRP] is inversely related to business conditions. Their abstract reads as follows:

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5 The errors in variables problem refers to a well-known bias in estimated regression coefficients if the predictor variables themselves are measured with errors. For example, see Durbin J., Errors in Variables, Review of the International Statistical Institute Vol. 22, No. 1/3 (1954), pp. 23-32.

6 Bishop, Steven, Michael Fitzsimmons and Bob Officer, 2011, *Adjusting the market risk premium to reflect the global financial crises*, JASSA The Finsia Journal of Applied Finance 1, 8-14.

7 Fama, Eugene F., and Kenneth R. French, 1989, *Business conditions and expected returns on stocks and bonds*, Journal of Financial Economics 25, 23-49.

8 Stambaugh, Robert F., 1999, *Predictive regressions*, Journal of Financial Economics 54, 375-421.

"Expected returns on common stocks …. contain a term or maturity premium that has a clear business-cycle pattern (low near peaks, high near troughs). Expected returns also contain a risk premium that is related to longer-term aspects of business conditions. The variation through time in this premium is stronger …. for stocks than for bonds. The general message is that expected returns are lower when economic conditions are strong and higher when conditions are weak."

29. Fama and French rationalise their conclusion that the E[MRP] is inversely related to business conditions as the outcome of one or both of two economic forces. One is that to the extent income is low when business conditions are poor, a higher expected return on stock is required to induce investors to forgo consumption in order to invest. The other is that to the extent that risk is high when business conditions are poor, investors require a higher reward for bearing that higher risk (i.e., a higher E[MRP] is required).

30. Keim and Stambaugh[9] (1986) investigate the predictability of the E[MRP] on the basis of predictive measures that reflect the level of the stock market. One such measure is the dividend yield on the market. Dividends are sticky and hence dividend yields tend to be high following market declines. For the reasons suggested in Fama and French (1989) and because a market decline will lead to an increase in the leverage of the typical firm, high dividend yields on the market are likely to predict high subsequent values for the E[MRP]. Keim and Stambaugh's empirical analysis leads them to conclude that higher dividend yields predict higher future values of the E[MRP].

31. The academic consensus that stock returns are predictable was challenged by two influential papers: Welch and Goyal[10] (2008) and Boudoukh, Richardson and Whitelaw (2008)[11]. Welch and Goyal (2008) questioned the significance of both in-sample and out-of-sample predictability of the E[MRP] by showing that the results can depend on the length of the investment horizon, the time period examined, the assumed time-series process describing changes in the predictor variables, and the stationarity of the relation between the predictor variables and the E[MRP]. Welch and Goyal show that as the statistical structure imposed on the estimation problem becomes looser, standard errors of estimates become larger and the statistical significance of almost all predictive relations that are based on single predictor variables disappears. Subsequent authors have questioned the approach in Welch

9 Keim, Donald B., and Robert F. Stambaugh, 1986, *Predicting returns in the stock and bond markets*, Journal of Financial Economics 46, 265-292.

10 Welch, Ivo and Amit Goyal, 2008, *A comprehensive look at the empirical performance of equity premium prediction*, Review of Financial Studies 21, 1455-1508.

11 Boudoukh, Jacob, Matthew Richardson, and Robert F. Whitelaw, 2008, *The myth of long-horizon predictability*, Review of Financial Studies 21, 15771-1605.

and Goyal by pointing out that if one uses a test of low enough power, one will not be able to reject the null of no predictability. But the failure to reject the null does not mean the acceptance of the null. A 6% probability of observing the level of predictability actually observed under a null of no predictability means that one cannot reject the null at the 5% level however a classical statistician would never say that he has accepted the null. Similarly, an economist, confronted with a classical statistician's failure to reject a null of no predictability at the 5% level, should not disregard the fact that there is only a 6% chance of observing the level of predictability displayed in the data if in fact there were no predictability. She should then act more like a Bayesian statistician. In reaching her conclusion regarding predictability she would consider what weight she should put on her prior belief regarding predictability given economic models of the relation between the predictor variable and the E[MRP].

32. Although in the title of their paper Welch and Goyal (2008) describe their investigation as comprehensive, Rapach, Strauss and Zhou[12] (2010) point out that Welch and Goyal limit their analysis to expectations of the MRP based solely on individual predictor variables. In practice investors base their expectations on the simultaneous use of all available information. Using the same statistical analysis as Welch and Goyal use, but instead considering predictions that combine the information in individual predictor variables, Rapach, Strauss and Zhou document the statistical and economically significant[13] predictability of the E[MRP]. Predictions that combine the information available in standard predictor variables consistently dominate predictions based on the historical average MRP. The implication for a regulator interested in determining the cost of capital is that the historical average MRP is not a good measure of investors' expectations of the MRP.

33. Dangl and Halling[14] (2012) focus on what they see as a different flaw in the Welch and Goyal analysis. The failure to impose a structure on the time-varying relation between predictor variables and the E[MRP] means that Welch and Goyalare unable to reject the null of no predictability. Dangl and Halling explicitly model the time-varying relation and thereby document statistically significant predictability of the E[MRP]. Echoing the results in Fama and French (1989), Dangl and Halling document that the relation between the E[MRP] and predictor variables, such as interest rates, spreads and yields, varies across the business cycle.

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12 Rapach, David E., Jack K. Strauss and Guofu Zhou, 2010, *Out-of-sample equity premium prediction: Combination forecasts and links to the real economy*, Review of Financial Studies 23, 821-862.

13 A relationship is statistically significant if we can be confident its presence in the data is not purely by chance. It is economically significant to the extent that the relationship is 'material' in some sense. For example, it is conceivable that a particular variable has a statistically significant role in explaining returns but that the magnitude of the role is so small as to be economically uninteresting.

14 Dangl, Thomas and Michael Halling, 2012, *Predictive regressions with time-varying coefficients*, *Journal of Financial Economics* 106, 157–181.

34. Henkel, Martin and Nardari[15] (2011) also conclude that the predictability of the MRP based on dividend yields and the interest rates varies across the business cycle and is statistically significant and economically important during contractions. Henkel, Martin and Nardari conclude that the E[MRP] is higher during contractions than expansions in the US and in all G7 countries except Germany.

35. Campbell and Thompson[16] (2008) explicitly address the question of whether anything beats the historical average value of the MRP in predicting the future value of the MRP. Campbell and Thompson argue that researchers and investors have more knowledge than simply the historical data and the statistical relations therein. There are fundamental economic relations that must also be considered. For example, the E[MRP] is the reward for bearing market risk and this reward must be positive not negative. The predictive relation between any predictor variable and the E[MRP] must be constrained to be such that the E[MRP] is never negative. Campbell and Thompson show that once even such a weak restriction as a positive value for the E[MRP] is placed on the statistical analysis, they are able to answer their question with a resounding "Yes". Simply imposing the economic prediction that the expected MRP is positive on the Welch and Goyal analysis gives the result that both the monthly and annual E[MRP] are predictable on the basis of each of the dividend yield on the market, the market's earnings yield, short-term government bond rates, long-term government bond rates, and the term spread. Campbell and Thompson also show that predictions of the MRP from even simple variants of a dividend growth model strongly dominate predictions based on the historical average MRP. Again, the implication for a regulator interested in determining the cost of capital is that the historical average MRP is not a good measure of investors' E[MRP].

36. The second paper which caused some initial reconsideration of predictability is Boudoukh, Richardson and Whitelaw (2008). The title of the paper appears to characterise long-horizon predictability as a myth, however the paper actually characterises the claim that the MRP is more predictable over longer horizons than it is over short horizons as a myth. Boudoukh, Richardson and Whitelaw (2008, p. 1601) conclude that "stronger long-horizon results …, present little, if any, independent evidence over and above the short-horizon results for persistent regressors."[17] These authors do <u>not</u> conclude that there is no evidence of predictability. Rather, they conclude that long-horizon analysis gives little independent evidence of predictability.

15 Henkel, Sam, James, J. Spencer Martin, and Federico Nardari, 2011, *Time-varying short-horizon predictability*, Journal of Financial Economics 99, 560–580.

16 Campbell, John and Samuel B. Thompson, 2008, *Predicting excess stock returns out of sample: Can anything beat the historical average?*, Review of Financial Studies 21, 1509-1531.

17 Boudoukh, Jacob, Matthew Richardson, and Robert F. Whitelaw, 2008, *The myth of long-horizon predictability*, Review of Financial Studies 21, 1571-1605.

37. Boudoukh, Richardson and Whitelaw focus on the use of dividend yields as a predictor of the E[MRP] and are careful to recognize that the current aggregate value of all currently existing shares (i.e., the current value of the stock market) is the present value of all future net distributions to shareholders in existing firms, namely dividends plus share repurchases in excess of amounts invested by shareholders in secondary share issues by existing firms. Dividends plus repurchases in excess of new issues constitute the net payout to current investors. Investors do not ignore repurchases and new issues, and empirical investigations of the predictability of the E[MRP] based on dividend yields must be careful not to overlook the role of share purchases and new issues. Although a reading of only the abstract of Boudoukh, Richardson and Whitelaw (2008) might lead one to conclude that these authors were unable to reject a null of no predictability, in fact, Boudoukh, Richardson and Whitelaw report that one can reject a null of no predictability (with a p value of less than 1%) if the net payout yield on the market is used as the predictor variable. It is worth noting that when Keim and Stambaugh (1986), Fama and French (1989), Cochrane[18] (2008) and Campbell and Thompson (2008) conclude that the E[MRP] is predictable on the basis of the dividend yield on the market, these researchers all used appropriately-specified measures of the dividend yield on the market (i.e., that appropriately take account of the role of share purchases and new issues).

38. Cochrane (2008) argues that long-horizon results do present independent evidence of the predictability of the MRP over and above and above that provided by short-horizon results even with persistent regressors. This disagreement with Boudoukh, Richardson and Whitelaw (2008) is beside the point if one is interested in the simpler question of whether the E[MRP] is predictable. Both Cochrane (2008) and Boudoukh, Richardson and Whitelaw (2008) conclude that the E[MRP] is predictable when the net payout yield is used as the predictor variable.

39. An important contribution of Cochrane (2008) is its analysis of how to predict the E[MRP]. Cochrane considers as his starting point the simplest variant of a dividend growth model that links the value of the stock market, M, to the dividends to be paid on the market over the coming year, D; the expected annual future dividend growth rate, g; and the expected return on the market, k. The present value relation links these variables as:

$$M = \frac{D}{k - g}.$$

[18] Cochrane, John H., 2008, *The dog that did not bark: A defense of return predictability, Review of Finance Studies* 21, 1533-1575.

The value of the market can be approximated as the present value of a growing perpetuity of future dividends. This variant of a Dividend Growth Model (DGM) can be rewritten as:

$$\frac{D}{M} = k - g \,. \qquad \textit{Equation 3}$$

40. Cochrane observes that if the expected return on the market is not in fact predictable (i.e., the *k* term is a constant) then all variation in the dividend yield on the market (i.e., all variation in *D*/*M*) must be due to variation in *g*; i.e., due to variation in the expected future growth rate of dividends on the market. But as Cochrane (2008) documents, future dividend growth rates are not predictable on the basis of standard economic predictors like interest rates, the term spread, credit spreads, etc., and hence conditional on these measures the expected growth rate *g* is a constant. Yet if both *k* and *g* (the two terms on the right-hand-side of (3)) are constants, then the left-hand-side of (3) must also be a constant. The left-hand-side of (3) is the dividend yield on the market and that is simply not constant—it varies inversely with the level of the market. Hence if *g* is a constant, the observed variation in market dividend yields must be due to variation in the required return on the market, *k*. Investors' required return on the market must vary directly with the market dividend yield—when the market dividend yield is high, investors' required return on the market must be similarly high. Cochrane explores the implications of this observation and concludes that the null hypothesis that the E[MRP] is a constant and that the observed variation in market dividends yields can be explained by the variation in expected dividend growth rates can be rejected at the 1-2% level.

41. Cochrane's analysis is not in fact complete enough to rule out the possibility that the E[MRP] is a constant if variation in market dividend yields is in fact appropriately explained by variation in expected future dividend growth given information that investors have that goes beyond simply the set of standard economic predictors examined by Cochrane. Li, Ng and Swaminathan[19] (2013) use better informed estimates of dividend growth (based on analyst forecasts) which allow a more stringent test of the predictability of the E[MRP] than Cochrane[20] and strongly

[19] Li, Yan, David Ng, and Bhaskaran Swaminathan, 2013, *Predicting market returns using aggregate implied cost of capita*l, Journal of Financial Economics forthcoming. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1787285.

[20] That is, the authors take into account more potential economic predictors than examined by Cochrane but still find that required returns vary over time and can be predicted. They implement a DGM model that allows dividend growth g forecasts to move around. The g input using in to the DGM model analysed by Li, Ng and Swaminathan reflects analysts' forecasts of growth over the immediate coming years followed by a number of years during which growth moves toward the long-run equilibrium level. Analysts' forecasts better represent the information that investors actually have. Using these more

reject a null that the E[MRP] is constant. Li, Ng and Swaminathan (2013) show that the E[MRP] implied by a dividend growth model strongly outperforms the historical average MRP as a predictor of the future realized MRP.

42. Li, Ng and Swaminathan (2013) consider the general form of the dividend growth model in which the growth rate of dividends is not assumed to be the same in every future year.

$$M_t = \sum_{\tau=1}^{\infty} \frac{D_t \prod_{j=1}^{\tau} \left(1 + g_{t+j}\right)}{k}, \qquad \textit{Equation 4}$$

where M_t is the ex-dividend value of the firm at time t, D_t is the net payout on the firm (dividends plus repurchases less new issues) in the period prior to time t, g_{t+1} denotes investor expectations of the growth rate of the net payout on the firm in the period after time t, g_{t+2} is the expected growth rate in the following period, etc. The expected growth rate in the initial years after time t is based on an average of analysts' forecasts of earnings growth and payout ratios for the firm during those years. Analysts use all the information available to them, not just a limited set of standard economic predictors. Forecasts of growth rates beyond 15 years are based on long-run GDP growth rates (reflecting both productivity growth and population growth). Forecasts of growth rates taper smoothly from the final analyst forecast for the specific firm to the common economy-wide growth rate.

43. Solving equation (4) for the discount rate used by investors when determining the value they place on each particular firm and averaging across all firms gives the $E[R_m]$. Subtracting the required return on a zero beta asset gives a direct measure of the E[MRP] implied by market prices. Li, Ng and Swaminathan show that the implied E[MRP] is a strong predictor of the subsequent realised MRP with adjusted R^2 values ranging between 7% at a 1-year horizon and 31% at a 4-year horizon. In establishing the statistical significance of the implied E[MRP] as a predictor of the future MRP the authors control for the potential statistical biases identified in Stambaugh (1999), Welch and Goyal (2008), and Boudoukh, Richardson and Whitelaw (2008). Li, Ng and Swaminathan's results provide strong evidence that:

- The MRP is predictable;
- the realised MRP is positively related to the E[MRP] implied from a dividend growth model;

credible measures of investors' forecasts of g, Li, Ng and Swaminathan estimate the required return and find that it is not a constant. The Li, Ng and Swaminathan estimates of required returns, being estimates of the return that investors require from investing in the market, turn out to be good predictors of the future realized return on the market.

- the dividend growth model implied E[MRP] is a better predictor of the future realised MRP than are standard predictor variables such as dividend yields, interest rates, and spreads; and
- the dividend growth model implied E[MRP] is a better predictor of the future realised MRP than the historical average value of the realized MRP.

44. The above papers on the predictability of the E[MRP] all consider non-Australian data. Although a number of published papers, most notably Brailsford, Handley and Maheswaran (2008 and 2012)[21] have examined the history of the MRP in Australia, to our knowledge only one published paper has empirically examined whether the E[MRP] for the Australian market is predictable. Bishop, Fitzsimmons and Officer (2011) examine the link between the MRP and the 90-day historical standard deviation over 1980-2009 and reach the same conclusion as French, Schwert and Stambaugh (1987) in their analysis of US data, namely that the E[MRP] is higher when the market is more volatile. Bishop, Fitzsimmons and Officer (2011)[22] conclude that "the significant effect of the GFC on risk and risk premiums .... warrant a departure from the use of the long-term average MRP for valuation related decisions."

45. Reports written in a regulatory context have examined the E[Rm] and the E[MRP] for the Australian equity market. Gregory (2012)23 applies the analysis in Fama and French (2002) to estimate the historical, not the current, value of the real E[Rm]. Assuming a constant expected growth rate of future real dividends, the long run real percentage capital gain will equal the long run real growth in dividends. Applying a DGM model that reflects this assumption Gregory estimates the historical value of the real E[Rm] for the period 1958-2011 at 8.14%. Hathaway (2012)24 uses a DGM analysis to estimate the forward-looking nominal E[Rm] on the Australian equity market at the end of 2011 at 13.3%. Relative to contemporaneous 10-year CGS yields this implies an estimate of the forward-looking E[MRP] relative to 10-year CGS yields of 9.6% at the end of 2011.

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21 Brailsford, T., J. Handley and K. Maheswaran, Re-examination of the historical equity risk premium in Australia, Accounting and Finance 48, 2008, pages 73-97.

Brailsford, T., J. Handley and K. Maheswaran, The historical equity risk premium in Australia: Post-GFC and 128 years of data, Accounting and Finance, 2012, pages 237-247.

22 Bishop S., M. Fitzsimmons, and R. Officer (2011), Adjusting the Market Risk Premium to Reflect the Global Financial Crisis, JASSA, The Finsia Journal of Applied Finance, Issue 1, 2011.

23 Gregory, A. (2012), *The AER Approach to Establishing the Cost of Equity – Analysis of the Method Used to Establish the Risk Free Rate and the Market Risk Premium*, prepared by Alan Gregory, Professor of Corporate Finance, Xfi Centre, University of Exeter, November 2012.

24 Hathaway, N. (2012), Forward Estimate of the Market Risk Premium: Update, A report prepared for the Victorian gas transmission and distribution businesses: APA Group, Envestra, Multinet Gas, and SP AusNet, prepared by Neville Hathaway, Capital Research, March 2012.

5 Advice on estimating $E[R_m]$ if $E[R_m]$ is not predictable

46. The academic state of the art in determining the E[MRP] is to use the current level of the market in conjunction with a dividend growth model to determine the implied discount rate used by investors. This implied level of the $E[R_m]$, also known as the implied market cost of capital, reflects all the information available to investors, including the historical level of the MRP. The E[MRP] is then simply the implied $E[R_m]$ less the current level of the required return on a zero beta asset (i.e., the risk free rate in the CAPM).

47. Despite this it is worth considering the question of how a regulator seeking to determine the cost of equity might do so if they were to conclude that the extant academic analysis was too intricate to be successfully implemented in a regulatory regime and they further believed that the determination of the $E[R_m]$ on the basis of the DGM model implemented by US regulators was an as yet unproven basis for determining the cost of equity.

48. Assume that the regulator will determine the cost of capital of firm *i* with an estimated beta of β_i from the Sharpe-Linter CAPM as a weighted average of the expected return on zero beta assets and the expected return on assets with an equity beta of 1.0, with the weight reflecting asset *i*'s estimated beta.

$$k_i^e = (1-\beta_i)\times E(\text{return on zero beta assets}) + \beta_i \times E(R_m).$$

49. Assuming that a default-free security is used as the proxy for a zero beta asset we can write:

$$k_i^e = (1-\beta_i)\times R_f + \beta_i \times E(R_m); \text{ i.e., } k_i^e = R_f + \beta_i\left(E(R_m) - R_f\right),$$

where R_f is the yield to maturity on a default free bond.

50. Suppose a regulator were to conclude that despite the academic papers documenting that the E[MRP] is predictable, it was preferable to estimate the $E[R_m]$ on the market as the sum of the current required return on a zero beta asset, proxied by CGS yields, and the historical average MRP. If the regulator were to repeat whatever set of tests led them to fail to reject a null of no predictability of the E[MRP], they would very likely find that they would also fail to reject a null of no predictability of either the nominal or the real $E[R_m]$. Such a regulator could then, just as validly, estimate the unconditional $E[R_m]$ as the historical average return on the market, and the $E[R_m]$ conditional on the current expected inflation rate as the historical average real return on the market plus the current expected inflation rate.

51. How should the regulator choose between apparently equally valid alternatives? Should the regulator estimate the $E[R_m]$ on the market as the sum of the current required return on a zero beta asset as proxied by CGS yields plus the historical average realised market excess return relative to the then prevailing CGS yields? Or should the regulator estimate either (a) the unconditional $E[R_m]$ as the historical average return on the market, or (b) the $E[R_m]$ conditional on the current expected inflation rate as the historical average real return on the market plus the current expected inflation rate? The answer lies in whether the regulator has certainty that its proxy for the zero beta asset in the CAPM really is an asset whose return is equal to the return on an asset with zero beta risk for investors holding the market portfolio – both at the moment and throughout the entire history used to estimate the historical average realised market excess return relative to then prevailing CGS yields.

52. The CAPM requires as an input the expected return on a zero beta asset. It seems natural to take a long dated default-free bond as an exemplar of a zero beta asset. But if the investment horizon under consideration is not the same as the life of the long-dated bond it is well understood that long-dated default free bonds can have non-zero beta over the investment horizon (see Davis (2005) and Campbell, Sunderam and Viceira[25] (2013)). This reflects the fact that the prices of such bonds vary through time with changes in liquidity premia and in market interest rates reflecting changes in, say, inflation expectations and inflation risk premia. This means that the price of Government bonds can, and does, vary over time with variations in the market portfolio: the expectation of which drives the investors' expected forward looking beta for Government bonds.

53. Campbell, Sunderam and Viceira (2013) conclude that in recent years long-term US government bonds have had a negative beta, while their beta was positive in the 1970s and 1980s. Davis (2005) examines Australian data for the period December 1979 through February 2004 and concludes in the paper's abstract that CGS bond betas "*are subject to time series variation and over the past few years the pre-existing positive correlation between bond and stock returns appears to have disappeared.*"[26] This recent diminution in CGS betas has continued and the measured betas for CGS has been negative since early last decade and, since the global financial crisis (GFC), have been at unprecedentedly negative levels.[27] A similar pattern has existed for US and UK government bonds (see figure 7, Campbell *et al.* (2009)).

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25 Campbell, John Y, Adi Sunderam, and Luis Viceira, 2013, *Inflation beta or deflation hedges? The changing risk of nominal bonds*, Harvard Business School Working Paper.

26 Davis, Kevin, 2005, *The systematic risk of debt: Australian evidence*, Australian Economic Papers 44, 30-46.

27 See section 5 of CEG, *Estimating E[Rm]: in the context of recent regulatory debate,* June 2013. Hereafter referred to as the *CEG companion report*.

54. Betas for nominal CGS will tend to be negative when an important dynamic in financial markets is a flight from risk to safety. In such a dynamic when there is bad economic news (or heightened risk aversion) investors sell risky assets (such as equities) and buy low risk assets (such as Government bonds). The opposite happens when there is good economic news. The effect of this is that equity and bond prices tend to move in the opposite direction (i.e., the beta for Government bonds is negative). In this dynamic, Government bonds will have negative CAPM risk because holding Government bonds in an investor's portfolio actively offsets equity market risk.

55. Estimating the expected return on the market as the prevailing CGS yield plus the historical difference between the average market return and average CGS yields introduces an unnecessary and potentially material source of bias. Estimating a historical average realised MRP relative to historical average CGS yields and then adding this to the prevailing CGS yield implicitly makes the assumption that any errors in the use of CGS as a proxy for the zero beta CAPM asset are the same in history as they are right now. If this is the case the errors cancel out. But if the beta of CGS varies through time, then the error is not the same through time and does not cancel out.

56. The quality of long dated Government bonds as a proxy for the zero beta CAPM asset varies materially through time. Adding an historical average realised market excess return (measured relative to historical average CGS yields) to prevailing CGS yields creates a mismatch if the historical average market conditions affecting CGS are different to the current market conditions. This mismatch can be avoided entirely by simply estimating the historical average return on the market.

57. While this is a general problem with such an approach, it is also a problem that is likely to be particularly acute at the moment. The evidence in the literature, and as updated by CEG, suggests that the historical MRP is estimated over a period when the betas of CGS bonds were positive. [28] Currently CGS bonds have a negative beta, and so if one is applying the CAPM consistently, their yield can be expected to be lower to reflect their negative beta risk. One cannot add the average return on the market in excess of the average return on a positive beta asset to the yield on a negative beta asset to obtain an estimate of the current return on the market. Doing so will produce a downward biased estimate of the current expected return on the market. The errors in these two different proxies for zero beta returns will not be the same and will not cancel out.

58. The apparently equally valid methods for determining the current expected return on the market are not in fact equally valid. The historical average return on the market will yield an unbiased estimate of the unconditional $E[R_m]$. Adding the current expected inflation rate to the historical average real return on the market

[28] See section 5 of CEG, *Estimating E[Rm]: in the context of recent regulatory debate,* June 2013.

will yield an unbiased estimate of the $E[R_m]$ conditional on the current expected inflation rate. But adding the historical average return on the market in excess of the historical average return on a positive beta asset to the current low yield on what is currently a negative beta asset will give a downward biased estimate of the return on the market.

6 Implication of this report's analysis for regulatory policy

59. Based on the published literature:

- The evidence is compelling that E[R_m] and E[MRP] vary through time in a manner that can be predicted;
- Ultimately, the use of a DGM model is the only reliable way of synthesising all of the disparate possible influences on E[R_m] and E[MRP].

60. As noted in section 4 of the CEG companion report,[29] by Tom Hird which Bruce Grundy has read, the Strategic Finance Group (SFG) DGM estimate for E[R_m] over the second half of 2012 was 11.0%.[30] This is the discount rate used by investors to discount future cash dividends. This does not include any assumed value to investors from imputation credits. If this was scaled up to include the value of imputation credits implicit in regulatory precedent it would be 12.2%.[31]

61. McKenzie and Partington[32] do not undertake a detailed examination of the literature reviewed in section 4. Rather they state only that they:

> *"... do not consider the use of predictive models of return based on dividend yield, even though distinguished researchers have (such as Fama and French, 1988). Spurious regression can be a problem here and researchers, such as .... Goyal and Welch (2003), find little evidence of predictive ability in such regressions. In our opinion, this is still a developing area of research, rather than a well developed practical tool, although its importance is growing (see Cochrane 2011)."*

As set out in section 4 a detailed examination of the literature on predictability shows that papers like Goyal and Welch[33] (2003) – a precursor to Welch and Goyal

29 CEG, *Estimating E[Rm] in the context of recent regulatory debate,* June 2013.

30 See table 4 of SFG, Dividend discount model estimates of the cost of equity prepared for the Energy Networks Association by SFG Consulting, June 2013.

31 See table 2 of Appendix 2 of SFG, Dividend discount model estimates of the cost of equity prepared for the Energy Networks Association by SFG Consulting, June 2013. For a gamma of 0.25 an 11.0% return exclusive of imputation credits rises to 12.2% inclusive of imputation credits.

32 McKenzie, M., and G. Partington (2011), Report to Corrs Chambers Westgarth, Equity Market Risk Premium, prepared by Michael McKenzie and Graham Partington on behalf of XTR Pty Ltd, 21st December 2011; paragraph 8, page 4.

33 Goyal, Amit and Ivo Welch, 2003, *Predicting the equity premium with dividend ratios* Management Science 49, 639-654.

(2008) discussed in section 4 - cannot be characterized as establishing that there is little evidence of predictability.

62. McKenzie and Partington's conclusion on whether $E[R_m]$ can be reliably predicted is that:

> "*Consequently, if there is compelling, reliable and reasonably precise evidence that the current MRP has changed substantively then the regulatory MRP should be adjusted. The problem is in obtaining reliable and precise evidence on the magnitude of any change and ensuring it is substantive enough to overcome the imperative for stability in the parameters used in the regulatory process.*"[34]

63. In the above quote, McKenzie and Partington clearly express a view that there exists a form of 'null hypothesis' which is that E[MRP]=6% ('the regulatory MRP'). McKenzie and Partington are working on the assumption that the AER's task is not to arrive at the best (most accurate) estimate of $E[R_m]$ and E[MRP] but, rather, to retain a 6% estimate of E[MRP] unless there is sufficient evidence to definitively reject this estimate as being wrong. McKenzie and Partington do not specify the level of confidence at which they would reject the null hypothesis that $E[R_m] = 6\%$ is correct. Standard practice amongst statisticians is to reject a null hypothesis when the evidence suggests that there is a less than 5% chance that the null hypothesis is true. For example, the best estimate of E[MRP] might be 8% but one might still not be able to reject a value of 6% with 95% confidence.

64. In our view this finding would be irrelevant, the AER should adopt the best estimate of E[MRP] – even if the evidence for that estimate is not so strong as to rule out 6% as 'possibly' being right.

65. McKenzie and Partington justify adopting their proposed bias towards not changing the 'regulatory MRP' on the grounds that there is an *"…imperative for stability in the parameters used in the regulatory process*".

66. In our view the logic employed by McKenzie and Partington is deeply flawed (and is similar to the AER practice documented in the CEG companion report report)[35]. Stability in the AER's assumed value of E[MRP] has led to a great deal of instability in the AER's estimate of $E[R_m]$ and the level of regulatory compensation provided by the AER. This instability is documented in the accompanying CEG Report[36] and

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34 McKenzie M. and Partington G., *Review of the AER's overall approach to the risk free rate and market risk premium*, p. 19.

35 See section 6 of the CEG companion report.

36 See section 2 of the CEG companion report.

results from the fact that, with a fixed E[MRP], the AER's estimate of E[R_m] and regulatory allowances move one-for-one with 10 year CGS yields. If the AER had adopted the best estimate of E[MRP] then, consistent with the work of SFG[37] and the analysis in the accompanying CEG Report,[38] the AER's estimate of E[R_m] would have been much more stable than it has been.

67. As shown in the accompanying CEG Report,[39] the volatility in the AER's estimate of E[R_m] has been extreme since 2008, leading to very different cost of equity allowances for businesses performing essentially the same functions that simply had averaging periods that happened to be a few months apart – when CGS yields were materially different. The resulting difference in the estimated cost of equity is then "locked in" by the AER for the next five years.

68. This means that two firms can have substantially different cost of equity allowances even though their regulatory periods, and the financial market conditions therein, are substantially the same. For example, Envestra and APA both operate gas pipeline businesses in Queensland. Their regulatory periods overlap for four out of their five years. Envestra's averaging period will end in June 2016 while the Roma to Brisbane Pipeline's (RBP) averaging period will end in June 2017.

69. Yet, RBP's real (inflation adjusted) allowance for the cost of equity was just 5.07% per annum.[40] This is 255 basis points lower than the Envestra real allowance for the cost of equity (7.62%) - solely due to the higher CGS yields in Envestra's averaging period. Put another way, Envestra's allowance was one and a half times RBP's allowance; even though four out of the five years to which the allowance applies are the same.

70. These regulatory decisions are symptomatic of the more general volatility in prices for customers and substantially different investment incentives between businesses over 5 year periods – just because the averaging periods for the businesses happen to be a few months apart. The accompanying CEG Report[41] describes this outcome as a roulette wheel approach to regulation.

71. To the extent that there is an *imperative for stability in the parameters used in the regulatory process* then that imperative should relate to the estimate of E[R_m] itself, and not for its component E[MRP]. Adopting an invariant estimate of the real

37 See table 4 of SFG, Dividend discount model estimates of the cost of equity, prepared for the Energy Networks Association by SFG Consulting, June 2013.

38 See section 3 of the CEG companion report.

39 See section 2 of the CEG companion report.

40 This is calculated as the nominal cost of equity of 7.75% deflated by the RBP decision estimated inflation rate of 2.55% using the Fisher equation. See section 3 of the CEG companion report.

41 See section 3 of the CEG companion report.

value of $E[R_m]$ (or, at least, an estimate that is less sensitive to variability in CGS yields) would address this roulette wheel problem.

72. In addition, as section 5 above notes, if one does not believe that variations in $E[R_m]$ and E[MRP] can be reliably estimated, then the best estimate of $E[R_m]$ is the historical average realised R_m.

73. The same literature that might appear to reject the predictability of E[MRP] would also likely reject the predictability of $E[R_m]$. Yet the AER, in adopting a fixed value for E[MRP] is, in effect, predicting $E[R_m]$ to be a fixed 6% above CGS yields. There is no basis in the published literature to justify doing so.

74. By way of further illustration, consider the following quote from McKenzie and Partington:

> "*The difficulty is that there is no reliable way to estimate what the variation in the MRP is at a specific point in time. Hence the recommendation in our prior reports on the market risk premium that, with respect to historic data, the objective should be to estimate the unconditional mean MRP, but that this should be supplemented by triangulation and reasonableness checks using alternative approaches in determining the current MRP to be used in regulatory decisions*" [42]

75. If one accepts the premise of this statement then one could equally accurately replace each mention of MRP (which has the same meaning as E[MRP]) with "$E[R_m]$". If one is relying on the literature that says E[MRP] and $E[R_m]$ are not sufficiently predictable to justify adopting an invariant estimate there is simply no basis to make that invariant estimate E[MRP] and not $E[R_m]$.

76. Similarly, on page 5 of their report, McKenzie and Partington state:

> "*Given that the predictability of returns is a much contested area, it is premature to adopt predictive regressions as a basis for adjusting the MRP. However, it is worthy of a watching brief.*"

77. Based on McKenzie and Partington's interpretation of the literature, precisely the same statement would be true if "MRP" was replaced with $E[R_m]$.

78. Moreover, once it is recognised that there is time varying estimation error associated with the proxy for the CAPM zero beta asset, it can be better to avoid using that estimate as a component of your estimate of $E[R_m]$. Put simply, if historical average realised returns are going to be used to estimate $E[R_m]$, then $E[R_m]$ can be estimated as the historical average realised return.

[42] McKenzie M., and G. Partington (2013), Review of the AER's overall approach to the risk free rate and market risk premium, 28th February 2013, p. 20.

79. By contrast, attempting to estimate E[R_m] based on the AER's methodology for estimating E[R_m] involves the following steps:

$$E[R_m] = R_{\beta=0} + \mathrm{E}[R_m] - R_{\beta=0} \qquad \textit{Equation 5}$$

$$E[R_m] = R_{\beta=0} + (\textit{Historial average } R_m - \text{Historical } R_{\beta=0}) \qquad \textit{Equation 6}$$

$$E[R_m] = \textit{Prevailing CGS} + (\textit{Historial average } R_m - \textit{Historical average CGS}). \qquad \textit{Equation 7}$$

Equation (5) is definitionally true. Equation (6) involves a step by the AER where it effectively assumes the historical average realised MRP is the best estimate of the current E[MRP]. Equation (7) is where the AER operationalises equation (6) using CGS as the proxy for the prevailing required return on zero beta assets ($R_{\beta=0}$).

80. Section 5 sets out our recommendation[43] that an unbiased estimate of the unconditional E[R_m] can be obtained if the AER stops at equation (5) and simply estimates E[R_m] as the historical average realised real R_m. Taking the additional steps to get to equation (7) requires not only the assumption that E[MRP] is constant, but also the use of an imperfect proxy for the $R_{\beta=0}$; namely CGS yields.

81. As noted in paragraphs 52 and 53 above, it is well accepted that CGS are not themselves zero beta assets. The prices of CGS are volatile and changes in the price of CGS are not, in general, independent of changes in the price of all other assets. Their beta risk varies through time – it was materially positive in the 1970s and 1980s, has fallen since then and is currently strongly negative (around -0.3); consistent with Government bond markets since the GFC being affected by strong 'flight to quality' dynamics. This is explained in more detail in the accompanying CEG Report.[44] The implication is that there is estimation error in both the estimate of the prevailing $R_{\beta=0}$ and the historical average $R_{\beta=0}$. This estimation error cannot be expected to simply cancel out because the beta of CGS is time varying (depends on financial market conditions).

82. This estimation error can be potentially very significant. Current estimates of the beta for CGS are around -0.3. The historical average beta for CGS is around +0.1 and if the realised MRP relative to the true zero beta rate is around 6.7%[45] then the

43 In a scenario where one accepts the conclusion that time variation in E[Rm] and E[MRP] cannot be predicted.

44 See section 5 of the CEG companion report.

45 If the historical average realised MRP relative to CGS is 6.0% but CGS has an average beta of 0.1 then the true MRP=6.7% (6%/(1.0-0.1))

combined estimation error in applying equation (7) is around 2.7%.[46] Correcting for this mismatch bias would bring the AER estimate into line with historical average realised R_m and DGM R_m. This mismatch error is similar in construction to the error found by the Australian Competition Tribunal in its 2003 GasNet decision.[47]

83. Similarly, as discussed in the accompanying CEG Report,[48] the IMF has concluded that yields on low risk assets are currently depressed below normal levels by a lack of supply (following developed country credit rating downgrades and the post GFC evaporation of AAA rated commercial assets) and a heightened demand due to changes in financial sector regulation. Such factors have the potential to create precisely the same mismatch between the prevailing proxy for $R_{\beta=0}$ and the historical average proxy for $R_{\beta=0}$ in equation (7).[49] Equivalently, the RBA has

46 The average CGS beta is around +0.1 through history up to the GFC (using yearly data) and the current beta is around -0.3 (using monthly data since the GFC). This suggests a 0.4*[True MRP] mismatch bias. If [True MRP]=6.7% then this amounts to 2.7% underestimate of E[Rm]. .

47 In that decision, (available at http://www.austlii.edu.au/au/cases/cth/ACompT/2003/6.html), the Tribunal found that the ACCC had erred by using a 5 year CGS yield as the proxy for the prevailing risk free rate and the 10 year CGS yield through history as the basis of the proxy for then prevailing risk free rate when estimating the historical average realised market excess return relative to CGS. Clearly a 5 year CGS bond is not the same as a 10 year CGS bond and using different bonds creates a potential for mismatch. Somewhat more subtly, but equally importantly, a 10 year CGS bond today is not the same (does not have the same risk characteristics) as a 10 year CGS bond at other times through history.

46 … While it is no doubt true that the CAPM permits some flexibility in the choice of the inputs required by the model, it nevertheless requires that one remain true to the mathematical logic underlying the CAPM formula. In the present case, that requires a consistent use of the value of rf in both parts of the CAPM equation where it occurs so that the choice was either a five year bond rate or a ten year bond rate in both situations.

47 The ACCC erred in concluding that it was open to it to apply the CAPM in other than the conventional way to produce an outcome which it believed better achieved the objectives of s 8.1. In truth and reality, the use of different values for a risk free rate in the working out of a Rate of Return by the CAPM formula is neither true to the formula nor a conventional use of the CAPM. It is the use of another model based on the CAPM with adjustments made on a pragmatic basis to achieve an outcome which reflects an attempt to modify the model to one which operates by reference to the regulatory period of five years. The CAPM is not a model which is intended to operate in this way. The timescales are dictated by the relevant underlying facts in each case and for present purposes those include the life of the assets and the term of the investment.

48 The Tribunal is satisfied that the use by GasNet of a ten year Commonwealth bond rate to determine a Rate of Return on equity under s 8.30 of the Code was a correct use of the CAPM and was in accordance with the conventional use of a ten year bond rate by economists and regulators where the life of the assets and length of the investment approximated thirty years in the MRP calculation and the risk-free rate. …

48 See section 7.2 of the CEG companion report.

49 That is, if there are particular factors that are relevant on average to the historical level of CGS and its quality as a proxy for E[$R_{\beta=0}$] but these are not relevant under the current market circumstances then a mismatch exists.

explained the current fall in CGS yields in terms of factors (such as heightened demand from foreigner investors, and foreign government credit downgrades) that have the potential to create the same mismatch. For example, in the last 10 years foreign holdings of CGS have doubled (from around 35% to 70% of the supply).[50] This is consistent with advice by the RBA to the AER that falls in CGS yields have been associated with heightened demand from foreigner investors.[51] This involves a fundamental change in the structure of the holdings of CGS relative to just 10 years ago – let alone 50 or 100 years ago. It is not a safe assumption that the required return on CGS over the last 50 to 100 years can be assumed to be driven by the same assessments of risk driving today's CGS yields.[52]

84. An additional problem with the way McKenzie and Partington approach the task at hand is that they appear to be seeking a single rule (or 'predictive regression') for determining variations in $E[R_m]$. Such a rule would allow the AER to mechanically input 'regresssors' (e.g., dividend yields, corporate credit spreads, implied volatility, interest rates etc.) into the estimated regression equation and a 'conditional' E[MRP] would be obtained from the regression.

85. A single simple rule may or may not exist that is capable of predicting $E[R_m]$ in most circumstances (such that it would be found to have predictive power using the tests referred to in section 4 above). However, even if it was the case that such a rule did not exist, it would not mean that the AER's estimate of E[MRP] reflect information specific to current market conditions.

86. Consider a scenario where:

- a major bank/Government announces that it is going to default on its loans from creditors (or there is heightened speculation that this is going to occur);
- equity markets lose 25% in value on the news;
- government bond yields drop 2.5% on the news; and
- there is supporting evidence of heightened risk premiums in the form of:
  - statements from experts to the effect that this is the case; and
  - increases in measured spreads between government bonds and other assets, including low risk assets whose expected cash-flows are not affected by the announced default.

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50 AOFM data available at: http://www.aofm.gov.au/content/investors/bonds.asp?NavID=208.

51 See section 7.1 of the CEG companion report.

52 It is important to be clear that this is not suggesting that there is a better proxy available for the CAPM zero beta asset than CGS. It is simply pointing out that the characteristics/quality of that proxy cannot be assumed to be the same today as they have been through history.

87. In that scenario, we believe, that there is a strong case not to pass on the 2.5% lower government bond yields in a 2.5% lower estimate of the $E[R_m]$. We would submit that, in this scenario, it would be more appropriate to either keep the estimate of $E[R_m]$ unchanged or increase it.

88. Further, this advice is not dependent on there being historical evidence that, on average through history, there is a reliable inverse relationship between government bond yields and E[MRP]. Even if it is categorically proven that this is not the case on average, our advice would still be that in this specific scenario it is the case. Moreover, we would expect that this would be the advice of the great majority of, if not all, experts – including McKenzie and Partington.

89. This illustrates an error that the accompanying CEG Report[53] describes the AER as committing. Relying on the work of McKenzie and Partington, the AER concludes that there is not a strong consensus that E[MRP] and long term government bond yields are, on average through history, negatively correlated (although McKenzie and Partington do concede that "*the weight of evidence may somewhat favour a non–positive relation*"[54]). However, the AER relies on this advice to conclude that there is no case for *currently* concluding that the historically low CGS yields are associated with a heightened E[MRP] measured relative to CGS yields.[55] The lack of a relationship on average through history is not the same as a lack of a relationship in the circumstances at hand.

90. A specific case study of precisely this point is provided by the Roma to Brisbane Pipeline (RBP) averaging period which actually resembled the hypothetical scenario described above. Detailed analysis of this period is provided in the accompanying CEG Report.[56] However, the pertinent facts are that CGS yields during that period fell to their lowest levels since Federation, mainly on the back of growing concern about the credit-worthiness of European Governments and banks. CGS yields fell by 2.5% in a little over a year (see Figure 1 below) and the RBA attributed this fall to heightened risk aversion. Contemporaneously, spreads between CGS yields and state government debt and swap rates spiked to levels not seen since the worst of the GFC in early 2009. At the same time, a consistent application of a simple DGM model over time showed a similar spike in the estimated $E[R_m]$ to levels not seen since the worst of the GFC. Nonetheless, the AER passed 100% of the 2.5% of the fall in CGS yields into its estimate of a lower $E[R_m]$.

53 See section 8 of the CEG companion report.

54 McKenzie and Partington, *Review of the AER's overall approach*, February 2013, pp.5-6.

55 See section 6 of the CEG companion report.

56 See section 3 of the CEG companion report.

Figure 1: Risk free rate decisions for regulated energy businesses

Source: Regulator's decisions, CEG analysis. Note that 2009 decision for Energy Australia et al is before amendment by the ACT.

COMPETITION ECONOMISTS GROUP

7 Best estimate of $E[R_m]$

91. Based on the analysis of the literature variation in $E[R_m]$ is predictable and the best method for estimating this variation is the DGM model. In terms of current estimates of $E[R_m]$, these are around 12%. As noted in Section 4 of the CEG companion report:

    - SFG has applied a data intensive DGM analysis to arrive at an estimate of $E[R_m]$ in the second half of 2012 was 11.0%.[57] This is the discount rate used by investors to discount future cash dividends. This does not include any assumed value to investors from imputation credits. If this was scaled up to include the value of imputation credits implicit in regulatory precedent SFG estimate that it would be 12.2%.[58]
    - Over the same period, the simple AMP DGM method as described in the previous section, gives an estimate of 11.8% including the value of imputation credits (12.1% in the RBP averaging period);
    - Associate Professor Lally has also arrived at a range for the DGM cost of equity. He estimates a range of 9.2% to 11.7% (for December 2012 when the 10 year CGS yield was 3.26%). There are a number of problems with Lally's calculations. Fixing only some of these raises the range to 10.7% to 13.2%.

92. By contrast, the AER's method arrives at an estimate for $E[R_m]$ over the second half of 2012 of just 9.1% (8.95% in the RBP averaging period). This is around 3.0% lower than the first two DGM estimates – slightly more than the fall in CGS yields over the year leading up to the second half of 2012. It is 1.4% lower than the midpoint of Lally's unadjusted range (2.9% lower than the mid-point of the adjusted range).

93. In other words, DGM models would not have supported a reduction in $E[R_m]$ of 2.5% in the year leading up to the second half of 2012. By contrast, the AER's approach of assuming a fixed E[MRP] did precisely this. For the reasons already outlined we consider that this provides strong evidence in support of the superiority of the DGM method over the AER's method.

94. We also consider the question of the best estimate of the unconditional $E[R_m]$ in circumstances where one believes that variation in $E[R_m]$ cannot be predicted. The best estimate is the historical average realised return on the market.

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57 See table 4 of SFG, *Dividend discount model estimates of the cost of equity*, June 2013.

58 See table 2 of Appendix 2 of SFG, Dividend discount model estimates of the cost of equity prepared for the Energy Networks Association by SFG Consulting, June 2013. For a gamma of 0.25 an 11.0% return exclusive of imputation credits rises to 12.2% inclusive of imputation credits.

95. According to NERA's update[59] to the Brailsford et. al.[60] data the average real realised R_m for the Australian market, inclusive of the value of imputation credits, from 1883 to 2011 is 8.84%. Adding currently expected inflation of around 2.50% to the historical average realised real R_m provides an estimate of the current real $E[R_m]$ of 11.56%.

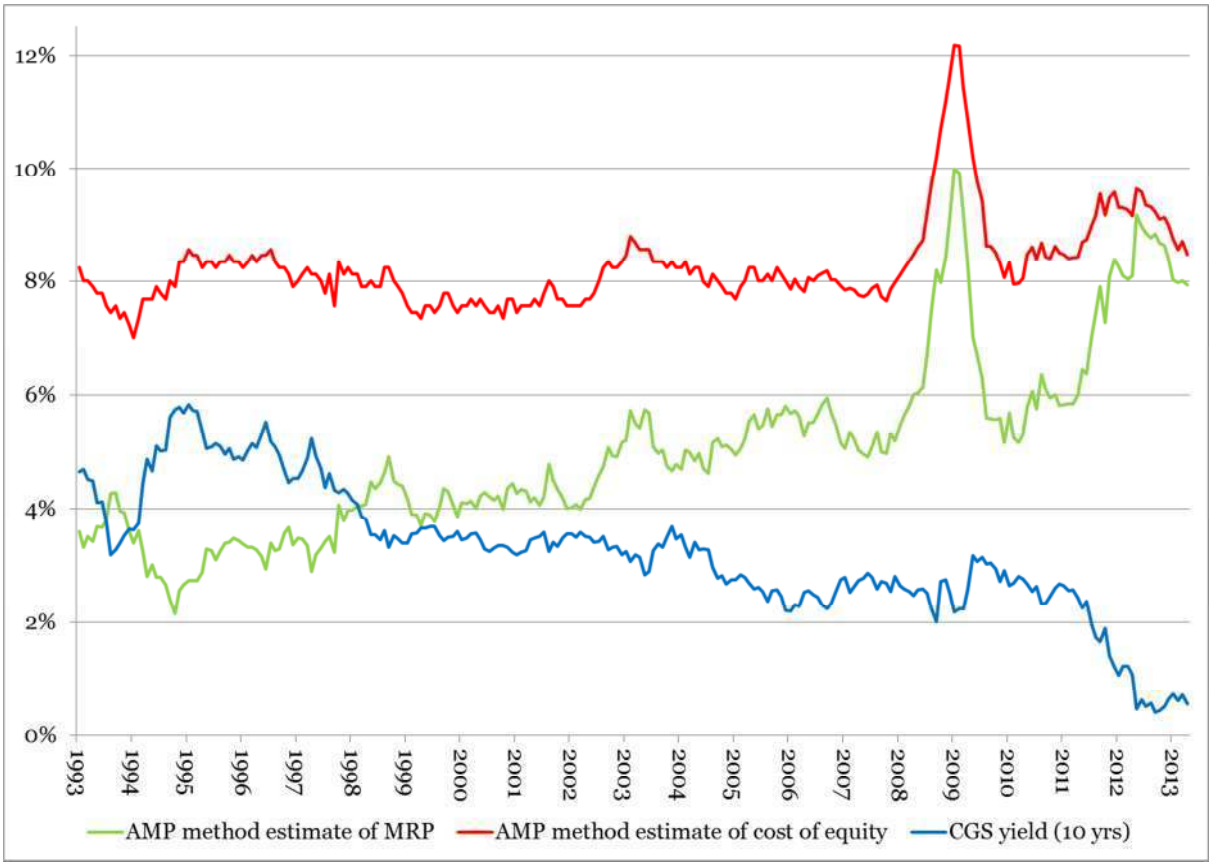
96. The DGM estimates and the historical average R_m figures are similar. Both the SFG's DGM estimates and the companion CEG Report's application of the DGM model tend to give stable estimates of $E[R_m]$ over time that are consistent with the historical average R_m. This can be seen in Table 4 of the SFG DGM report[61] (where $E[R_m]$ does not deviate far from its average of 10.6% (11.8% including imputation credits) and in Figure 2 below (taken from the CEG companion Report) which shows that the AMP method gives very stable estimates of $E[R_m]$ of a little over 8% in real terms (11.5% in nominal terms and including imputation credits).

59 NERA, *The market, size and value premiums*, 2013.

60 Brailsford, T., J. Handley and K. Maheswaran, *Re-examination of the historical equity risk premium in Australia*, Accounting and Finance 48, 2008.

61 SFG, *Dividend discount model estimates of the cost of equity*, June 2013.

Figure 2: AMP method estimate of real E[Rm] and E[MRP] relative to 10 year indexed CGS yields



Source: RBA and CEG analysis.

Appendix A Curricula vitae

COMPETITION ECONOMISTS GROUP

Economics of competition, regulation and damages

Curriculum Vitae

Dr Tom Hird / Director

Contact Details

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Key Practice Areas

Tom Hird is a founding Director of CEG's Australian operations. In the six years since its inception CEG has been recognised by Global Competition Review (GCR) as one of the top 20 worldwide economics consultancies with focus on competition law. Tom has a Ph.D. in Economics from Monash University. Tom is also an Honorary Fellow of the Faculty of Economics at Monash University and is named by GCR in its list of top individual competition economists.

Tom's clients include private businesses and government agencies. Tom has advised clients on matters pertaining to: cost modeling, valuation and cost of capital.

In terms of geographical coverage, Tom's clients have included businesses and government agencies in Australia, Japan, Korea, the UK, France, Belgium, the Netherlands, New Zealand, Macau, Singapore and the Philippines. Selected assignments include:

Selected Projects

- Advice to Chorus New Zealand on the estimation of the cost of capital;
- Advice to Wellington Airport on the estimation of the cost of capital;
- Advice to Vector on appeal of the New Zealand Commerce Commission decision on the cost of capital.
- Expert evidence in relation to the cost of capital for Victorian gas transport businesses.
- Advice to Everything Everywhere in relation to the cost of capital for UK mobile operators - including appearance before the UK Commerce Commission.
- Expert evidence to the Australian Competition Tribunal on the cost of debt for Jemena Electricity Networks.
- Advice to Integral Energy on optimal capital structure.
- Advice to ActewAGL on estimation of the cost of debt
- Advising NSW, ACT and Tasmanian electricity transmission and distribution businesses on the cost of capital generally and how to estimate it in the light of the global financial crisis.
- Advice in relation to the appeal by the above businesses of the Australian Energy Regulator (AER) determination.

- Expert testimony to the Federal Court of Australia on alleged errors made by the Australian Competition and Consumer Commission (ACCC) in estimating the cost of capital for Telstra.
- Advice to T-Mobile (Deutsche Telekom) on the cost of capital for mobile operators operating in Western Europe.
- Advising Vivendi on the correct cost of capital to use in a discounted cash flow analysis in a damages case being brought by Deutsche Telekom.
- Advising the AER on the cost capital issues in relation to the RBP pipeline access arrangement.
- Advising the ENA on the relative merits of CBASpectrum and Bloomberg's methodology for estimating the debt margin for long dated low rated corporate bonds.
- Advising the Australian Competition and Consumer Commission, Australia on the correct discount rate to use when valuing future expenditure streams on gas pipelines.

Bruce D. Grundy
Curriculum Vita
February 2013

Department of Finance, Faculty of Business & Economics
The University of Melbourne, Victoria 3010 Australia

Education

PhD, Finance, Graduate School of Business, University of Chicago. 1992.
Specialisations:
Finance and Economics. Beta Gamma Sigma. Dissertation: "Preferreds and Taxes." Committee: Merton Miller (Chairman), George Constantinides, Douglas Diamond.

B. Com. Honours (1st Class), University of Queensland. 1977.

Academic Positions

Professor of Finance, University of Melbourne 2005-2013.

Ian Potter Professor, Melbourne Business School, 2000-2005.

Professor of Finance, University of Melbourne, 1998-1999.

Andrew Heyer Term Assistant Professor of Finance, Wharton School, University of Pennsylvania, 1991-1998.

Assistant Professor of Finance, GSB, Stanford University, 1985-1990.

Visiting Positions:

Visiting Professor, London Business School, Fall 2013.

Visiting Professor, Wharton School, University of Pennsylvania, Fall 2005, Fall 2006, Fall 2007.

Visiting Professor, Singapore Management University, Fall 2005.

Visiting Professor, University of Chicago, Winter 2003.

Metzler Bank Professor, Johann Wolfgang Goethe-Universität Frankfurt am Main, Summer 1998.

Visiting Professor, Macquarie University, Summer 1994.

Publications

"Stock returns and the Miller-Modigliani valuation formula: Revisiting the Fama-French analysis," forthcoming *Journal of Financial Economics.* Co-authors: Gil Aharoni and Qi Zeng.

"Convertibles and hedge funds as distributors of equity exposure," 2012, *Review of Financial Studies* 25(10), 2077-3112. Co-authors: Stephen Brown, Craig Lewis and Patrick Verwijmeren.

"Do option markets undo restrictions on short sales? Evidence from the 2008 short-sale ban," 2012, *Journal of Financial Economics* 106(2), pp. 331–348. Co-authors: Bryan Lim and Patrick Verwijmeren.

"Investor sentiment, executive compensation, and corporate investment," 2010, *Journal of Banking & Finance* 34, pp. 2439-2449. Co-author: Michael Li.

"Disclosure, hidden charges and indexed pensions," 2005, *Agenda: A Journal of Policy Analysis and Reform,* 12(1), pp. 33-46. Co-authors: Diana Beal and Sarath Delpachitra.

"Stock market volatility in a heterogeneous information economy," 2002, *Journal of Financial and Quantitative Analysis* 37(1), pp. 1-27. Co-author: Youngsoo Kim.

"Momentum: Fact or factor? Momentum investing when returns have a factor structure," 2001*, Review of Financial Studies* 14(1), pp. 29-78. Co-author: Spencer Martin.

"Merton H. Miller: His contribution to financial economics," 2001, *Journal of Finance* 56(4), pp. 1183-1206.

"Generalized properties of option prices," 1996, *Journal of Finance* 51(5), pp. 1573-1610. Co-authors: Yaacov Bergman and Zvi Wiener.

"Option prices and the underlying asset's return distribution," 1991, *Journal of Finance* 46(3), pp. 1045-1070.

"Changing risk, changing risk premiums, and dividend yield effects," 1990, *Journal of Business* 63(1), pp. 51-70. Co-authors: Nai-fu Chen and Robert F. Stambaugh.

"Optimal investment with stock repurchase and financing as signals," 1989, *Review of Financial Studies* 2(4), pp. 445-465. Co-author: George Constantinides.

"Trade and the revelation of information through prices and direct disclosure," 1989, *Review of Financial Studies* 2(4), pp. 495-526. Co-author: Maureen McNichols.

"Call and conversation of convertible corporate bonds: theory and evidence," 1986*, The Analysis of Security Prices* 31, pp. 35-70. Co-author: George Constaninides.

"The behavior of stock prices around ex-dividend dates," 1983, *The Analysis of Security Prices* 28, pp. 83-114.

Edited Volumes

Selected Works of Merton Miller: A Celebration of Markets. Vol I Finance, 2002 (University of Chicago Press, Chicago, Ill.

Selected Works of Merton Miller: A Celebration of Markets. Vol II Economics, 2002 (University of Chicago Press, Chicago, Ill).

Other Publications

"An analysis of shareholder ownership patterns for Australian firms," forthcoming in *In The Black CPA Australia Magazine*. Co-authors: Dean Hamlon and Sean Pinder

"Stock return predictability in rational markets," 2007, *Insights: Melbourne Economics & Commerce* Volume 1 April.

"Real options analysis and investment appraisal: the opportunities and challenges," 2006, *Insights: Melbourne Economics & Commerce* Volume 4 November.

"Book Review: *Pricing and hedging of derivative securities* by Lars Tyge Nielsen," 2000, *Journal of Financial Research* 23, pp. 391-394.

Working Papers

"Disappearing call delay and dividend-protected convertible bonds," Co-author: Patrick Verwijmeren.

"Why are conversion-forcing call announcements associated with negative wealth effects?" Co-authors: Chris Veld, Patrick Verwijmeren, Yuriy Zabolotnyuk.

"Charitable fund raising: Matching grants or seed money," Co-author: Ning Gong.

"Can socially responsible firms survive competition? An analysis of corporate employee matching grants," Co-author: Ning Gong.

"Differential information and derivatives pricing," Co-author: Qi Zeng.

Work in Progress

"Option microstructure and the smile," Co-authors: Bryan Lim and Patrick Verwijmeren

"A market clearing explanation of the profitability of momentum strategies," Co-authors: Wei Li, Qi Zeng and Zhe Zhang

"Hoteling, OPEC and the term structure of expected future oil prices," Co-author: Richard Heaney.

"Valuation of crude oil and gas reserves," Co-author Richard Heaney.

"An analysis of shareholder ownership patterns for Australian firms," Co-authors: Dean Hamlon and Sean Pinder

Awards

2012 FIRN Best Policy Paper Prize

2012 Third Annual Financial Markets & Corporate Governance Research Prize

2010 Deakin University Quantitative Finance/Risk Management/Derivatives/Corporate Governance Conference Research Prize

1998 Geewax-Terker Research Prize

1994-95 Batterymarch Fellowship

2009, 2010, 2011 Faculty of Business and Economics Teaching Excellence Prize

2006, 2008 Faculty of Economics and Commerce Teaching Award

1994 Wharton Hauck Teaching Prize

1993 Outstanding Teaching Award (Wharton)

Grants

CPA Research Grant, "Links between Australia's taxation system and investment in Australian listed companies by different classes of resident and non-resident investors," 2012-2013, joint with Sean Pinder and Dean Hamlon. $40,000.

Faculty of Business and Economics Strategic Initiative Grant, "Neuro-Finance," 2012-2015, joint with Carsten Murawski. $600,000.

Australian Research Grants Council Discovery Grant, "Three Decades of Financial Distress and Corporate Restructuring in Australia" 2008-10, joint with Paul Kofman and Howard Chan. $104,537

Australian Research Grants Council Discovery Grant, "Storage and the Hoteling Valuation Principle: Understanding the Dynamics of the Oil Industry" 2007-09, joint with Richard Heaney. $345,000

National Science Foundation Grant, "Call and conversion of convertible bonds" 1985-1987, joint with George Constantinides. US$300,000

Professional Society Activities

Founding Member: FIRN

Fellow: Australian Society of Certified Practicing Accountants.

Member: SIRCA Research Committee

Member: American Economic Association, American Finance Association, American Mathematical Society, European Finance Association, Asian Finance Association, Western Finance Association.

Doctoral Colloquium Fellow: AFAANZ 2003 Colloquium, 2005 Colloquium.

Doctoral Consortium Fellow: AFAANZ 2004 Consortium

Doctorial Consortium Fellow: Asian Finance Association 2005

Doctorial Consortium Fellow: FMA Asia 2010

Australian Society of CPA's 1999 Research Lecture

FIRN Doctoral Tutorial Discussant: 2005-07.

FIRN Local Convener: 2006-2010.

FIRN Governing Council: 2011-2012.

Managing Editor:

International Review of Finance, 2004-2008

Associate Editor:

Journal of Finance, 2000-2003

Journal of Financial Research, 1999-2006

Accounting and Finance, 1999-2002.

Journal of Financial and Quantitative Analysis, 1992-1996.

Review of Financial Studies, 1988-1994.

International Review of Finance, 2008-present

Editorial Board:

Accounting and Finance, 2002-present

Business Research, 2007-present

Insights: The Faculty of Economics & Commerce, 2007-2010.

Ad Hoc Referee:

Agenda, American Economic Review, Australian Economic Review, Australian Journal of Management, Accounting and Finance, European Economic Review, European Journal of Finance, Financial Management, Financial Review, Journal of Accounting Research, Journal of Business, Journal of Business and Economic Statistics, Journal of Corporate Finance, Journal of Finance, Journal of Financial

Economic, Journal of Financial Intermediation, Journal of Financial Services Research, Journal of Political Economy, Journal of Public Economics, Management Science, Mathematical Finance, Review of Accounting Studies, Review of Quantitative Finance and Accounting, Review of Financial Studies, Quarterly Journal of Economics

Program Committee:

Australasian Banking & Finance Conference: 2010, 2011, 2012

American Economics Association Meetings: 1998

American Finance Association Meetings: 2001

ASU Sonoran Winter Finance Conference: 2012, 2013

Asian Finance Association Meetings: 2004, 2005, 2006, 2009, 2012

Asian FMA Meetings: 2009, 2010

Finance Down Under Conference: 2009, 2010, 2011, 2012, 2013

European Finance Association Meetings: 2000, 2001, 2002, 2005, 2010, 2011, 2012

European Financial Management Association Meetings: 1999

Indiana University Symposium on Design of Securities and Markets: 1993

Journal of Accounting Research Annual Conference: 2002, 2003

Western Finance Association Meetings: 1990, 1991, 1994, 1995, 1997, 1998, 2004, 2007, 2008, 2009, 2010, 2011, 2012, 2013

Review of Accounting Studies Annual Conference: 2004, 2005

Singapore International Conference on Finance: 2009, 2010

Society for Financial Econometrics: 2010

Financial Intermediation Research Society: 2010, 2011.

Reviewer:

Chair External Review Committee, ANU School of Business Department of Finance, Applied Statistics & Actuarial Science: 2010

Research Grants Council of Hong Kong: 1997, 2000, 2004, 2005, 2008, 2009

National Science Foundation Proposals: 1990, 1991, 1994, 1997

Australian Research Council: 1994, 1995, 2007

Social Sciences and Humanities Research Council of Canada: 1993 and 1994

Australian Accounting Research Foundation Exposure Draft on Director and Executive Disclosures

Singapore Management University Quantitative Finance Programme: 2003 through 2010

External Reviewer, Accounting & Finance Department, Monash University: 2002

Discussant:

Accounting & Finance Association of Australia and New Zealand Meetings: 2006, 2007

American Finance Association Meetings: 1986-900, 1994-95, 2006

Annual Conference on Financial Economics and Accounting: 1992 and 1996

ANU Summer Camp: 2008, 2009, 2010, 2011, 2012

Asia-Pacific Finance Association Meetings: 1999

Asian Finance Association Meetings: 2004, 2005, 2006, 2009

Asian FMA Meetings: 2010

European Finance Association Meetings: 1995, 2002, 2005, 2010, 2011, 2012

Fifth Annual Texas Finance Festival: 2003

Finance Down Under: 2011, 2012, 2013

FIRN Research Day: 2010

FIRN Annual Conference, The Art of Finance, Hobart: 2012

Paul Woolley Centre on Capital Market Dysfunctionality Conference: 2008, 2009, 2011

Simulation Based & Finite Sample Inference in Finance Conference: 2003

Singapore International Conference on Finance: 2008, 2009

Western Finance Association Meetings: 1993 and 1997

SIRCA Young Researcher Workshop 2012

Session Chair:

Accounting & Finance Association of Australia and New Zealand Meetings: 2003, 2004, 2005

Asian Finance Association Meetings: 2004, 2005, 2006, 2009

Asian FMA Meetings: 2010

Australasian Banking & Finance Conference: 2003, 2011

American Finance Association Meetings: 2001

European Finance Association Meetings: 2002, 2005, 2010, 2012

Western Finance Association Meetings: 1995

Keynote Speaker:

La Trobe University Conference on Financial Markets and Corporate Governance: 2012

Asian FMA Meetings: 2010

Accounting & Finance Association of Australia and New Zealand Meetings: 2003

Australasian Banking & Finance Conference: 2002

Conference Organization:

The Dollars and Sense of Bank Consolidation: MBS Conference 2002

Risk Management and Pricing for Financial Institutions: Lessons from the Closed-End Fund Industry: Wharton Financial Institutions Centre Conference 1995

Finance Down Under Conference: 2007, 2008, 2009, 2010, 2011, 2012, 2013

FIRN Asset Pricing Group Meetings: 2013

Conference Presentations:

Australian Conference of Economists: 2006

Asian Finance Association Meetings: 2004, 2005 and 2006

Asian FMA Meetings: 2010

Australasian Q-group: 1999, 2004

Finance Down Under: 2010

HKUST Annual Finance Symposium: 2004

Third National Symposium on Financial Mathematics: 2004

AGSM Finance and Accounting Camp: 1996, 1997 and 1999

American Finance Association Meetings: 1986, 1989, 1990, 1996, 1997, 1998

NBER Summer Institute: 1998

Annual Conference in Financial Economics and Accounting: 1995 and 1996

American Mathematical Society Meetings: 1996

European Finance Association Meetings: 1995, 2002, 2005, 2010, 2012

NBER Financial Risk Assessment and Management Conference: 1995

N.J.C.R.F.S. Conference in Security Design and Innovations in Financing: 1993

Western Finance Association Meetings: 1984, 1989, 1993, 2010

Sixth Annual Conference MSMESB: 1991

Australasian Banking and Finance Conference: 1989, 2007, 2011

ZEW Centre for European Economic Research, Mannheim: Conference on the Economics of Charitable Fundraising: 2009

World Finance Conference, Cyprus: 2013 (co-author presentation)

Seminar Presentations:

Australian Graduate School of Management, Australian National University, Bond University, Boston College, Carnegie-Mellon University, Central Queensland University, Chinese University of Hong Kong, Columbia University, Commodity Futures Trading Commission, Cornell University, Dartmouth College, Deakin University, Duke University, Fields Institute for Research in Mathematical Sciences, Hong Kong University of Science and Technology, Humboldt University, Indian School of Business, Insead, La Trobe University, London Business School, London School of Economics, Macquarie University, Massey University, Melbourne Business School, MIT, Monash University, National University of Singapore, New York University, Northwestern University, NUS Risk Management Institute, Odense University, Ohio State University, Queen's University, Queensland University of Technology, Singapore Management University, Stanford University, Rutgers, University of Aarhus, University of Adelaide, University of Alberta, University of British Columbia, University of California Berkley, University of California Irvine, University of California Los Angeles, University of Chicago, University of Frankfurt am Main, University of Houston, University of Illinois Champaign, University of Oregon, University of Maryland, University of Melbourne, University of Michigan, University of Minnesota, University of New South Wales, University of North Carolina Chapel Hill, University of Queensland, University of South Australia, University of Sydney, University of Technology Sydney, University of Vienna, University of Western Australia, University of Washington in St Louis, Vanderbilt University, Victoria University Wellington, Washington University, Yale University

Manuscript Reviewer:

University of Chicago Press

Cambridge University Press

Academic Press

Teaching Experience

Derivatives-related courses: Honours, Masters and PhD courses on options, futures, swaps, mortgage-backed securities and exotics.

Corporate Finance-related courses: Honours, Masters and PhD courses on capital budgeting, mergers and acquisitions, corporate taxation, agency problems, information asymmetries, and security design.

Corporate Governance: MBA course

Real Options and Resource Projects: Undergraduate and MBA courses

Financial Management: Executive MBA course

Executive Education:

ABN Amro, Australian Graduate School of Management, KPMG, Liechtenstein Global Trust, Melbourne Business School, PaperLinx, PWC, Susquehanna Investment Group, Telstra Risk Management and Assurance, Turkish Capital Markets Board, Wharton School Pension Funds and Money Management Program

Member of Thesis Committees:

Completed (first appointment):

Mahmoud Agha (University of Western Australia), Alya Al Foori (Sultan Qaboos University), Ken Bechmann (Copenhagen Business School), Jacob Boudoukh (New York University), Cynthia Cia (Monash University), Jennifer Carpenter (New York University), Yangyang Chen (Monash University), Adam Dunsby (Goldman Sachs), Michael Gallmeyer (Carnegie-Mellon), Pekka Heitala (Insead), Terry Hildebrand (Enron), Ron Kaniel (University of Texas), Youngsoo Kim (Alberta), Michele Kreisler (Morgan Stanley), Guan Hua Lim (University of Singapore), Hui Li (Deakin), Zhenhua Liu (RepuTex), Spencer Martin (Ohio State), Krishnan Maheswaran (Melbourne University), Ed Nelling (Georgia State), Ian O'Connor (Melbourne University), Rob Reider (J.P Morgan), Mark Vargus (University of Michigan)

In Progress: Chelsea Yao (University of Lancaster), George Wang, Michelle-Joy Low, Bill Zu, John Tan, Emma Li.

External PhD Examiner:

Aarhus University, UTS, University of Sydney, University of Western Australia, University of New South Wales, Massey University

Administrative Positions

University of Melbourne

Cost Containment Committee: 2007.
Business@Melbourne Coordinating Committee: 2007-2008.
Melbourne Business School Committee: 2006-2011.
Academic Structures Working Group: 2008-2009.

University of Melbourne, Faculty of Business & Economics:

Acting Dean and Deputy Dean, Faculty of Business & Economics: 2006-2008.
Head, Department of Finance: 2010-2012.
Deputy Head, Department of Finance: 2008-2010.
FEC Advisory Board: 2007-2008.
Convener Melbourne Derivatives Research Group: 2006-2010.
Finance Seminar Convener: 2007-2009.
FIRN Local Coordinator: 2006-2011.
PhD Coordinator, Department of Finance: 2007, 2009-2011.
Accounting and Finance Department Committee: 1999.
Research and Research Training Committee: 1999, 2007, 2009-2011.
International Committee: 2009.
SSPL Committee: 2009.
Academic Promotions Committee: 2009-2011.

University of Melbourne, Melbourne Business School:

Director Ian Potter Centre for Financial Studies: 2000-2005
Academic Planning and Development Committee: 2002-2005.
Curriculum Committee: 2002-2005.

The Wharton School:

Convenor Corporate Finance Workshop: 1995-1997.
Wharton Fellows Fund Oversight Committee: 1993-1997.
Recruiting Committee: 1995-1996.
Finance Seminar Convener: 1992-1994.

Stanford Graduate School of Business:

Finance Seminar Convener: 1988-1990.
Deans Advisory Committee: 1986-1988.