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[redacted]

14th October 2020

Dear Sir/ Madam

Re: Nyrstar submission on the AER draft working paper on CAPM and alternative return on equity models

We note the theoretical basis and preference in using the Sharpe Lintner Capital Asset Pricing Model (CAPM) by the Australian Energy Regulator (AER) among other regulatory bodies nationally and internationally. We also acknowledge the submission by Partington and Satchell dated the 30th June 2020. However, there is a significant body of empirical evidence that suggests CAPM does not provide an adequate description of the economic reality of equity returns. Our concern is that the regulatory process will continue to use an approach with known flaws. In summary, the key limitations of CAPM are:

- It assumes that investors use the mean-variance framework for decisions however, in practice investors are likely to weight 'negative' returns more than 'positive' returns;
- The CAPM assumes a symmetrical return distribution that is characterised by mean and variance only with a normal distribution. However, distribution of returns of assets maybe skewed and have kurtosis and be approximated by log normal distributions instead. CAPM allows for risk to be measured by variance and not skewness;
- The assumption that investors have homogeneous expectations is not realistic. In practice, heterogeneous expectations are more likely and hence each investor will have their own capital market line;
- The assumption that there are no transaction costs is not appropriate because transaction costs affect net returns received by investors;
- The existence of tax also impact investor's behaviour as investors may seek to invest in companies because of the company's dividend policy suits their tax position (e.g. franked dividends);
- The CAPM also implies that equity beta (β) is constant. This may also be violated in reality as companies change strategies or business/ industry cycles affect earnings performance and returns and hence β;
- Empirical evidence indicates that whilst the CAPM predicts a linear relationship between systematic and excess return there are periods where there may be no correlation of excess returns and β; and
- CAPM assumes a single period investment horizon which is also unrealistic. Investors may change their strategy over time.

The model that is universally used to test empirically the CAPM is $R'_p = Y_0 + Y_1\beta_p + e_p$

Where $R'_p = R_p - R_f$ = excess return on portfolio 'p' where R_f is the risk free rate

β_p = prior estimate of the beta value of portfolio 'p'

e_p = random error term

The hypotheses for CAPM are that the constant term Υ_0 should not be significantly different from zero, the slope Υ_1 is significantly less than the difference between the excess return on the market portfolio and that on the risk free asset. Furthermore, that there is a linear relationship between rate of return R'_p and systematic risk and no other factors other than beta explain the variability in rate of return. Empirical evidence does support linearity between the rate of return and systematic risk. However, the other hypotheses are rejected for example factors other than beta have been found to contribute to the variance in rates of return for example; Price-Earnings Ratios, firm size and dividend yield have some explanatory power.

Whilst linearity of rate of return and beta provides some support for CAPM, betas are not constant. There is a strong argument that supports predictive betas (forward looking betas). A number of company characteristics can affect its beta for example, earnings cyclicality, management quality, earnings volatility, gearing and growth strategies among others. If CAPM is to be retained using historic beta is not appropriate as it leads to estimation errors in betas and forward looking (predictive) betas would be more preferable rather than a static backward looking parameter. The other issue is that beta is applied uniformly to all firms subject to economic regulation which may penalise some firms and provide excess regulatory returns to others due to the fact that firms have different beta profiles. The comparator set for estimating betas has also diminished so that the sample is not statistically relevant anymore and thus different approaches should be used in estimating betas. From an end user perspective minimising the extent of inefficient over compensation is the objective. Hence, providing more weighting to forward looking factors and a wider comparator set for beta should be the focus.

Whilst the AER draft working paper has considered various other cost of equity models/ approaches another approach could have been explored that has advantages over the CAPM. These are multi-factor Arbitrage Pricing Models (APM). Whilst the Fama and French (FF) models (FF 3 factor model) and possible variants (the addition of momentum and/ or liquidity factors) were discussed and rejected on the grounds on weak empirical evidence or weak theoretical bases. Nonetheless the APM has certain advantages over CAPM and is considered more robust namely (noting that CAPM is a special case of APM);

- The APM makes no assumptions about the distribution of asset returns whereas CAPM assumes it is joint normal;
- The APM makes no assumptions about an investors utility function other than that they prefer more wealth than less and that they are risk averse;
- APM can be applied to a multi-period framework; and
- APM can be empirically tested using a subset of assets without having to identify and measure returns on the efficient market portfolio.

The strength of the APM approach is that returns of an asset are a function of anticipated and unanticipated events such as unanticipated inflation, changes in industrial production, unanticipated shifts in risk premiums and movements in the shape of the term structure of interest rates. Whilst factor identification may be difficult and that assets can be affected by idiosyncratic forces the model has a stronger theoretical basis in explaining cross-sectional variation in asset returns. One suggestion would be to use CAPM and APM to provide guidance in establishing the cost of equity rather than exclusive reliance on one method such as an averaged approach. The argument that because other regulators use a preferred method such as CAPM is not an adequate justification that two methods (or maybe even three methods) cannot be used. The basis for this counter argument is that using mixed approaches provides the best attributes of each methodology in determining the cost of equity leading to a more robust calculation method. Should the CAPM approach be retained the AER could commence investigation into APM as a 'side project' to test the methodology in terms of reliability, relevance, suitability, efficacy and validity of APM which may inform and improve future reviews in the cost of equity instrument. The AER should commit to exploring the application of other methods to improve the methodological and theoretical rigour rather

than be set on a particular historical approach. This is justified on the basis that financial markets are globally integrated and are in a constant state of change thereby new approaches are warranted.

Should the AER wish to contact me regarding this submission please contact myself on [redacted] or email [redacted]

Yours faithfully [redacted]

Regional Energy Manager – Australia

Nyrstar Australia Pty Ltd