Cost of Equity Issues: A Report for the AER
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January 16, 2011.

Background

This report has been prepared at the request of the Australian Energy Regulator who requested that it should address the following major arguments:

- The Sharpe CAPM should not be used to set the rate of return on equity for a service provider. In particular, the Sharpe CAPM:

  o relies on four theoretical assumptions, and each of these assumptions results in a downwardly biased estimate of the rate of return for low-beta firms.

  o can be rejected on the basis of empirical evidence (published in academic journals) that shows it produces a downwardly biased estimate of the rate of return for low-beta firms.

  o is only well accepted when implemented in a 'non-static' form.

- The imprecision of any one model suggests that multiple models should be used to establish the reasonableness of the cost of equity

- The Black CAPM should be used to set the rate of return on equity for a service provider. In particular:

  o the theoretical problems with the Sharpe CAPM are resolved by the use of the Black CAPM.

  o the empirical evidence (published in academic journals) is consistent with the predictions of the Black CAPM.

  o the additional input parameters (return on a zero-beta portfolio) can be accurately estimated for an Australian context.

- The Fama–French three–factor model should be used to set the rate of return on equity for a service provider. In particular:

  o there is theoretical problems with the Sharpe CAPM are resolved by use of the Fama–French model

  o the empirical evidence (published in academic journals) is consistent with the predictions of the Fama–French model

  o the additional input parameters (size and value premiums) can be accurately estimated for an Australian context.

- The dividend growth model should be used to set the rate of return on equity for a service provider. In particular:

    o the theoretical problems with the Sharpe CAPM are resolved by the use of the dividend growth model.

    o the empirical evidence (published in academic journals) is consistent with the predictions of the dividend growth model.

    o the additional input parameters (forecast dividends and share prices) can be accurately estimated for an Australian context.

- The method based on market analyst assessment should be used to set the rate of return on equity for a service provider.

- The method based on cashflow analysis to meet credit rating metrics should be used to set the rate of return on equity for a service provider.

- In determining whether the rate of return of equity derived from the models and/or methods is commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services, the AER should compare the rate of return on equity with

    o Theoretically predicted differences between the cost of equity and cost of debt

    o Observed dividend payments to listed energy utility companies

    o Estimates of the MRP based on the spread between AAA and BBB debt

    o Estimates of the MRP based on implied volatility analysis

- Contrary to the AER's previous claims, observed variance between returns for utilities and the market indicate that regulated businesses did not provide a safe haven for investors during the GFC.

The project brief asked that I specifically consider the arguments regarding the cost of equity capital in the Envestra September 2010 submission on access arrangement proposals for the 2011–16 regulatory control period and reports submitted to the AER by Envestra authored by:

- Professor Bruce Grundy[1]

- Competition Economics Group (CEG)[2]

I have been provided with and have read and complied with the Federal Court of Australian Practice Note CM7.

The structure of this report is as follows. First I will make some general remarks about the use of models in the calculation of the cost of equity. Second, I will draw on those

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[1]   Grundy, *The calculation of the cost of capital: A report for Envestra*, 30 September 2010.
[2]   CEG, *Estimating the cost of capital under the NGR: A report for Envestra*, September 2010.

remarks in briefly reviewing a number of relevant recent studies of the CAPM (and other asset pricing models) published in leading academic journals. Third, I will specifically address the questions posed in the consultancy brief and will make some comments on a number of related issues raised in the submissions to the AER provided as part of the consultancy. The conclusion provides my opinions on the questions posed by the AER in the consultancy brief.

My qualifications and experience are provided in Appendix 1 to this Report.

1.   Introductory Remarks
Any model of asset pricing is an approximation to reality, and will be built upon a number of assumptions which may not correspond to reality. The models may also use concepts (variables) which are unobservable and for which imperfect proxies must be used in implementing or testing the models.

In assessing such models there are various possible approaches. One is to ignore the divergence of assumptions from reality and focus solely on whether the model predicts the empirical phenomenon it seeks to explain, and does not imply other phenomenon which are inconsistent with reality. An alternative extreme is to focus on the reality of the assumptions and dismiss models which have unrealistic assumptions even if they explain the phenomenon in question (on the grounds that a false proposition, such as all creatures can fly, can imply a true proposition, such as sparrows can fly). More generally, researchers will aim to identify whether empirical "failures" of a model are due to its core assumptions being invalid, or whether "auxiliary" assumptions required to implement or test the model are the cause of failure.

Asset pricing models such as the CAPM or the Fama-French three factor model, have as their objective the explanation of determinants of returns required by investors on risky assets. The critical issue is that of whether particular factors can be identified which are responsible for, and which can explain, differences in the risk premiums in required returns on different assets. The required returns are also referred to as expected returns by financial economists by relying on an assumption that asset prices equilibrate in efficient markets through supply and demand influences. If, given the current price of an asset, investors' expectations about future cash flows or future market value of that asset imply an expected return different to their required return, they will buy or sell that asset causing its price to adjust until it equates expected and required returns. Thus, the theories are simultaneously theories of equilibrium asset prices and *required* and *expected* returns. The theories do not purport to fully explain *actual* returns, since these can differ from *expected* returns due to a variety of factors including news about future cash flows which cause investors to reassess the appropriate price of an asset. If actual returns are a poor proxy for expected returns, the ability of a theory of *expected* returns to explain *actual* returns may be limited.

In the case of the Sharpe CAPM, core assumptions include: a one-period world; rational investors; efficient asset markets; no transactions costs; a "market" portfolio consisting of

all risky assets; the existence of a risk-free asset. With these assumptions, it is possible to derive the well known CAPM relationship:

$E(r_i) = r_f + \beta_i [E(r_m - r_f)]$

in which: r_i, r_m and r_f are the returns on risky asset i, the market portfolio and the risk free asset respectively, and where $E(.)$ represents expectations at the start of the period.

It is clear that some of the core assumptions are invalid, and much subsequent research has been aimed at generalizing the model to allow for more realistic assumptions. Thus, the Black CAPM removes the assumption of a risk-free asset (replacing its role with a zero-beta portfolio), while Merton's ICAPM extends the analysis to a multi-period setting. None of these extensions (like the original CAPM) provides any guidance on the length of the period (minutes, days, months, years) involved.

But it is also important to note that in implementing the model, a number of auxiliary assumptions must be made, because key components of the model are unobservable or unknown. For example, the model relates expected returns on individual assets to the expected market risk premium – and neither of these expectations are known or observable. It is also not generally possible to identify the market portfolio, and the systematic risk measure (β) reflecting forward looking covariances and variances in returns is assumed to be known to investors, but is unobservable. In practice, proxies for these unobservable variables are used, and empirical failings of the model may reflect inadequacies of the chosen proxies rather than of the model itself. For example, actual returns are used rather than expected returns, and beta (β) is estimated from historical relationships between returns. More generally, in a well known paper, Roll (1977) argued that tests of the CAPM were, in fact, only tests of whether the assumed proxy for the market portfolio of all risky assets was a mean-variance efficient portfolio or not.

More generally, empirical testing of the model requires application over many time periods, and there is nothing in the model which implies that the parameters of the model will be the same in different time periods. This has led to the distinction between the conditional and unconditional CAPM, in which it is recognized that the CAPM equation could vary period by period, perhaps in some systematic relationship to other observable factors. Unless the influence of those other factors is allowed for (the conditional CAPM), empirical tests of the CAPM, assuming parameter constancy across multiple periods (the unconditional CAPM), may reject the CAPM, even if the conditional variant is valid. The conditional CAPM leads to an unconditional CAPM relationship in which expected asset returns depend on both a market risk factor and an additional factor reflecting the effect of the temporal variation in the conditional CAPM relationship. (See, for example, Jagannathan and Wang, 1996)

The Intertemporal CAPM (ICAPM) developed by Merton (1973) also leads to the market risk factor being supplemented as an explanator of expected returns by an additional factor resulting from potential movements in the investment opportunity set at the start of the next period. While the "hedge portfolio" representing this additional factor cannot be specified *a priori*, this model provides a rationale for inclusion of additional variables in CAPM estimation where those variables are viewed as proxies for the hedge portfolio. As

in the case of the single period CAPM, the suitability of any such proxies is open to debate.

The Fama-French three factor model (discussed later) has also been argued to be consistent with the ICAPM, with the two additional factors (HML and SMB) being interpreted as proxies for shifts in the investment opportunity set. The apparent ability of this model to explain differential returns on portfolios of assets grouped according to book to market ratios and size, has made it popular in empirical work. But there exists substantial disagreement on its merits and on whether it is superior to the CAPM. Recent CAPM-related studies examined in the next section illustrate some of the relevant issues.

2.   Recent CAPM Studies

There have been a significant number of recent studies examining the CAPM and other asset pricing models published in recent years in leading academic journals. The following discussion provides a brief overview of approaches and implications, and illustrates what I interpret to be the lack of general agreement on the superiority of alternative asset pricing models to the CAPM. In conjunction with other studies, however, they do suggest that there are alternative factors which should be included in an unconditional CAPM reflecting either the conditional nature of the CAPM or the greater realism of the ICAPM. However, agreement on which additional factors are warranted has not been reached.

Cohen, Polk and Vuolteenaho (2009) adopt a long-horizon approach (involving 5 years or more) to examining the CAPM, in contrast to most other studies which examine returns measured over short time horizons. They argue that tests of an asset-pricing theory are joint tests of that theory and of market efficiency. Using short horizon (daily, monthly) data may lead to rejection of a theory because of the possibility of market inefficiency which will affect measures of both first and second moments (expected returns, variances and covariances) upon which such tests are based. Using a longer horizon is, they argue, also consistent with buy and hold strategies and with corporate capital budgeting decisions. While the asset-pricing model under consideration may not be able to explain the short run returns of interest to professional money managers, these may reflect primarily deviations from market efficiency and wealth redistributions between traders.

Their approach focuses on explaining asset prices rather than returns, since over a long horizon prices are the dominant determinant of returns. It also involves an alternative, fundamental, method of estimating beta, using the covariance between longer term cash flows of the firm and the market. This reflects a view that potential estimation errors can be induced from market inefficiency when high frequency data is used and, more importantly, that over a longer term horizon it is covariances of cash flows which are most important in determining risk.

Their results, using US data, lead them to suggest that "the CAPM in conjunction with market efficiency may provide a good approximate description of the level of stock prices" (p 2742). They find that their cash-flow (fundamental) CAPM betas are able to explain a substantial proportion of differential returns on value and growth portfolios. However, their empirical results do involve estimates of the market risk premium which are somewhat high relative to the observed historical values.

Llewelyn, Nagel and Shanken (2010) critique the test procedures used in many recent examinations of asset pricing theories, noting that much of the emphasis has been on explaining differences in returns on portfolios sorted by book-to-market ratio and by size. They argue that the construction of such portfolios involves a factor structure closely related to Fama and French's SMB and HML factors (which were constructed to explain CAPM anomalies in returns across book-to-market and size portfolios), and that explanatory variables which are correlated with those factors will appear to provide a good explanation for returns.

They also argue that implied restrictions on estimated coefficients should be taken seriously as a test of asset pricing models. Drawing on the analysis of Brennan (1971) which includes the Black CAPM as a special case, and the argument that under the CAPM the zero beta has zero systematic risk and thus should have an expected return equal to the risk free rate, they cast doubt on results of studies which estimate and interpret an intercept well above the risk free rate as the zero beta rate. .

> "Most clearly, theory says the zero-beta rate should equal the risk free rate. A possible retort is that Brennan's (1971) model relaxes this constraint if borrowing and lending rates differ, but this argument isn't convincing in our view: (riskless) borrowing and lending rates just aren't sufficiently different – perhaps 1–2% annually – to justify the extremely high zero-beta estimates in many papers." (p 183)

Statistical complications when testing asset pricing models is also the topic examined by Ray et al (2009). They argue that commonly used test statistics are inappropriate and that "the evidence for rejecting the CAPM on statistical grounds is weaker than the consensus view suggests".

Campello, Chen and Zhang (2008) argue that the use of realized returns as a proxy for expected returns creates problems for asset pricing tests, referring to simulation evidence demonstrating that wrong inferences can be drawn due to non-convergence of actual to expected returns except over very long horizon windows, and empirical observation of long periods during which relative stock and bond returns do not conform to theoretical predictions. They derive estimates of expected equity returns from corporate bond yields (drawing on credit default models which create a link between those yields and expected equity returns), and use these in their tests. They find that the market beta plays a significant role and that their "evidence suggests that previous evidence that beta is dead might have resulted from the use of average returns as a poor proxy for expected returns." (p1299). They also find evidence that size and book-to-market are related to expected returns and thus reflect risk factors.

Adrian and Rosenberg (2008) use a variant of the intertemporal CAPM in which short and long term components of equity market volatility are additional factors to the market risk premium. In cross sectional regressions on portfolios sorted on market-book and size they find that all of their three factors contribute to the explanation of returns, with pricing errors comparable to those of the Fama-French model. They also find that adding the HML and SMB factors to their three factor model adds little in terms of explanatory power (as measured by the root mean square pricing error) although the coefficients of these factors are statistically significant. (They attribute this to differences in explanatory power of the volatility and FF factors across the different portfolios examined). Sensitivity of stocks to either volatility component affects required returns. The estimated "negative prices of volatility risk mean that assets with high returns in states of the world with high volatility are expensive (i.e., they have low expected returns)". Sensitivity to market risk increases required returns, with estimates of the price of market risk (Table IV) lying between 0.34 and 0.45 per cent per month.

An alternative approach to using realized returns as a proxy for expected returns is use of the *implied cost of capital*. This is estimated as the discount rate which equates expected future earnings of the company to its current equity market value, and uses analysts earnings forecasts (and some terminal value assumption) and the relationship between retained earnings and changes in the book value of equity. It can be shown to be equivalent to the dividend discount model. Pastor, Sinha and Swaminathan (2008) note that a number of cross sectional studies using this approach have found conflicting results regarding the role of the market risk factor as a determinant of expected returns.

Levy and Roll (2010) address the question of testing the CAPM when the market portfolio used in practice is mean-variance inefficient. As is well known, tests which reject the CAPM may be instead rejecting the hypothesis that the market portfolio chosen is mean-variance efficient. They ask the question of whether it is possible to adjust estimated CAPM parameters (stock returns and variances) in such a way as to make the assumed market portfolio mean-variance efficient while keeping those adjusted parameters relatively close to their estimated values. The rationale for this approach lies in the existence of estimation errors associated with sample expected returns and variances/covariances. They find that they are able to find adjusted parameters lying (generally well) within a 95 per cent confidence interval of the estimated values which lead to accepting the hypothesis that the chosen market portfolio is mean-variance efficient, consistent with the CAPM. Furthermore they argue that using the estimated beta (calculated using original parameters) in the Security Market Line equation provides a reliable estimate of expected returns if the number of assets is large. (While the market return should be adjusted to reflect the adjustments to its constituent assets, Levy and Roll suggest that the actual and adjusted return will generally be relatively close).

In a recent survey of studies of the cross section of asset returns, Subrahmanyam (2010) summarizes that the "research at this point presents a rather unsatisfying picture of a morass of variables, and an inability of us finance researchers to understand which effects are robust and which do not survive simple variations in methodology and use of

alternative controls." He notes that additional factors included in studies come from a variety of sources including informal "Wall Street Wisdom", theoretically motivated risk factors, behavioral/mispricing perspectives, and market frictions. He documents at least fifty factors which have been used in studies examining returns on (essentially the same data set of) US stocks. As well as the Fama-French factors augmented by momentum and liquidity factors, a range of macro-economic based factors have been used. Variables motivated by the conditional CAPM and ICAPM have been used, and some authors have examined the effects of decomposing beta into several components reflecting different sources of systematic risk. Various factors based on the Consumption CAPM have also been used, and other studies have included variables which aim to pick up effects on returns from asset mis-pricing and behavioural effects (rather than risk factors).

Levy (2010) addresses the challenge to the CAPM posed by the behavioral economics perspective which challenges the expected utility framework on which the CAPM is built. He argues that the CAPM survives even when a prospect theory depiction of behavior is preferred to the expected utility approach. He also argues that departure from a normal distribution of returns as required for derivation of the CAPM (unless conditions such as quadratic utility are assumed) does not substantively invalidate the CAPM. He also argues that the use of *ex post* parameters as proxies for the *ex ante* parameters implied by the model is a major factor leading previous studies to reject the CAPM.

Another (not yet published) recent study is by Da, Guo and Jagannathan (2010).[3] They argue that because stock prices reflect valuation of both a firm's existing projects and real options available to it "the expected return on stocks need not satisfy the CAPM even when *project* expected returns do". This is initially demonstrated by means of a simulation. They also argue that their study provides "new empirical evidence to argue that there is little evidence against the use of the CAPM for estimating the cost of capital for *projects*". Their approach involves estimating real-option-adjusted returns and real-option-adjusted betas by taking the residuals from regressions of estimated (excess) returns and betas on variables believed to be positively correlated with the magnitude of real options (capex growth, idiosyncratic volatility, leverage, inverse of the interest coverage ratio).[4] The option adjusted betas perform well in a CAPM of option adjusted returns, giving support to the CAPM as a model of project returns. One possibly contentious feature of their empirical work is the use of "aged betas", involving use of betas estimated two or more years earlier, reflecting a view that non-instantaneous adjustment of markets to changes in risk perceptions makes these more appropriate. However, their empirical results for standard time-series and cross-section tests (Table 2) are consistent with "aged beta" performing better than recent beta in both CAPM and FF models, particularly when the sample excludes very small stocks and "momentum" stocks (those with very large positive or negative recent returns). One question unanswered by their analysis is whether betas estimated from stock returns can be reliably used in estimating the cost of equity for projects rather than the adjusted betas.

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[3] This is a revised version of the NBER Working Paper 14889 referred to by the submissions to the AER.
[4] These variables are measured relative to the average market value.

This brief overview of a number of recent studies in well regarded academic journals suggests a number of conclusions. First, there is ongoing debate about the statistical tests appropriate and suitable for discriminating between and rejecting alternative asset pricing theories. Second, there is a wide range of additional explanatory variables which have been added to the standard CAPM as additional risk factors. While some have theoretical underpinnings, there remains disagreement on whether they are capturing priced risk factors. Third, the evidence is mixed on whether alternative models outperform the static CAPM, although recognition that the CAPM is conditional with parameters which can vary over time is important.

This latter point has implications for the approach which might be taken by regulators such as the AER. Because CAPM parameters (betas and the MRP) are reviewed every five years, there is recognition that they can potentially vary over time as the conditional CAPM implies. At the same time, by relating required returns only to market beta risk (and the current MRP and risk free rate), it is assumed that the risk arising from (future) time variation in beta and the MRP (and the risk free interest rate) is not priced (ie a determinant of required returns). Nor are other potential risk factors which might be based on an ICAPM model assumed to be priced. Because the AER approach does not explicitly link changes in assumed CAPM parameters to explicit risk factors (and the empirical evidence does not provide clear guidance on how to do so) it may be appropriate to refer to it as an "implicit conditional CAPM" approach.

3.   Alternative Approaches and Models

Sharpe CAPM
The Sharpe CAPM is well known and has been subject to extensive empirical testing. It is a single period, static model which relates expected asset returns to the risk free rate and a risk premium related to the MRP given by
$E(r_i) = r_f + \beta_i [E(r_m - r_f)]$.
The theoretical assumptions of the Sharpe CAPM have been argued by CEG, Grundy and Envestra to imply that the cost of equity for low beta stock is higher than predicted by the Sharpe CAPM. Those arguments are based essentially around an argument that the Black CAPM is a preferable model. If it is (but see below) the arguments are theoretically correct, but their empirical significance is limited.

First, with unequal borrowing and lending rates, the Black model implies a flatter CAPM relationship and higher cost of equity for low beta stocks than does the Sharpe CAPM. However, the differential will be no greater than that between the different intercept values given by borrowing costs and the risk free rate (and these can be relatively low – see below). Second, if the Black model applies and there are equity market transaction costs, the zero beta rate will be higher than the risk free rate to reflect those costs. The size of this effect is unknown. While bid-ask spreads and other market transactions costs are particularly important for investors undertaking trading strategies which imply short holding periods, they become less relevant when longer holding periods are considered. Moreover, such costs apply (to varying degrees) to all equities (not just the zero beta

portfolio) implying effects on the required return on the market portfolio and potentially upon beta estimates in ways which are not easy to determine *a priori*.

Third, the market portfolio involves a wider range of assets than the equity market which is typically used as a proxy. It is suggested (Grundy, para 13) that the volatility of the equity market will exceed that of the true market portfolio. This is not necessarily the case, since the relative volatilities will depend upon the relative size of volatility of the equity market and other risky assets, and the covariances between them. It is also not necessarily the case that the expected return on the equity market will exceed that on the true market portfolio. The fact that the equity market may not be an efficient mean-variance portfolio implies that it is not possible to make any inferences about whether the Sharpe CAPM biases estimates of the cost of equity for low beta firms downward.

Fourth, the single period nature of the Sharpe CAPM is well recognized as a weakness of the model, both in theory (leading to the ICAPM) and for empirical testing (leading to the conditional CAPM). As discussed earlier, there is ongoing empirical work attempting to identify appropriate other risk factors to supplement the standard CAPM, but little in the way of widespread agreement.

It is appropriate at this point to note that the ICAPM could imply that an estimated zero-beta rate exceeding the risk free rate in a single period CAPM could, as Grundy (para 20) states, be interpreted as implying that the zero beta portfolio has risk sensitivities to changes in the investment opportunity set which lead to its expected return exceeding the risk free rate. But no evidence is presented to support that interpretation, and the conclusion in Grundy's para 21[5] does no more than assert a non-zero probability of that interpretation being correct, not that it is a high probability.

One strength of the Sharpe CAPM is that it is easily implemented in calculating the cost of equity, although recognizing its conditional nature means that parameters such as beta and the MRP can vary over time, and there is limited guidance available from research on the likely magnitude and precise determinants of such variations.

Black CAPM
The Black CAPM is an internally consistent theoretical analysis of asset pricing in a one period world which generalizes the Sharpe CAPM to the case where there is no risk-free interest rate and/or where investors are unable to borrow or lend at the risk-free interest rate. In these circumstances, the CAPM generalizes to the relationship:
$$E(r_i) = E(r_z) + \beta_i \left[E(r_m - r_z) \right]$$
where r_z is the return on a portfolio Z (the *zero beta portfolio*) which has returns uncorrelated with those of the market portfolio.

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[5] That conclusion (my emphasis added) is "The cost of equity for a zero beta stock **can** exceed the risk-free rate and the cost of equity for all stock with betas less than (greater than) one **can** exceed (be less than) the cost predicted by the Sharpe CAPM".

While it may be argued that there is no truly risk free investment (governments may default, and the real value of currency can change) in practice it seems appropriate to assume that there is some domestic currency risk-free investment available to investors. On the other hand, assuming that investors are able to borrow at the risk-free interest rate is clearly less tenable. However, it is important to note that it is possible for institutional investors to borrow at rates close to the risk-free interest rate. For example, secured short-term borrowings such as repurchase agreements (or via securities lending) typically involve effective borrowing costs only a small number of basis points above the risk-free interest rate.

To provide some indication of these borrowing costs, I have compared the interest rate on borrowings from the RBA using repurchase agreements (for government securities) for approximately 30 days maturity with yields on 30 day Treasury Notes.[6] For the period April 2009 to December 2010, the average difference was 5 basis points. While this comparison involves transactions with the Reserve Bank rather than purely private sector transactions, it suggests that the margin between the interest rate on "risk free" borrowing opportunities for wholesale market participants and the government risk free rate is relatively low.

With borrowing and lending opportunities available, the zero beta expected return will lie within the range given by those borrowing and lending rates. While it will be above the risk-free interest rate, it will not lie above the available borrowing rate.

This observation is relevant for assessing the implications of early CAPM studies which found that the relationship between security returns and beta was flatter and with higher intercept than consistent with the Sharpe CAPM. One interpretation of that result is that it is consistent with the Black CAPM – for which the intercept is the zero beta expected return which is higher than the risk-free interest rate. There are, however, other interpretations. One is that the market portfolio used in the tests is not mean-variance efficient. If so, the intercept of the estimated equation will not be an unbiased estimator of the zero-beta expected return. Another interpretation (along the lines suggested by Lewellyn, Nagle and Shanken, 2010) is that the estimated zero-beta expected returns are so different to the risk free interest rate as to not be credible, implying that the Black CAPM is not supported.

One problem in implementing the Black CAPM is that the expected return on the zero beta portfolio is not *ex ante* observable, unlike the risk free interest rate. It is tempting to infer the zero beta return from the intercept of a cross sectional regression of individual security (or portfolio) returns on betas of those securities (portfolios). However, this is subject to the criticisms made above (ie that the results simply demonstrate use of a market portfolio which is not mean-variance efficient) and thus that the intercept term may be a biased estimate of the zero-beta rate even if the Black CAPM applies.

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[6] The calculation involved extracting repurchase agreements of maturity between 25 and 35 days, taking the last available figure for the month, comparing this with the 30 day Treasury Note rate on the same day, and averaging over the sample. For two months there were no matching observations and for the nineteen "end of month" comparable rates, the average Treasury Note rate was 3.97 and the Repo Rate was 4.02.

Grundy (Table 1, column 4) presents estimates of the ratio [(Rm-R0)/(Rm-Rf)] from four studies (where R0 is the zero beta rate in his notation). Without more information, it is difficult to assess the reliability and precision of these estimates, and exactly how the calculation is made. (For example, several of the papers present a range of results for the estimated equations, and it is not obvious which of those results have been used). Moreover, two of the papers referenced, while classic studies, are over thirty five years old (involving even older data), and it can be asked whether estimates derived from a past era in which the financial system had greater transactions costs (which could affect the relationship between R0 and Rf) remain relevant. [7]

I have attempted to replicate his estimate in the case of the Kothari, Shanken and Sloan (1995) paper (KSS), by noting that for the regression

$$R_i = \gamma_0 + \gamma_1 \beta_i + u_i$$

the estimated coefficients γ_0 and γ_1 correspond to R0 and Rm-R0 respectively. Given a value for Rf,

$$[(Rm\text{-}R0)/(Rm\text{-}Rf)] = \gamma_1/(\gamma_1 + \gamma_0 - Rf)$$

KSS state that the average value of Rf over their estimation period is 3.7 per cent p.a. which equates in decimal form to 0.003 per month. They present a range of estimates of the regression equation above based on different portfolio formation methods in their Table 1. Extracting the relevant coefficients for each equation presented, the Table below presents estimates of the ratio [(Rm-R0)/(Rm-Rf)] for the period 1927 to 1990.

Portfolios	γ_0	γ_1	Rf	$\gamma_1/(\gamma_1+\gamma_0\text{-}Rf)$
20, beta ranked	0.76	0.54	0.003	0.416345
20, size ranked	0.30	1.02	0.003	0.774487
100, beta and size ranked independently	0.63	0.66	0.003	0.512821
100, first beta, then size ranked	0.57	0.73	0.003	0.562837
100, first size, then beta ranked	0.58	0.71	0.003	0.551671

The estimate of 0.416 in the first row of the table appears to correspond to Grundy's estimate of 0.415. But it is clear from the rest of the table that this is only one possible estimate (and the lowest of those estimated using the other results in Table 1 of KSS). Moreover, each of these estimates is subject to estimation risk, and it is not straightforward to derive reliable confidence intervals.

I am unable to find the corresponding data in the Da, Guo and Jagannathan (2009) study to undertake the same calculation. Similarly I am not able to find the results in that paper which support the entry in column 3 of Grundy's (Table 1) implying that this study rejects the Sharpe CAPM. My reading of this paper (see earlier) is that while the CAPM may not appear valid when equity returns are used in standard tests, this reflects a number

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[7] I note that Durack, Durand and Maller (2004) reach a tentative conclusion in their study using Australian data that one estimated equation "suggests that the risk-free rate of return may be slightly higher than the zero beta return." (p157)

of factors including the incorporation of real option values into equity prices and does not preclude use of the Sharpe CAPM for estimating the cost of equity capital for specific projects.

FFM

The Fama French three-factor model has become popular in empirical work, but whether it is superior to the Sharpe CAPM remains widely debated. Fama and French's additional factors (HML – based on differential returns on portfolios of firms with high and low market to book ratios, and SMB – based on differential returns on portfolios of small versus large firms) were constructed in response to empirical anomalies found in early studies of the CAPM. Consequently, they perform well as factors explaining differential returns on portfolios of stocks sorted by market to book ratios and size.

While there is no theoretical derivation of these factors, one interpretation is that they proxy for changes in the investment opportunity set which the ICAPM implies leads to a role for additional factors in addition to the MRP. One response to this has been a number of studies which use variables more firmly grounded in theory to see whether these "drive out" the Fama-French factors as explanatory variables in studies of returns on portfolios sorted by market to book and size, often with some apparent measure of success. However, Llewelyn, Nagel and Shanken (2010) argue that because such portfolio construction leads to return patterns which are "known to be explained" by one or two factors (HML, SMB), use of additional factors correlated with those will give apparently successful results.

Another response to the Fama-French model has been to argue that its apparent empirical success reflects "characteristics" rather than "risk factors". If mispricing occurs, returns may be linked to market-book ratios due to eventual correction of that mispricing. Other characteristics of stock pricing may include real option values.

The Fama-French factors can be constructed for the Australian equity market, making implementation of this model feasible. However, the results of studies attempting to implement a Fama-French model for Australia have had mixed results, and my opinion based on examining these studies is that there is not strong evidence to support its use.

The review of recent literature in Section 2 above indicates, in my opinion, that there is no settled view on whether the Fama-French model is superior to the Sharpe CAPM. An absence of theoretical foundations for the Fama-French model is a weakness, while the various studies which indicate that the role of the HML and SMB factors is weakened or removed by alternative specifications or methods of testing of the CAPM also cautions against its use.

Dividend Growth Model

The assumption that the value of an asset is equal to its expected future cash flows discounted at a required rate of return which reflects the risk of those cash flows is fundamental to finance. Assuming that all cash flows available to shareholders are

eventually distributed as dividends leads to the dividend discount model, whereby the share price is equal to the discounted value of expected future dividends. Further simplifying assumptions that future dividends will grow in perpetuity at rate *g* from the next dividend (paid in one period) of D_1 leads to the result that the current share price $P_0 = D_1/(r-g)$, where r is the assumed discount rate (cost of equity).

It is possible to use this model to derive an implied discount rate, by inverting the relationship to give $r = D_1/P_0 + g$, where the resulting cost of equity depends upon the assumptions about the next dividend (D_1), its expected growth (g), and the current share price (P_0). In practice, the assumption of constant perpetual growth in dividends is not realistic for individual companies, although it has some merit when considering economy-wide magnitudes, where the growth rate of aggregate dividends can be expected to correlate with long-run nominal GDP growth. But even there, volatility of GDP growth weakens its applicability.

Consequently, an alternative approach is to forecast future dividends over some relatively short time horizon and calculate the current share price as the discounted value of those dividends plus the (discounted) share price at the end of that horizon. This leads to solving for r in a relationship of the form:

$$P = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + ... \frac{D_N}{(1+r)^N} + \frac{TV_N}{(1+r)^N}$$

in which TV_N is the assumed *terminal value* share price at the end of the period (N) up to which dividend forecasts have been made. The merit of this approach is that variations in expected near-term dividends can be allowed for (by, for example, using analyst forecasts), but the problem arises of forecasting of the terminal value term (TV_N) which in most applications accounts for the majority of the valuation. That is often done by assuming a constant dividend growth model from that date, based upon the last dividend D_N.

The weaknesses in this approach are that (a) it depends upon forecast values for future dividends over the horizon, and (b) the appropriate terminal value is likely to be affected by the dividend values assumed over the horizon. In that latter regard, consider a situation in which with a one-period horizon, a company has earnings of $20 in that year. If dividends are assumed to be $0 the retained earnings should cause the terminal value share price to be $20 higher than if dividends are assumed to be $20 and there are no retained earnings.

Unless the interrelationships between assumptions about earnings, cash flow, dividends and terminal value are carefully spelt out, and shown to be consistent, this approach may be unreliable.

This is potentially a significant issue in the calculations by CEG (section 6.2) applying the DGM to Australian utility stocks. The securities listed in Table 6 are, I believe, primarily stapled securities (combining both shares and loan notes) issued by trust structures. Investor cash flows (often referred to by analysts as "dividends") paid by these companies are, depending on the nature of the securities, some mix of true dividends,

return of capital, and an interest component). To the extent that this is the case, the capital component of those payments should be deducted from the "dividend" in performing the calculation. Alternatively the terminal value assumption should reflect the decline in capital value of the securities due to repayments of principal. Similarly, projecting "dividend" growth, if current dividends are measured to include both true dividends and loan interest requires recognition that the loan interest component will not grow (and likely decline as loan principal outstanding declines). The capital growth component of security holder returns also depends upon the relationship between the non-capital payments (dividends, interest) and earnings per security, which can be seen to be quite variable. Without more detailed information on the "dividend" forecasts and assumptions involved in the calculations by CEG it is not possible to assess the robustness of their results.

To illustrate the issues involved I present in the Table below information sourced from the Annual Reports of two of the utility companies (Envestra, ENV and SP Ausnet, SPN).

Company	Item (cents per share/security)	2009	2010
ENV	Earnings	3.8	2.8
	Unfranked dividend	1.89	2.75
	Partially franked dividend	-	2.75
	Loan Note Interest	3.9	-
	Loan Note Principal	4.39	-
	Total Distribution	*10.18*	*5.5*
SPN	Earnings	6.99	8.09
	Franked Dividend	2.647	3.2
	Loan Interest	3.594	4.579
	Capital Return	5.574	2.148
	Total Distribution	*11.815*	*9.927*

Approaches used by Analysts

It has been suggested that the approaches used by analysts and market specialists such as Investment Banks in performing company valuations should be considered in determining the cost of equity. Specifically, it has been noted that such valuations often involve the use of a number of different "models" to ensure consistency. Thus, for example, a valuation may be performed using: (a) discounted cash flow valuation using a cost of equity derived from the CAPM (or otherwise); (b) a dividend discount model; (c) a multiples approach in which use of some measure such as a price/earnings ratio from comparable companies is applied to the earnings of the company in question to derive a price estimate. In some cases, a DCF valuation may be made at the *entity* level (using a WACC and equity value determined by subtracting the value of debt) or at the *equity* level (using cost of equity and cash flows to equity).

It is appropriate to think of this use of multiple approaches as a form of *triangulation*, in which recognition of potential measurement or estimation errors warrants comparison from different perspectives. It is important to note, however, that this does not involve use of incompatible or inconsistent approaches. It can be shown that DCF, dividend discount, and comparable multiples approaches are all consistent in the sense that there is some set of inputs which would lead to all approaches giving the same valuation. Thus, if different valuations arise from the different approaches, it is then appropriate to revisit the assumed input parameters of each approach to determine the causes of divergence and, as appropriate, make adjustments to those input parameters to achieve closer convergence and consistency of results between the outputs of those compatible models.

This is in distinct contrast to a situation where there are competing alternative models which purport to explain or predict the same variable. Taking some average of results from different, incompatible, models requires a judgement that none of the models is to be accorded greater weight than the others, even if it is viewed to be better founded. It also opens the door to disputes over weights to be applied to different models and raises the question of what criteria to use in excluding possible models. While in the real world of imperfect information the "true" cost of equity capital can never be established with 100 per cent confidence, estimates based on a single generally accepted model seem likely to lead to more reliable results and less scope for disputes based on opinions which cannot be subject to rigorous testing,

Analysts from broking firms also provide estimates of future dividend yields for regulated entities. However, it is not apparent that for many such entities these are estimates of dividends *per se* as opposed to estimates of distributions which encompass dividends, interest payments on loan notes and returns of capital. Even where they are specifically estimates of dividends these are only one component of returns – capital gains being the other. Broker analysts also provide estimates of future share prices for such firms, providing a potential estimate of expected capital gains. However, these are generally accompanied by buy, hold or sell recommendations premised on a view that market prices are not in line with market fundamentals (for buy or sell recommendations) and not generally linked to an estimate of a required rate of return. Moreover, the analyst forecasts are also often premised on a judgement about future regulatory decisions, making use of such forecasts in forming regulatory decisions problematic at best.

Cross Checks: Ratings, Valuation and Returns

In the building block model used by Australian access regulators, an WACC is calculated based on an estimated cost of equity and an estimated cost of debt associated with a specified credit rating and an assumed (notional) gearing (debt/assets) ratio. An access price time path is derived based on demand projections over the regulatory horizon. This, in turn, implies a net revenue stream for the firm which, in conjunction with payout policy, capital expenditure and financing decisions, will determine the path of the firm's actual gearing ratio over time. Internal consistency of the model requires that current gearing, projected cash flows and other relevant financial ratio indicator variables are consistent with the specified credit rating (eg BBB). It is also necessary that the firm is expected to be able to maintain the assumed credit rating over time and thus be able to

raise debt finance on the terms assumed. It is possible to check whether the time paths of particular financial ratios which are outputs of the model are consistent with the assumed credit rating used as an input by reference to standards used by the ratings agencies. But because ratings agencies may take additional factors into account, and the regulated firm has flexibility in payout, capex, and financing decisions, there are likely to be a range of model outputs consistent with the assumptions used.

Checking the model output against the assumptions used is important in ensuring consistency. However, finding an inconsistency does not provide direct guidance on which model inputs should be adjusted. Most elements of the building block model which influence earnings and cash flows (cost of equity, cost of debt, leverage, depreciation etc) could conceivably be adjusted.

In addition to cross-checking the assumed credit rating against forecast financial ratios etc., it is also important to note that a cross-check against stock market ratings is readily available. It is straightforward to show that if access prices are set using the correct cost of capital such that expected future net cash flows provide both the required return to capital and the full return of capital, the market value of equity plus debt will (at the start of the regulatory period) equal the book (regulatory) value of assets. If market and book value of debt are equal, this implies that the market value of equity should be equal to the book value of net assets (the regulatory asset base less debt outstanding). (Within the regulatory period, the valuation may differ because of unanticipated changes in risk premia or cash flows). In principle, if market value exceeds book value, this suggests that the regulatory rate of return is above that required by investors, and the converse when book value exceeds market value.

In practice, there are various factors which might cause market and book value to differ at the date of regulatory determination. For example, regulated entities may be also involved in other non-regulated activities where they are able to earn excess returns, or where there are potential growth opportunities valued positively by the market, leading to a market value in excess of book value. Alternatively, the regulatory approach assumes a particular financial and operating structure for regulated entities, which may be sub-optimal, such that different leverage or organizational structure (eg trusts) enables a higher rate of return (for example by optimizing tax treatment). Similarly, if regulatory decisions are based on a "stand-alone" approach involving a particular set of regulated assets, but regulated entities operate several such sets of assets and are able to extract operating synergies, these synergies would show up in a higher market valuation. On the down-side, market concerns about "regulatory risk" (typically expressed as the risk that future regulatory decisions will not allow an appropriate rate of return) could cause market values to be below book values.

While implementing this cross-check prior to the finalization of a regulatory determination may be difficult, it can be applied *ex post* to test whether prior regulatory determinations have exhibited any biases in determination of cost of equity. Examining the sale values of regulated entities can also, subject to the caveats above, provide relevant information on how market based required returns relate to regulatory returns.

CEG (Section 4.4) also suggest that the experience of the Global Financial Crisis can be used as a form of cross-check by arguing that the poor stock market performance during this period of regulated utilities suggests a beta closer to 1.0 (para 50). The weakness in this argument lies in the implied assumption that actual returns are indicative of expected returns over a relatively short period of time, and particularly at a time of significant market disruption.

It is well known that actual stock returns can be attributed to changes in expectations about future cash flows and/or changes in required rates of return. An increase in the required rate of return would, *ceteris paribus*, lead to a fall in stock price, and a negative actual rate of return over that period when the (positive) required return had increased. (The lower price, given unchanged future expected cash flows, means an increased expected rate of return). Similarly, a reduction in expected future cash flows would, *ceteris paribus*, lead to a negative actual return.

Thus, to infer that utilities had a beta greater than unity from their having negative returns slightly greater than those of the market over the period January 2008 to March 2009 (Table 2, Figure 2, CEG)[8] requires an assumption that there was no difference in the "news" affecting those firms relative to the market. Given the disruption to the financial markets at the time, this would be a bold assumption! Indeed, CEG (para 51) refer to "..regulated utilities exposure to …refinancing heavily geared businesses"

It is worth examining the assertion that short period actual returns can implying something about expected returns in the light of the remark from Edward Elton in his Presidential Address to the American Finance Association in 1999. "There are periods longer than 10 years during which stock market realized returns are on average less than the risk-free rate (1973 to 1984)! There are periods longer than 50 years in which risky long-term bonds on average underperform the risk free rate (1927 to 1981)!" (Elton, 1999, p 1199).

To infer that the performance of regulated utilities stock prices relative to the market generally during the GFC can be interpreted as them having higher betas than used in prior regulatory asset pricing would require substantially more analysis and evidence than provided. There is no *a priori* reason, of which I am aware to support such an inference. I also note that the assertion in CEG (para 49) that "when estimating betas we should give most weight to the betas that exist in periods when risk is high" seems to be a *non sequitur*. Noting that betas may be time-varying and perhaps positively correlated with market volatility (although not all betas can vary that way since their average (the market beta) must equal unity!) does not lead to such a conclusion. In the absence of evidence to the contrary, there seems no reason to depart from the more usual approach of determining individual company betas by using a sufficient time span of data to enable underlying relationships to be picked-up, and also considering information from portfolios of "comparable" companies in order to avoid distortion of results from the effect of "news" specific to that company on its realized rate of return.

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[8] It is not clear from the CEG report whether the returns relate solely to share price movements or are based on accumulation indices (ie including dividends).

Relative Cost of Debt

It has been argued (CEG, Section 5.2, drawing on Grundy, para 38-41) that finance theory provides some consistency checks on the relative cost of debt and equity. This argument is derived from the Modigliani-Miller (MM) irrelevance theorem, whereby the value of the firm is unaffected by leverage. As a first (and minor) comment, it should be noted that this result is based on a number of assumptions, including zero corporate taxes and no financial distress costs. The assumption of zero taxes is clearly inconsistent with reality – unless it is assumed that franking credits are fully valued ($\gamma = 1$) such that corporate taxes are washed out.

More importantly, this argument does not, of itself, provide any substantive information about the relationship between the debt premium and the cost of equity. The reason is straightforward. The MM relationship, when expressed in terms of rates of return on debt and equity, applies to the *expected* rates of return. The debt premium, and cost of debt commonly used in a WACC calculation, relate to a *contractual (promised)* rate of return on debt – which will generally exceed the expected return because of default risk.

The fallacy in the argument can be seen from a simple example. Consider a company established for a cost of $1 which will provide a gross return in one period of $3 with probability 0.5 and $0 otherwise. The expected net return $r = 50$ per cent. Assume that the required return on unlevered equity is $r^e_u = 50$ per cent, such that this is a zero NPV proposition. Consider the extreme alternative case[9] where the company is financed instead by 100 per cent debt (with equity receiving any residual income). Suppose the promised return on debt is $r_d = 200$ per cent. The expected return to debt holders is then $r^*_d = 50$ per cent (because they received all cash flows from the company).

This simple example illustrates the fallacy in using arguments based on the behavior of the expected return on debt and equity as leverage changes to draw inferences about the relationship between the expected return on (equivalently, cost of) equity and the contractual interest rate on debt. Imposing greater structure by modeling of default probabilities and loss given default may enable some relationship to be derived, but would be conditional upon the assumptions involved therein (and assumptions about the applicability or otherwise of the MM irrelevance theorem).

Estimating the MRP from contemporaneous data

It has been suggested that estimates of a forward looking market risk premium should be obtained by reference to contemporaneous risk measures such as the spread between bonds with different credit ratings (eg AAA relative to BBB) or implied volatility of the equity market (such as derived from option prices and summarized in indices such as the VIX).

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[9] This is unrealistic, but should be interpreted as the limit as the financing approaches 100 per cent debt.

As noted by CEG, some authors, such as Jagannathan and Wang (1996) have previously used the spread between BBB and AAA bonds as a proxy for the forward looking market risk premium. They assume a linear relationship between the MRP and the spread, and it is not clear whether that relationship would persist in a financial crisis such as that of 2007-2009. There has been much debate about whether the freezing of bond markets and explosion in credit spreads has been due to liquidity issues or solvency issues. And while higher spreads are consistent with higher underlying stock volatility, they may also reflect upward assessments of loss given default (lower recovery rates). A higher spread is likely to be consistent with a higher MRP, but the strength of the relationship in times of a financial crisis is difficult to assess. Petkova (2006) includes a default spread variable as one of the indicators of changes in the investment opportunity set in an ICAPM and finds it relevant, and that the Fama-French SMB factor may be a proxy for that effect. (This study also finds that an ICAPM using four state variables (innovations in dividend yields, term spread, default spread, and T Bill rate) as well as the market factor outperforms the Fama-French model).

Similarly, a higher level of market volatility is likely to be associated with an increase in risk which translates into a higher MRP, but again the strength of the relationship is difficult to assess.

It has also been suggested that the MRP can be derived from application of the Dividend Discount Model to the stock market as a whole. This involves finding the discount rate which equates the present value of projected future aggregate dividends to the current stock market capitalization, and subtracting the risk free rate from that figure. CEG (Section 6.3) undertakes such analysis and, using a variety of assumptions obtain a quite wide range of estimates. That, in itself, illustrates the dangers in using this approach for anything more than a "ballpark" estimate of the MRP. The quite high MRP estimates obtained by CEG partly reflect the high assumed growth rate of dividends over the initial few years. But the even higher estimates obtained in Table 9 when the MRP is assumed to revert to a lower value at some future date indicate how sensitive these calculations are to such assumptions which affect the Terminal Value at that date.

This is illustrated in the simplified example in Table below which uses essentially similar data to that of CEG. The initial price (market capitalization) is 1172, next dividend is 72 and growing at 10 per cent for the next four years. Thereafter the growth rate is *glong* = 0.6 and in column 4 the discount rate from year 4 onwards is assumed to be *rlong* = 0.11, whereas in column 6 it is assumed to be 0.12. It can be seen that the Terminal Value (Price) at year 4 is substantially lower when the higher discount rate is used. The discount rate over the period 0 to 4 which makes the present value of year 1 to 4 dividends plus year 4 Terminal Value (Price) equal to the current price is solved for as *rshort*. Increasing the long term growth rate by one percentage point reduces the implied short term discount rate by almost five percentage points (from 0.215 to 0.167) in this example.

rlong	0.11	0.12
glong	0.06	0.06
gshort	0.1	

Year	Dividend	Price	DCF	Price	DCF
0		1172	1172	1172	1172
1	72		59.24694		61.67397
2	79.2		53.62805		58.11176
3	87.12		48.54205		54.7553
4	95.832	2108.304	1010.583	1756.92	997.459
5	105.4152				
		r short	0.215253	r short	0.167429

Because of that high degree of sensitivity of calculations of the short term discount rate to assumptions about long term discount rates (or growth rates) this method is unlikely to give reliable results.

Industry Practice and the MRP

Graham and Harvey (2009) provide an alternative method of estimating the MRP – that of directly asking Chief Financial Officers what their view is. Their survey data for the USA extends quarterly from June 2000 to February 2009 and relates to CFO estimates of the longer term (ten year) MRP. They find that the average survey MRP estimate had fallen from around 4.5 per cent per annum at the start of the decade to around 2.5 per cent just prior to the crisis (2006) and subsequently increased to over 4 per cent in 2009 (and was 4.7 per cent (median value 4.3) in February 2009). There was increased dispersion of views. Examining the time-series behavior of their results, they find some evidence of a slight negative relationship between past market returns and the survey MRP, a weak positive relationship with the real interest rate, and a strong positive correlation between the survey MRP and an index of stock market volatility (VIX) and also with a credit spread measure (Baa-Treasury yield). In a subsequent paper (Graham and Harvey, 2010) they find that the survey MRP had returned to pre-crisis levels by June 2010.

4.   Conclusion

In direct reference to the questions posed in the consultancy brief:
   (a) it is my opinion that (i) the theoretical assumptions of the Sharpe CAPM do not necessarily lead to a downward bias estimate of the required rate of return for low beta firms (ii) the empirical evidence does not clearly demonstrate such a bias (iii) there is general agreement that the CAPM needs to be viewed in a conditional form – but that the precise determinants and size of that conditionality (and hence variations over time in beta, MRP etc) are not well agreed.The AER's approach of revisiting the CAPM parameters at each regulatory review is consistent with a conditional approach, although it does not involve any specific formulation of how such conditionality is reflected in current values or future changes in asset parameters. That approach could, perhaps, be referred to as an "implicit conditional CAPM".
   (b) It is my opinion that (i) the Black CAPM does not resolve the problems of the Sharpe CAPM; (ii) is not better supported than the Sharpe CAPM by available empirical evidence; (iii) its implementation is problematic because of problems in reliably estimating the zero beta return.

(c) It is my opinion that (i) the Fama French model cannot resolve theoretical issues in asset pricing because its foundations are empirical rather than theoretical; (ii) the empirical question of the model's superiority over the Sharpe CAPM (or other asset pricing models) remains contested; (iii) it would be possible to implement the Fama French model in Australia, but the studies which have done so to date have found conflicting results which do not, in my opinion, provide strong support for its use.

(d) It is my opinion that the Dividend Growth model is not superior to the Sharpe CAPM for estimating the cost of equity for an individual firm neither on theoretical ground nor on available empirical evidence, and that there are sufficient difficulties in its application to limit its use to at best "ballpark" estimation at an aggregate market level.

(e) It is my opinion that the approach of market analysts in using a variety of models to estimate company values involves use of compatible approaches but that this is not equivalent to use of competing models in estimating the cost of equity.

(f) It is my opinion that it is appropriate to "cross-check" the assumptions made about credit ratings used in the "building block" model by analysis of the predicted cash flows. Inconsistencies could be due to factors other than the assumed cost of equity.

(g) It is my opinion that (i) while theory can provide information on the theoretical relationship between the cost of equity and cost of debt, the relationship can not be straightforwardly derived from the Modigliani-Miller irrelevance relationship; (ii) "dividend" payments by utility companies may involve some return of capital and thus cannot be used to assess the cost of equity capital; (iii) while the debt credit spread is likely to be positively correlated with the MRP the size and strength of the relationship is unclear; (iv)while implied stock market volatility is likely to be positively correlated with the MRP the size and strength of the relationship is unclear.

(h) The experience of utility stocks during the GFC, taken by itself, does not provide any reliable information about their systematic risk.

I, Kevin Davis, have made all the inquiries that I believe are desirable and appropriate and no matters of significance that I regard as relevant have, to my knowledge, been withheld from the Court.

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APPENDIX 1.

Kevin Davis   Bio

I am currently Professor of Finance in the Department of Finance at the University of Melbourne, having been appointed as Professor of Finance at that University in 1987 I was appointed as Inaugural Director of the Melbourne Centre for Financial Studies, a joint venture of Melbourne, Monash and RMIT Universities and Finsia, established in 2005, and am currently its Research Director.

I have a B.Ec (Hons) from Flinders University and an M.Ec from ANU, and am a Senior Fellow of Finsia, a Fellow of the Finance and Treasury Association, and Fellow of the Australian Mutuals Institute.

I have written numerous books and articles in peer reviewed journals on economics and finance which are detailed in my curriculum vitae, available at www.kevindavis.com.au where copies or links to many of the papers are available. Among those items, there are several which deal with the determination of the cost of capital.

I have consulted extensively, including to the Australian Consumer and Competition Authority, on matters such as valuation, the cost of capital, financial market reform. I have developed and presented training courses for financial institutions, financial market regulators, and corporate treasurers.

Current research interests include financial markets and instruments, financial institutions management, financial regulation, financial engineering, corporate finance and valuation. I have co-authored/edited sixteen books and published numerous chapters in books and articles in academic journals including *Journal of Regulatory Economics, Journal of Banking and Finance, Journal of Derivatives, Griffith Law Review.*

I have extensive consulting and training experience and am a regular contributor to public debate on financial matters.

In 2003 I was appointed by the Federal Treasurer to prepare a report on "Financial System Guarantees", assessing the case for introduction of deposit insurance, and which provided the background for the introduction of the Financial Claims Scheme.

I am a director of: SIRCA; Melbourne University Credit Union; Financial Management Association of Australia.

I am co-chair of the Australia-New Zealand Shadow Financial Regulatory Committee.