Market Risk Premium

A Review Paper

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Conclusion.

The average historical market risk premium i.e. the observed market rate of return less the yield on Government bonds, is estimated as 6.7% over the period 1958 to 2007 if there is no value placed on a return to investors for imputation tax benefits[1].

A market risk premium of 6% has been widely used in regulatory price determinations in Australia. We have reviewed and updated the historical empirical evidence and we have examined the argument for change in the MRP in light of forward looking as well as historical evidence. We are of the view that there is no persuasive evidence to reduce this market risk premium but there is some persuasive argument to increase it to 7%.

The best source of a forward looking market risk premium is, in our view, a long term average of historical MRPs – the longer the time period the better. Data is available from 1883 to the present. A recent paper (Brailsford et al 2008) reviewed data prior to 1958 and questioned its appropriateness in reflecting a broad market return. After a 'best efforts' adjustment to this data by the authors, the historical MRP over this period (1883 – 1957) was 6.1% compared with 8.0% from the prior 'Officer' unadjusted data. Whether of not the Brailsford et al adjustments are appropriate does not change our view of the recommended MRP.

The market risk premium of 6% was originally based on evidence that excluded any explicit consideration of a component to reflect any value of imputation tax benefits in the historical MRPs. Consequently the 6% can be viewed as an estimate of the MRP when this value is zero (the term 'gamma' is usually used to reflect the value of $1 of imputation tax benefits created by a firm however we are concerned with the value of a dollar of imputation tax benefits once distributed given that we are adjusting observed market returns). The inclusion of an estimate of the imputation tax benefits in the historical estimate of market equity returns forms the basis of our recommendation that the MRP be increased from 6% to 7% as qualified below.

We recognise that precise estimation of both the MRP without imputation tax benefits and the estimation of imputation tax benefits is a challenge due to 'noise' in historical data. An overlay of the need for regulatory certainty encourages us to recommend that there be no change in the widely used 6% under a view that imputation tax benefits have no value but it this is not enough to prevent our recommendation of 7% when imputation benefits are included. While we have not focused on estimating an explicit value of gamma or the value of imputation tax credits once distributed in this paper, regulatory practice places a value on gamma of 0.3 and greater. Under these circumstances we recommend the MRP be 7%.

A number of suggestions have been made as to why there may be reasons to look beyond a long historical series of observed MRPs to arrive at an estimate of the MRP. These include suggestions that structural change may have occurred and there are historical events that may not be repeated and should be excluded from the MRP estimation. After reviewing these suggestions in light of our data, we are of the view that longest time series should be used and that there should not be any removal of observations because past events may not repeat.

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[1] The statistical precision of the estimate is low given the high variability in the historical data.

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1. Introduction

A basic tenet of finance theory is that investors act as if they require a reward for bearing risk. The required reward is usually expressed in terms of a positive premium over a “risk free” rate of return[2] for investing in assets – either ‘real’ or claims on real assets such as financial assets.

The required total reward for capital bearing risk and the time value that capital is tied up in assets or projects can be expressed in the cost of capital of the asset or investment. The cost of capital is an input to price determination hearings in a number of regulatory price jurisdictions in Australia. These determinations consider a return on capital to be an appropriate economic cost of doing business and an estimate of it is built in to an assessment of regulatory revenue requirements[3].

The overarching guide for assessing this cost of capital is that it should reflect the rate of return required in a competitive capital market that is supporting investment in real assets. Current theories suggest that this required rate of return should be independent of ownership. Regulatory bodies in Australia look to a competitive market to guide an assessment of what the appropriate cost of capital should be for assets over which they influence the pricing or outputs. The challenge for regulators is to ensure the cost of capital is set to earn investors a competitive rate of return to encourage investment but not lead to monopolistic pricing while providing an incentive to improve overall performance.

The cost of equity, as a component of the weighted average (of debt and equity) cost of capital, is not directly observable. It is generally estimated using the capital asset pricing model [“CAPM”]. The CAPM describes the cost of equity capital as equal to the risk free rate of return plus a premium for the risk of the equity invested. This premium is a function of market risk premium [“MRP”] times the relative risk of the equity compared with the risk of the market (beta of equity). As a consequence, the MRP is an important input to price determinations.

The paper examines the MRP in Australia, primarily from the perspective of investing in long term assets. An overlay is a regulatory perspective however the overlay does not affect our evaluation and update of available evidence or our review of an historical and forward looking perspective of the MRP[4].

This document is structured to:

- summarise our findings;
- summarise guidance from the theory as to how to think about and estimate the market risk premium;
- review issues in measurement;
- review and update historical evidence that guides a view on MRP;
- review forward looking evidence and recent research in this regard; and to
- present our point of view as to the most appropriate MRP.

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[2] There is no such thing as risk-free return, when the finance literature talks of a risk-free rate they mean a rate that reflects low and relatively constant risk such as the rate on government backed (in their currency) paper (debt).

[3] For example the Annual Revenue Requirement(ARR) of a viable company must be equal or greater than the: operating costs + depreciation + cost of capital (the required return on capital times the value of capital) + effective tax.

[4] We use the term Market Risk Premium (MRP) to refer to both a forward looking and historical context. Some use the term “excess market returns” or “market excess returns” to refer to the historical difference between the observed return on the market and the risk free rate. We do not use this term.

2. Guidance from the Theory

Under the simplest version of the Capital Asset Pricing Model ["CAPM"][5], investors choose a portfolio of assets that maximise their return for a chosen level of risk. With the existence of a risk free asset, all investors will choose some combination of the risk free asset and a market portfolio[6]. The mix of the risk-free asset and the market portfolio will depend upon individual attitudes to risk.

With this outcome, the risk of any particular asset will be its contribution to the risk of the 'market' portfolio. The individual asset's contribution to the risk of an "efficient portfolio" (the market portfolio) can be shown to be covariance[7] of the assets returns with the market's return rather than the individual variance of the asset's returns. The total risk of an asset from an investor's perspective is not the relevant risk – it is the sub element called systematic risk or covariance risk which is the risk that contributes to the non-diversifiable market risk. This systematic risk when divided by the variance of the market portfolio is referred to as beta.

The CAPM is a forward looking concept but because of the lack of reliability in forecast models the parameters are generally estimated by reference to historical returns[8]. It is common for MRP to be estimated in this way. We elaborate on this point later in the paper.

The CAPM describes the pricing of assets in the following way[9].

$$E(k_i) = r_f + E(MRP)\,\beta_i \qquad (1)$$

Where:

$E(k_i)$	is the expected rate of return from investing in the asset;
r_f	is the risk free rate;
E(MRP)	is the expected market risk premium and it is positive;
β_i	is the beta or risk of the asset relative to the market (It reflects the relative contribution of the asset to the risk of the market).

Some key features of the model for the purpose of this paper are that it:

- is forward looking
- defines a positive reward for bearing risk i.e. a market risk premium will be positive
- is a one period model of no particular time dimension;
- applies to all assets which also defines the market portfolio.

The model is relatively uncomplicated however it lacks specificity if it is to be used in practice. A number of questions need to be addressed when using it, for example:

- What is the length of the 'one period'?

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5 The model generally attributed to Sharpe, Lintner, Mossin.

6 The portfolio must lie on the "efficient set", the portfolio usually chosen is a broad based share market portfolio, each share weighted by capitalisation.

7 Covariance can be thought of as how that return on an asset changes when the market changes. Not all the changes in an assets return are due to the market. The CAPM focuses on the element of movements in returns related to market movements.

8 This is discussed further in Section 3.1 on page 5

9 The symbols are similar to those in the Issues Paper however we have deliberately included the expectations operator E for emphasis. The model we refer to is the same as that referred to in the Issues Paper (e.g. page 6).

- Conceptually it is the price setter's horizon but typically there is an assumption of some match between the asset life and investor's planning horizon. Returns are usually expressed per annum returns.

- What is the market?
  - Conceptually it is all assets, however practically it is assumed that a broadly based equity market index is a good proxy.
- What is the expected return on the market, or the MRP, given the risk free asset?
  - The emphasis should be on a forecast of the market risk premium however, in practice, it is estimated with reference to historical returns on the grounds that these influence investors' view of the future and that there is no better forecasting model available.
  - There is also a need to specify the tax status of the return on the market and the components of the return. The observable return on an equity market index is after corporate but before personal tax. The existence of an imputation tax system means that, if the benefits are valued, they should be included in the index as a component of the return. This flows from corporate tax really representing a pre-payment of personal tax for investors who can access the imputation tax rebate.
- What is beta of individual assets? How to estimate it?
  - Typically the market model[10], which can be thought of as consistent with an ex post (or empirical analogue) version of the CAPM, is used to estimate beta by a linear regression[11] the historical returns of a stock against the market's returns.
  - There is a particular challenge in estimating betas for unlisted businesses or business units of a multi-business unit company.

All of these questions have been subject to considerable debate and research. Arising from this research, some 'near' conventions have been established by academics, practitioners and regulators but there remain many areas of judgment. Since the focus of this study is the MRP (market risk premium), we summarise the areas we take as conventional and highlight the areas where we need to exercise judgment and what the trade-offs might be.

Areas where convention has arisen

Area	"Near Convention"
Long term investor horizon	10 year view for risk free rate and MRP
Period of estimation of MRP	Annual
Method of averaging when using historical data	Arithmetic average
Market portfolio of risk assets	Represented by a broad domestic equity market index.

[10] The market model is simply an algebraic relationship between the return on an asset and the return on the market generally expressed as $\tilde{r}_i = \alpha + \beta\tilde{r}_m + \tilde{\varepsilon}$

[11] Usually, but not necessarily, by using the statistical technique called Ordinary Least Squares regression

There are a number of areas where some element of judgment is required to form a view about an appropriate MRP to use when applying the CAPM, especially in a regulatory environment. These will be addressed later in the paper and include:

Areas generally requiring judgment

Area	Comment
Weight to place on historical versus forward looking estimates of MRP:	The use of observed or historical MRP as a forward looking estimate assumes the past will repeat itself, that investors' view of the future is based on experience and that there has not been any significant structural change in the forces that determine a MRP.
Accuracy	Observed MRPs have a large standard deviation or variance making accuracy to multiple decimal points suggest a degree of accuracy that isn't really there.
The benefit of regulatory certainty (especially stability in parameters) versus variability due to short term market movements:	Placing a high value on regulatory stability means there has to be compelling evidence before changing a parameter such as the MRP, once it is established.
The value of imputation tax benefits:	It is clear that these are of value to domestic investors but not to foreign investors due to the lack of a direct market for imputation tax benefits. We do not form an explicit view about their value in this paper.

3. Estimating a Market Risk Premium

3.1 Introduction

The most critical parameter of the CAPM and its components is the expectations operator (E). The expectations operator should be thought of as the mean or average of the market's forecast of future or required (expected) returns before they will invest in the equity of a particular risk class. Ideally, what we need is some method of forecasting investor's expectations or equivalently their required returns for the different risk class of assets. Unfortunately, while such models exist, they require additional assumptions about investor behaviour and rarely have very much to offer in the way of forecast-ability. In an investment environment, this is perhaps not surprising insofar as if there were forecast abilities in these models then this would remove elements of risk and make the models redundant insofar as they are based on risk or stochastic returns.

In such circumstances, it is perhaps inevitable that forecasts, in order to be objective, rely heavily on historical data. The reason for relying on such data is that the expectations of investors will be framed on the basis of their experiences, which are of course historical. Therefore the mean of historical distributions of returns or models framing returns could be expected to have had the greatest influence on investors' expectations about the future. Hence the reliance on some average of historical MRPs in order to settle on an estimate of the investor's expected or required MRP.

Under these circumstances a longer time series is best as it will not only improve statistical 'accuracy' but also best weight events according to the likelihood of occurrence. For example, a short time period that incorporates the 1987 crash could potentially overweight that event compared to its likelihood of occurrence.

An alternative approach to estimating a MRP from historical data is an explicit forward looking approach. Typically this involves firstly deriving the implied required rate of return on equity from the current share prices of a security and market participant's expectations of the future cash flows. This is then aggregated across all stocks to provide and expected market return. The third step is to deduct an estimate of the risk free rate to derive a 'forward' estimate of the MRP. These approaches are heavily reliant upon, and sensitive to, the forecast cash flows, usually represented by a growth rate. According to Gray (2001), the sensitivity of the MRP to these forecasts does not provide a statistically 'tighter' estimate than the historical series. As noted by Gray:

> *"When we recognise the uncertainly surrounding the estimation of the components of the dividend growth model, it is clear that this model's estimate of the market risk premium is even more imprecise than the estimate obtained by using historical data." P8*

This suggests forward looking methods don't give a more precise estimate then one based on historical data. Consequently our primary focus in this paper is forming a view about an appropriate MRP for price determinations derived from historical data.

The empirical research using each of these two approaches is reviewed after examining a number of measurement issues.

3.2 Measurement Issues

This section of the paper addressed a number of the important measurement issues associated with estimating a MRP. In particular it addresses:

- Arithmetic versus geometric measurement of returns;
- The time period to consider when estimating an MRP from historical data;
- Matters dealing with the measurement of market return – the choice of a market index including equal versus market weighted;

- The maturity and nature of risk free rate to use;
- The treatment of imputation tax credits.

3.2.1 Arithmetic and Geometric Measurement for Returns

Given the view that the expectations of investors will be framed on the basis of their experiences, the question then arises as to which average or more accurately which measure of central tendency of the distribution of the historical returns should be used? By convention academics and practitioners usually select the *mean* of the distribution but there is no strong theoretical reason[12] why this should be selected over the *mode* or *median* to represent the effect of history on current expectations.

The *arithmetic average* or *mean* market risk premium is usually used on the basis that we are seeking an estimate of the expected return on a broad market of equities. If all historical observations were treated as independent draws from the same distribution, the appropriate estimate of the expected value is the arithmetic mean.

However, in some circumstances, a geometric mean is computed[13]. The geometric mean is always less than or equal to the arithmetic mean, it is only equal when there is no variation in the historical returns $(\sigma^2_{MRP} = 0)$ but as the variability in returns increases $(\sigma^2_{MRP} \to 0)$ the smaller the geometric mean becomes relative to the arithmetic. The geometric mean represents the actual investment returns over a defined period and is appropriate when estimating the aggregated return achieved from a buy and hold strategy, but that is not the purpose here, where we are trying to find the best representation of how expectations are formed on past historical returns.

The MRP is to be used in the CAPM to compute the cost of equity expressed in annual terms. Therefore, we require an estimate of the expected return, on an annual basis of the market portfolio $(E(r_m))$ over and above the risk-free rate (r_f). What return do we expect on the market portfolio over the next period, relative to the risk-free rate? The historical data provides us with many observations on what the market returned relative to the risk-free rate over a series of one-year periods. To the extent that each of these should be given equal weight in framing expectations, a simple arithmetic average is appropriate.

There are further problems because the distribution of returns is not stable[14]. The lack of stability means that the standard statistical tests of significance of a mean from observed values cannot be relied upon.

3.2.2 Time Period under Consideration

However, having a basis for choosing an average of an historical series does not overcome the problem of which average from the distribution of historical excess returns is appropriate to reflect investors' expectations. Once again theory is of little help and the conventional practice has been to choose an arithmetic mean of annual MRPs basically because these observed excess returns are usually publicised as annual rates. Consequently this information can be expected to have a more profound effect on investor's expectations than shorter periods such as monthly rates return or indeed longer periods such as 5 or 10 year rates of return. Of course, if the distribution of excess returns

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12 The most compelling reason to use an average rather than the other measures of central tendency is its mathematical tractability.

13 The arithmetic mean return r_m is calculated as $r_m = \frac{\sum_{i=1}^{n} r_{mi}}{n}$, whereas the geometric mean R_m is calculated as

$$R_m = \prod_{i=1}^{n} (1 + r_{mi})^{(1/n)} - 1.0$$

14 From the context of known mathematical functions that can be used to approximate returns.

was a stationary over time then it would not matter whether monthly, annual or 10-yearly periods were chosen as a stationary or stable distribution would mean that the parameters were invariant over various time periods and that one year rates would be simply a product of monthly rates and in turn 10-year rates a product of annual rates.

The further question in the context of historical returns is how far back should we go in retrieving data on returns? The longer we go back in time then potentially the less relevant the data is likely to be for today's circumstances. This is because of potential changes in underlying economic factors such as the structure and efficiency of capital markets, changes in the opportunities to diversify risk across countries, better information production etc. However if we shorten the time period for estimating the MRP then the high variability in observed returns means that we will have an estimate with poor statistical reliability. The average will change from period to period, this means that the shorter the time period used to determine an average, the less chance of finding an estimate that is sufficiently stable for use as a surrogate for current expectations. The practice has been to adopt 5 and 10 year moving averages and examine them for stability of the MRPs. More sophisticated mathematical models such as exponential smoothing have also been used to try and find some stability in the estimate.

In our view, which has been confirmed by the data we have examined, we should use the longest time series possible, subject to minimising data measurement errors, to estimate the MRP.

3.2.3 Measurement of Market Return

The market return or 'market factor' used in the CAPM and MRP is the rate of return on a broad share market index such as the All Ordinaries of the Australian Share Market or the S&P 500 Index of the New York Stock Exchange. The return is measured as an accumulation index, meaning it includes dividends as well as price changes, for example the return for a single period i (of no fixed dimension) for stock or index j is defined as:

$$r_{ij} = (p_{ij} - p_{i-1,j} + d_{ij}) / p_{i-1,j}$$

Where p_{ij} is the price (ex-dividend if any) at the end of period i and $p_{i-1,j}$ is the price at the end of the previous period (start of the new period) for stock or index j and d_{ij} is the dividend (or cash) that is assumed to occur at the end of the period i.

The greater the frequency with which r_{ij} is measured the greater accuracy because of the assumption that dividends are paid at the end of the period. Shorter period rate of return can be simply compounded to give a longer period rate of return e.g. a four period rate of return is the product of each of the four period rates of return, i.e.

$$r_{i=1\to 4} = (1+r_1)(1+r_2)(1+r_3)(1+r_4) - 1.0\,.$$

When forming an index of stock returns there has been some discussion about the appropriate weighting that should be used on the stocks making up the index. For example the early accumulation indexes such as CRSP in the US (Centre for Research in Security Prices) index an equal weighting of stocks making up the index was used. However, the theory underlying CAPM is unambiguous; the index representing a 'market factor' should be represented by all assets in the economy weighted by their relative values.

Therefore the index should be a value weighted index representing the broadest (preferably all) sectors of the economy. In fact nearly all estimates of the market risk premium have been using value weighted indexes.

3.2.4 Maturity and Nature of the Risk-free Rate

The equations for CAPM and MRP have been defined in the context of a particular point in time, but this does not imply there is any defined time period for the models. The theory does not specify any time period for the models – the CAPM is applicable to a single time period of unspecified length. As a consequence, there has been quite a deal of controversy and variation in the time period used to estimate the parameters of the CAPM used in practice. Insofar as the surrogate for the risk free rate has been a 10 year government bond yield, this would imply a 10-year planning horizon. The reason that a 10 year yield has been adopted is because most of the projects for which CAPM has been used as a means of estimating the required return on equity have been long term projects and it would be a mistake, in these circumstances, to use short dated government securities as the risk free rate surrogate. Ideally a much longer maturing government security would be used but the market for such instruments is quite thin and the yields may be an unreliable basis for use as a proxy for the risk free rate of return.

On the other hand, those who do use shorter-term government bill rates often point to the fact that traders in equity markets are basically setting prices and these people have short term planning horizons. The response is that the investment planning by corporations should not be affected by short term market movements and, insofar as their planning is long term, an extended period for the risk free surrogate such as the 10 year bond yield is the most appropriate.

3.2.5 Treatment of Imputation Tax Credits

An imputation tax system was introduced in Australia from July 1 1987. A key purpose of the imputation system was to remove the tax bias against equity income in the prior classical tax system and place it on the same tax footing as debt income. The imputation system removed the double taxation of dividend income under a classical tax system for Australian Resident Taxpayers. The classical system taxed equity income at the corporate level and then again at the personal level. Under the imputation system, corporate tax can be viewed as a collection of personal tax for those subsequently claiming the imputation tax benefits.

The Australian system has since been modified over time in a number of ways. Some relevant changes are:

- A corporate tax on superannuation funds was introduced from 1st July, 1988 to enable them to use imputation tax benefits and to remove any disincentive to invest in companies paying imputation benefits;
- The introduction of a 45 day holding period around the distribution of franking tax credits in 1997 which imposes additional ‘cost’ on trading in credits;
- A move to a rebate rather than tax credit system in July 2000 which enables domestic tax exempt and low taxed residents to now fully access imputation benefits.

An outcome of the imputation system is a differential effect across some shareholder groups. The ‘beneficiaries’ are, in the broad, individuals and superannuation funds whereas foreign investors and tax-exempt shareholders (historically) did not gain directly from the change. As a result, the net dollar return after tax these different shareholders groups earn can differ.

The term “gamma” has been used widely to reflect the value of a dollar of imputation tax benefits. It is used to adjust either the tax rate in after cash flow estimation or to the cost of capital when undertaking project or enterprise valuations or when assessing regulatory revenue requirements. However we do not use gamma but rather a component of it to adjust for the impact of imputation tax benefits on ‘measures’ company or market returns.

To explain our adjustment and its relationship with gamma, we draw on the description of three milestones in the life of an imputation tax benefit as described by Hathaway and Officer (2004).

1. It is **created** when company tax is paid;
2. It is **distributed** when company tax is paid to shareholders as an attachment to dividends;
3. It is **redeemed** when shareholders claim the rebate and enjoy the tax benefit.

Common usage is to define gamma (γ) as the value of a dollar of imputation tax benefit when it is **created**. A dollar of imputation tax created will be retained (and tracked as a "FAB" - franking account balance – until it is distributed by way of an attachment to a dividend. The imputation tax benefits are of direct interest to shareholders once they are distributed. Thus when looking at the return shareholders receive from their investment over a particular period, we are interested in capital gains, dividends and the imputation tax benefits attached to dividends.[15]

The relationship between gamma and the value of imputation tax benefits distributed is captured in equation (3).

$$\gamma = F \times \phi \qquad (3)$$

Where F is the proportion of imputation tax benefits created that are distributed (attached to dividends)

ϕ is the value of an imputation tax benefit that has been distributed. We define this to be the value on the day that the stock becomes ex dividend. Dividend drop-off studies estimate a value for ϕ.

Regulatory bodies have used a value of 0.5 for gamma to adjust statutory tax paid to reflect the amount that is distributed and used by shareholders. However our interest when adjusting observed market returns for imputation tax benefits is in ϕ.

Hathaway & Officer (2004) estimate a value of 71% for F from tax statistics and a value of 0.5 for ϕ from their dividend drop off empirical work. Thus they suggest a value for gamma of 0.355 being the product of these two numbers. Values for these terms are subject to considerable uncertainty, measurement error and research. It is not our intent to review this research or form a view on values for these terms. Instead we estimate a total market yield for imputation tax benefits to add to the MRP estimated from historical data based on a range of possible values for ϕ.

As noted, under a dividend imputation tax system, there are potentially three components to the return received by equity holders – dividends, capital gains, and imputation tax benefits. In this setting, the appropriate measure of MRP is one that includes all three components. This point is clearly demonstrated in Officer (1994) and reinforced by Gray and Hall (2006). However, standard stock market accumulation indexes reflect dividends and capital gains only. Consequently, the value of franking credits should, in theory, be added to the historical estimates of stock index returns after the introduction of the system in July 1987.

There is a practical challenge in estimating the value of these imputation tax benefits and there is no single precise and robust estimate that is universally viewed as being correct. For these reasons, it is common not to include a value of imputation tax benefits when constructing stock return indexes.

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[15] Any value to imputation tax benefits retained will be reflected in the share price through an anticipation of when they may be distributed and their value at this time.

[20] See Hathaway and Officer (2004) for example

It is not within the scope of this paper to estimate a value for imputation tax benefits. However we do include imputation tax benefits in the market return for a range of possible valuations of them where the valuations are derived from regulatory practice and empirical studies[20] to show the impact on the MRP. For example, we estimate the adjustment to be 85 basis points for a value of 0.5 for the imputation benefits once distributed.

In addition, regulatory and market practice[21] is to compute an estimate of MRP based on historical data, but to adopt a final estimate that reflects appropriate judgment about other information such as recent trends, changes in the market, survey evidence, evidence from various economic models and so on. These judgments and the lack of precision in the average arising from the high variance in observed MRPs explain why regulatory and market practice has been to use an estimate of 6% even though historical data from the last 30, 50, 75, or 100 produce estimates that are higher. In our view, taking the MRP to a decimal point could give an impression of accuracy in the estimate that is misleading.

While any likely adjustment to reflect the value of imputation tax benefits is going to be small, in our view it may be large enough to support a change in the historical use of 6%.

Nonetheless, following the approach to adjusting MRP for imputation tax benefits indicated by Officer (1994) where their value is added to the market's expected rate of return a post imputation tax estimate of the MRP can be obtained[22]. The adjustment requires:

1. An estimate of the dividend yield (d_i) component of the total or cumulative yield (r_i) made of the capital yield (p_i) plus the dividend yield for the period (i). The implicit company tax paid on this dividend is estimated i.e. the dividend yield is grossed up (divided by 1.0 less the company tax rate i.e. ($1- T_c$)) and then the tax component is estimated by multiplying the grossed up dividend by the effective company tax rate;
2. Since not all dividends are franked dividends, the proportion of franked dividends (f_i) has to be estimated. Multiplying this by the implicit company tax paid on the dividend gives the 'effective tax' implied on the dividend;
3. Finally, since not all investors value imputation tax benefits once distributed at their 'face value', see Hathaway and Officer (2004), an estimate of the value (ϕ) implied by the market of a unit or $1 of franking credits must be estimated.

The net result of these procedures is an estimate of the value of franking credits (VFC_i) in the return to investors for the period i, i.e.

$$VFC_i = d_i \left(\frac{T_C}{1-T_C}\right).f_i.\Phi \qquad (4)$$

We focus on estimating a market return that included a value for imputation tax benefits that are attached to dividends paid.

The relationship of our adjustment to Officer (1994) and Gray & Hall (2006) (who also relates the relationship to Lally research) is demonstrated by equation 18 from Gray and Hall (our equation (5) below). This describes the relationship between the overall return investors receive (r'_t) and the return that is captured in stock market indexes which excludes any recognition of imputation tax benefits.

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[21] See again Truong, G., Partington, G. and Peat, M. (2005).

[22] Gray and Hall (2006) present the mathematical relationship between the value of franking tax benefits and the MRP. Their adjustment is consistent with ours.

$$r'_t = r_t + \gamma \frac{C_t}{P_{t-1}} \qquad (5)$$

Here $\frac{C_t}{P_{t-1}}$ is the imputation tax benefit yield for benefits created

Substituting equation (3) for γ yields

$$r'_t = r_t + F\Phi \frac{C_t}{P_{t-1}} \qquad (6)$$

Where the last two terms $[\Phi \frac{C_t}{P_{t-1}}]$ refer to imputation tax benefits distributed. Since we estimate these from dividends that have been distributed then we are interested in adjusting this yield by ϕ not γ. [23]

Estimates of the VFC for the thirteen years from 1993 to 2005 indicate an average value for the VFC of 85 basis points if the value of a dollar of franking credits distributed (ϕ) is 0.5. This would suggest an increase in the market rate of return for the period by an average of 0.85%. For example if the MRP for the period or the expected MRP was 6% then it should be adjusted to 6.85% for the effective value of the franking credits. This is not a large amount and well within the range of standard measurement errors one might expect from estimates of the MRP. However, on the basis of such an estimate, given a value of 0.5 for imputation tax credits distributed, in our view an MRP of 7% is more justifiable than one of 6%. Added strength for this view arises from most historical averages (across different periods) being greater than 6%.

We provide more detail around the estimate of VFC in a later section.

[23] There is a potential logical inconsistency in practice. Market returns are measured as capital gains plus dividends. The full value of the dividend is included despite studies showing these are not necessarily fully valued (the price drop off is less than the amount of the dividend). We are not including the full amount of the imputation tax benefit but adjusting it by ϕ.

4. Review of Prior Research

4.1 Historical-based Research

Empirical research in Australia has almost exclusively examined the historical behaviour of stock market returns relative to Treasury bond, or in some cases Treasury bill, returns. The exception is a forward market risk premium estimate available from Bloomberg.

Most historical studies have a genesis in data prepared by Officer (1989). Officer compiled a market realised return and risk free rate series from 1883 to 1987. The data preceded the introduction of imputation tax in Australia. The average excess return for this period was 7.9%. Subsequent studies have updated this series, just as has this paper. Subsequent studies include Dimson, Marsh and Staunton (2003), Hathaway (2005), Hancock (2005), Brailsford, Handley and Maheswaran (2008). In addition there have been papers prepared for regulatory hearings that update the Officer data, examples include Gray and Officer (2005), Bishop (2007).

Ball and Bowers (1986) did not use the Officer series and focused on the post 1973 period (1974 – 1985) determined by preparation of stock data by the Centre for Research in Finance ["CRIF"] at the AGSM. This group compute a value weighted index of all listed stocks in their files rather than the smaller number of stocks that are included in the Sydney Stock Exchange Indexes and subsequent ASX and S&P indexes. We have not correlated these indexes but are of the view that the MRPs are not substantially different. For example, Hancock (2005) used CRIF data and compared the MRPs from his data with that from Officer data over the period 1974 to 2003 and the averages were 5.9% and 6.0% respectively (the risk free data was from the same source) and the standard errors were the same at 4.3% (verified in this study). Since the Ball and Bowers study covered only 12 years, we do not comment on it further here.

While the base data sources either correspond or give similar MRPs in all studies, there have been some notable differences in two groups of studies.

1. The first group is Hathaway (2005) and Hancock (2005). These two studies adjust the base data for events they believe to be non-recurring and without the adjustments lead to an overstatement of the MRP. After adjustments, Hathaway argues that the appropriate market risk premium is 4.5% which is consistent with Hancock who argues that the MRP has not been stable over the prior 122 years and it is in the range 4.5% to 5.0%. We comment on the approach taken by these two papers in a later section.

2. The second group (of one) is the Brailsford et al (2008). This paper investigates the sources of data that comprise the Officer series and argue that the pre 1958 data has some measurement errors and cannot be relied upon. Nevertheless the post 1958 data is comparable to the updated Officer data used in this and other studies. Brailsford et al make a 'best efforts' adjustment to the pre 1958 market return data and calculate an average market risk premium of 6.4% over the period 1883 – 1987. This is below the average of 7.8% reported by Officer (1989). The difference is clearly attributable to the pre 1957 period where the averages are 6.1% and 8.0% respectively. The post 1957 averages (to 2005) are essentially the same at 6.4% and 6.3% respectively.

Given the above studies use essentially the same data source as this paper (subject to the comment above about Brailsford et al) we rely on our summary output as representative of the results of other research. With the exception of the section dealing with imputation tax, we report MRP data that does not explicitly include the impact of imputation tax on the market return. This is not because we are of the view that they have no value, the opposite is the case, but rather because we are not taking a position on the value of a dollar of distributed imputation benefits in this paper. While we rely primarily on the data used in this study, we do draw on the Dimson, Marsh and Staunton series of papers for two reasons:

- because they show Australian data in an international setting; and
- they hypothesise about future MRP relative to their historical series thereby providing us with a framework to comment on these matters.

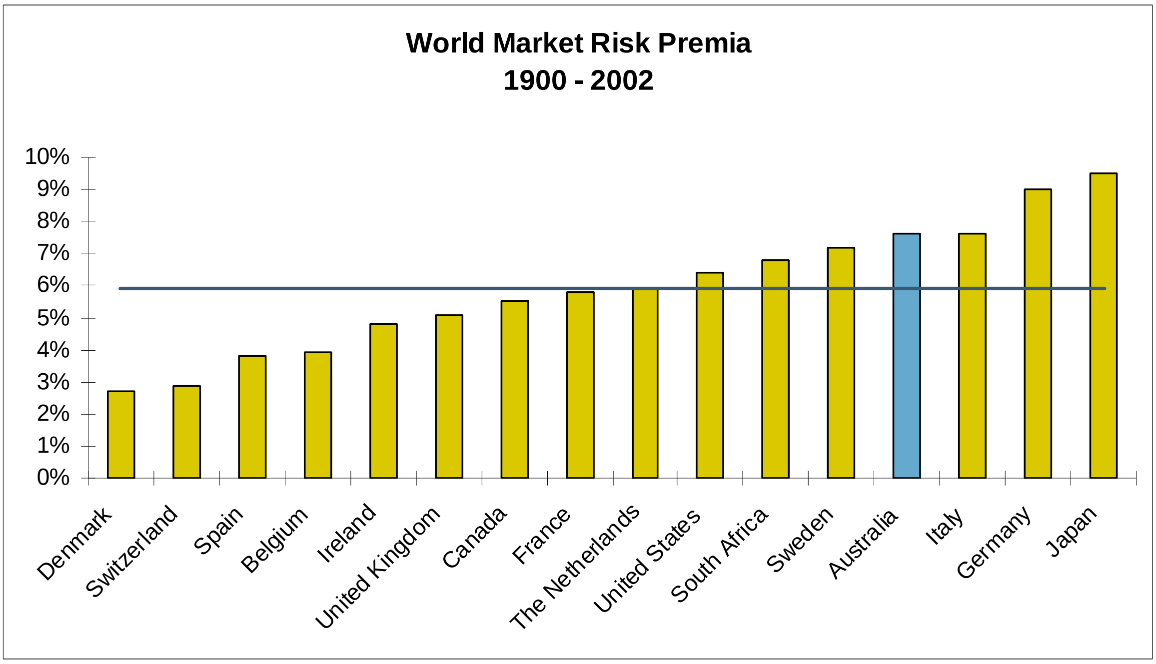
We cover each of these points in turn.

Dimson, Marsh and Staunton (2003) present MRPs (relative to long term bonds) for 16 countries using 102 years of data from 1900 to 2002. This is presented in Figure **1** below.

The (unweighted) average for the 16 countries is 5.9%. The Australian average was 7.6% (based on Officer data) and this excludes any adjustment for imputation tax benefits. Twelve of the 16 countries had MRPs greater than 5%. The Australian historical MRP is at the higher end but not dissimilar to the US, South Africa, Sweden and Italy based on these data but would be around the average using the unadjusted (for imputation tax benefits) data from Brailsford.

The market risk premium of 6% widely used by regulators in Australia is consistent with this world wide historical view of the average MRP as is our recommendation of 7% when imputation tax benefits are included at a gamma of greater than 0.3.

Figure 1: Australian MRP in International Setting



Source: Dimson, Marsh and Staunton (2003). The MRPs are calculated here as (1+Mkt Return)/(1+R_f rate) -1. This will give a slightly different premium that calculated as simply Mkt Return less R_f.

4.2 Forward data based Research

Typically forward data based research involves firstly deriving the implied required rate of return on equity from its current share prices and market participant's expectations of the future cash flows. This is then aggregated across all stocks (after repeating the process for all stocks) to provide and expected market return. The third step is to deduct an estimate of the risk free rate to derive a 'forward' estimate of the MRP.

A typical example of this approach can be found in Harris and Marston (1999) using US data. The underlying model used is generally the dividend growth valuation model expressed in rate of return form. The model can be expressed as:

$$r_e = D_1/P_0 + g$$

where:

r_e is interpreted in this approach as the internal rate of return implicit in the pricing of the security given the estimates of the dividend yield and growth rate in dividends
D_1 is the next expected dividend
P_0 is the current share price and
g is expected constant growth rate in dividends.

A major challenge with this model is deriving the growth rate g. This represents the expected constant growth rate in dividends into the future and the r_e is very sensitive to this input. Gray (2003) models a recent time series of dividend yields, inflation and GDP growth and after allowing for pair-wise correlations concludes (p 23) that:

> *". . . this model's estimate of the market risk premium is even more imprecise than the estimate obtained by using historical data."*

Harris and Marston (1999) estimated g and D_1 from a consensus of analysts' forecasts at the individual stock level. They used consensus forecasts of EPS over five years to derive g and assume this applies in perpetuity. The assessment of r_e is aggregated to form a market return. A risk free rate is deducted from this value weighted market expected return to assess a forward looking MRP.

Harris and Marston (1999) report that the MRP derived in this way varies over their time period of interest (1982 – 1988), with an average of 7.14%. This, they argue is approximately equal to the historical arithmetic long term differential between returns on stock and long-term government bonds of 7.5%.

To our knowledge there is only one source of forward looking estimates of the MRP in Australia. Bloomberg follow a similar approach to Harris and Marston when estimating a forward looking MRP. Bloomberg develop a market risk premium for a number of countries, including Australia, using the forward looking approach applied to the dividend growth model. Bloomberg works with individual stocks in each country's equity index. They use a three stage growth approach generally transitioning over 14 years from a 3 year near term growth rate to a long term or maturity growth rate. The internal rate of return is derived from solving for the discount rate that equates the present value of the dividend forecasts with the current share price. These internal rates of return are market capitalisation weighted to generate an overall market rate of return. The current yield on 10 year Treasury Bonds is deducted from this to determine a market risk premium.

Unfortunately Bloomberg do not store (or make available) an historical series of this forward looking market risk premium. Nevertheless Allen Consulting Group have captured output from this service over time and it is reproduced below along with a recent update[25]. We understand that there is no explicit consideration of imputation tax in these estimates. We are uncertain as to the date of the Allen Consulting Group 2008 number but have added the Bloomberg number as at July 2008.

[25] Allen Consulting Group, "Review of Studies Comparing International Regulatory Determinations" Report to ACCC, 2004

Table 1: Bloomberg forward based estimates of MRP

Country	Market Risk Premium			
	2004	2006	2008	July 2008
Australia	4.5	4.9	7.9	8.6
Canada	6.6	6.6	7.8	6.8
United Kingdom	5.0	5.2	6.3	6.7
USA	5.1	4.5	6.8	6.9

Source: Allen Consulting Group, Bloomberg

Of note from these data is the volatility in the MRP, as would be expected. There is an apparent trend upwards in each country but it could easily change. We do not draw any firm conclusions from this or the forward looking analysis more generally other than it not providing a better view than the historical series.

The forward looking market risk premium will vary over time. It is likely that the premium derived by the processes described above will differ from period to period as is evident from Table 1. Use of an MRP by regulatory authorities from this source (exclusively) will involve changing the MRP from decision to decision. While there may not be anything wrong with this approach from a purely theoretical perspective, it would require great confidence in the derived MRPs to rely upon them. We are of the view that regulatory certainty that is derived from using an average over time rather than a changing number is tantamount. There is, in our view insufficient confidence in the precision of the MRPs derived by the forward looking approach to warrant a move from the historical average approach.

4.3 A summary of MRPs used in regulatory price determinations in Australia

A market risk premium of 6% has been widely used in regulatory price determinations in Australia as is evident in Table 2 below. The table has been adapted from the ESC Electricity Distribution Price Review 2005 and updated. Our understanding is that these do not include an explicit adjustment for imputation tax benefits.

The estimate has been subjected to considerable debate in the regulatory hearings with argument to both decrease and to increase the MRP.

Table 2: Equity premium estimates applied in Australian regulatory decisions

Year	Hearing	Rate
2000	ESC Electricity Distribution Price Review	6.00
2000	IPART AGL Gas Distribution Final Decision	5.00 — 6.00
2000	OFFGAR Alinta Gas Distribution Final Decision	6.00
2001	ACCC Moomba to Adelaide Gas Transmission Final Decision	6.00
2001	ACCC Powerlink Electricity Transmission Final Decision	6.00
2001	QCA Envestra and Allgas Gas Distribution Final Decision	6.00
2002	ACCC ElectraNet Electricity Transmission Final Decision	6.00
2002	ACCC GasNet Gas Transmission Final Decision	6.00
2002	ACCC SPI PowerNet Electricity Transmission Final Decision	6.00
2002	ESC Gas Distribution Final Decision	6.00
2003	ACCC Moomba to Sydney Pipeline Gas Transmission Final Decision	6.00
2003	ACCC Murraylink Electricity Transmission Final Decision	6.00
2003	ACCC Transend Electricity Transmission Final Decision	6.00
2003	OTTER Aurora Electricity Distribution Final Decision	6.00
2004	ICRC Actew AGL Electricity Distribution Final Decision	6.00
2004	IPART Electricity Distribution Final Decision	5.00 — 6.00
2005	ESCOSA Electricity Price Review Final Decision	6.00
2005	QCA Electricity Distribution Final Decision	6.00
2005	IPART Revised Access Arrangement for AGL Gas Networks Final Decision	5.50 — 6.50
2005	ERA Final Decision on the Proposed Access Arrangement for the Goldfields Gas Pipeline	5.00 – 6.00
2005	ESC Electricity Distribution Price Review	6.00
2006	QCA Gas	6.00
2006	OTTER Electricity Price Review	6.00
2007	ESC Gas Distribution Price Review	6.00

Source: ESC Final Decision Electricity Distribution 2005 p 365 used as basis and AER Issues Paper

4.4 A Summary of Survey Evidence

Only limited insights into the MRP used in practice are available from published research. Survey evidence is relatively limited but, in the studies we have reviewed, the MRP commonly used falls in the range 6 – 8%. The studies do not explicitly state whether respondents identified an imputation tax benefit in the MRP. Twenty two percent of Chief Financial Officers ["CFOs'] responding to a survey by Truong et al (2008) use a lower estimate. This evidence, summarised below, arises from a survey of CFOs by Truong et al (2008) and from reviews of independent expert reports prepared in response to takeover offers.

Known surveys of Australian practice have been conducted by Kester et al (1999), Truong, Partington and Peat (2005), Lonergan (2001), KPMG (2005) and Jardine Fleming Capital Partners (2001).

Kester et al (1999) surveyed capital budgeting practices in Australia, Hong Kong, Indonesia, Malaysia, Philippines and Singapore. The Australian survey was directed at CFOs and CEOs of a sample of companies listed on the ASX in December 31, 1996. Of the 281 companies surveyed, 57 responded. The survey did not ask detailed questions about estimation procedures for estimating a cost of equity. However the survey did reveal that 73% of respondents used the CAPM for this purpose. Sixteen percent used the dividend growth rate model with 11% a risk premium added to the cost of debt. This outcome was in sharp contrast to the other countries where use of the CAPM was only 27% in Hong Kong and 24% in the Philippines with a much lower usage in the other countries.

Truong, Partington and Peat (2005) surveyed 356 listed Australian firms in late 2004 about various corporate finance practices. All firms were components of the All Ordinaries Index in August 2004, but not in the finance sector. In all, 87 responses were received giving a response rate of 24%. Usage of the CAPM for estimating the cost of equity was essential the same as for Kester et al above with 72% of respondents responding in this way. However their responses are consistent with multiple methods being used for this purpose since 47% also used a cost of debt plus a premium for equity and 34% used the cost of debt.

The most common MRP employed was 6% (we assume excluding imputation tax benefits)[26]) however more used a rate higher rate than a lower rate. There is no comment about whether this is relative to a long term or short term proxy for a risk free rate. However 53% of respondents responded that the MRP was based on 'traditional standards', consequently we surmise that the MRP is likely to be relative to long term bonds given the Australian research is focused on this view. The data from the paper is presented in Table 3 below.

Table 3: MRP's used by ASX 500 CFOs

MRP Range (%)	No. Responses	% Reponses
3.0 – 5.0	4	11
5.0 - 5.5	4	11
6.0	18	47
6.5 – 7.0	7	18
7.0 – 8.0	3	8
Other	2	5

Source: Truong et al (2005)

As noted earlier, Truong et al reported that 85% of respondents made no adjustment to their estimate of MRP to reflect the value of franking credits.

Lonergan (2001) includes results of a review of independent expert reports over the period 1990 to 1999. The only information directly relevant to MRP was that only 48 of the 122 reviewed reported details of how they arrived at the WACC. It is a little unclear as to how many used the CAPM however it is reported that 42 of the 48 (88%) used the CAPM and made no adjustment for imputation tax benefits. Seven (6%) did make an adjustment for imputation tax in the valuation but there is no comment on the estimate of the MRP used or whether there was adjustment to the MRP for imputation tax.

[26] We consider this assumption reasonable given the generally paucity of data on the amount to include, the general uncertainty about how to treat the imputation benefits and the widespread use of 6% from survey evidence.

KPMG (2005) also includes a review of independent expert reports. The results are captured in Table 4 below. It finds 35 of the 118 reports reviewed over the period 2000 – 2005 applied a WACC. Of these, 33 adopted the CAPM for the cost of equity. The paper also captured the MRP used in these cases and the results are reproduced below. None used an MRP less than 6.0% with the most using that number. 24% used an MRP greater than 6.0%.

Table 4: MRP's used in Independent Expert Reports

MRP Range (%)	No. Responses	% Responses
< 6.0	0	0
6.0	25	76
6.0 – 6.5	3	9
7.0	4	12
8.0	1	3

Source: KPMG (2005)

Jardine Fleming Capital Partners Ltd (2001) presented the results of a survey to "Trinity Best Practice Committee". The results for Australia are captured in Table 5.

Table 5: MRP's used by a cross-section of different users

	Responses	Past Equity Premium
Academics	26	6.30%
Brokers	20	5.05%
Asset Consultants / Trustees	4	6.67%
Corporate Managers	11	6.05%
Total Average	61	5.87%

Source: Jardine Fleming Capital Partners Ltd

We have omitted the data on the expected equity premium (which was an additional column in the original Table) because discussion at the Trinity Best Practices Committee revealed that little weight should be placed on the expected equity premium data because participants were asked the wrong question. We are of the view that the greatest weight should be placed on the groups that are making 'hard' investment decisions (Corporate Managers, possibly Asset Consultants) rather same simply making recommendations to others (academics and brokers). Not all groups undertake detailed valuations consequently without a better understanding of the composition we hesitate to treat each group equally.

5. Update of Historically-based Market Risk Premium

5.1 Historical Regulatory Perspective

A MRP of 6% is widely used in regulatory price determinations in Australia. The use of the number has been influenced by the empirical work of Hathaway and Officer[27].

Two items of importance when reviewing the market risk premium with reference to this widely used number are:

1. This empirical evidence examined MRPs without any adjustment for a value for imputation tax benefits;
2. There is a high degree of measurement error in historical estimates of MRPs – observed MRPs are very volatile. As presented below, the range of historical MRPs from 1883 to 2007 is from -32% to 54%. In our opinion, given this range, precision to several decimal is not warranted. Consequently the view was put[28] to early regulatory price determinations and upheld that an integer was more appropriate than a number with a decimal point.

While high measurement error remains in the updated MRP estimates below, we allow for an adjustment to reflect the value of imputation tax benefits in our conclusion and in one section of the analysis. However, including an adjustment for imputation tax benefits requires a view on the value of a dollar of benefits paid to shareholders. It is not the intent of this paper to form such a view, consequently:

- We estimate the impact of including a value of imputation tax benefits in the MRP for a range of such values;
- Much of our analysis and discussion uses historical MRPs that view these benefits as having zero value. This is not because we are of the view that they have no value, indeed our view is the opposite, but because we are not defining a value in this paper. Where including a value for these benefits matters to our conclusion we have made it clear that a value has been included.

5.2 Data and Approach

The historical MRP was estimated annually for the period 1883 to 2007 on a calendar year basis. A monthly series was also estimated from January 1980 to December 2007, the time period simply being the longest for which easily available and consistently determined data was available. It was calculated as the observed return on a broadly based market index less the opening yield on a proxy for the risk free rate. In the imputation tax section, the MRP was also adjusted from 1987 forwards to reflect an estimate of the rate of return from imputation tax benefits under different assumptions about the value of these benefits. The post 1987 period reflects the entire period for which the imputation tax system has operated.

The time series of realised market returns, imputation tax benefits and the risk free rates (the yield on 10 year maturing Treasury bonds), all used to calculate the MRP, were derived from a number of sources as described below.

5.2.1 Market Return

An equity market index was used as a proxy for the market return. The historical series from 1883 to 1979 was captured by Officer and described in Officer 1989[29].

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[27] Mainly unpublished studies given to the regularity authorities.

[28] Professor Officer was involved in advising Essential Services Victoria.

[29] Officer RR, 1989, "Rates of return to shares, bond yields and inflation rates: an historical perspective," in R Ball, P Brown, F Finn & RR Officer eds., "Share Markets and Portfolio Theory." 2nd Edn, University of Queensland Press.

"Annual share returns were constructed from a share market accumulation index; such an index reflects both dividend returns plus capital gains. The index was constructed for the period 1882-1987 (106 years) inclusive from a variety of sources. The early period made use of data developed by Lamberton (1958) and this was linked to an accumulation index of fifty leading shares from the AGSM price file (1958-1974) and the AGSM Value Weighted Accumulation Index (1975-1987). The use of different indexes can present problems. There is always doubt as to compatibility when such a mix of indexes is used. A large number of checks were made for consistency and compatibility of indexes. All of the checks suggested movements in the above indexes were relatively closely and contemporaneously related.

There are also doubts as to the accuracy of the data in earlier parts of the period particularly for shares. The base data were monthly share price data from which annual indexes were constructed adding in dividends. Using annual data and the various relationships found, Officer (1985) dispels of the concern about incorrectly drawing inferences because of poor-quality data, at least on an annual basis."

Brailsford et al have investigated a market return series from December 1882 to December 2005 and have argued that the series to 1957 may be overstated. The primary reason is the apparent inclusion of a dividend yield based only on dividend paying stocks rather than on all stocks in the Lamberton series referred to in the Officer quote. While estimating and adjusting for a likely size of the error, they cast doubt on the veracity of these data and, instead focus on series from 1958 to 2005. At the time of writing we have not had access to these data.

The series from 1980 to 2007 was based on the All Ordinaries Accumulation Index, a value weighted index made up of the largest 500 companies as measured by market cap, that are listed on the Australian Stock Exchange. This index captures a market return comprising dividends and capital gains.

This index does not include the additional benefit arising from imputation tax credits, introduced from July 1987. As an input to estimating this benefit, the All Ordinaries Price Index was used to derive a dividend yield from 1988 forward. The dividend yield was estimated by the difference between the two indices.

5.2.2 Imputation Tax Benefit

As noted above, stock market accumulation indices computed in Australia reflect a dividend yield plus a capital gain yield. They do not contain any yield from imputation tax benefits that may have arisen from the introduction of the imputation tax system in July 1987.

One reason for the introduction of imputation tax system was to offset the otherwise double taxation of dividends. Under the prior classical tax system, dividends were taxed firstly at the corporate level since they are paid out of after corporate tax earnings and secondly at the personal level since dividends are treated as taxable income. Under the imputation system, corporate tax paid can be viewed as a prepayment of personal tax for Australian Resident Taxpaying Personal Investors (ARTPI). Since we are interested in estimating the pre- personal but post- corporate tax rate of return from the 'market' we would be understating the return by ignoring any value associated with imputation tax benefits that could be attributed to personal tax savings.

To include a rate of return for imputation tax benefits required knowledge of the market value of these credits. Since it is beyond the scope of this paper to present a view on the value of these credits[30], we have instead, estimated a rate of return component to include the market return based on a range of values for a dollar of imputation tax credits distributed.

The imputation tax benefit to include was discussed above under the heading 'Treatment of Imputation Tax Credits' above. The adjustment to the index for the value of the tax credits from 1988 forward was estimated as follows:

$$VFC_t = d_t \left(\frac{T_{ct}}{1 - T_{ct}}\right).f_t.\Phi \ldots (1)$$

Where VFC_t is the estimated rate of return from imputation tax benefits in year t for all stocks in the market index

d_t is the dividend yield in the index in year t being a capitalised weighted sum of individual company dividend yields

f_t is percentage of dividends in the index of market returns that are franked (attract an imputation tax benefit)

ϕ_t is the value of a dollar of imputation tax benefit that is distributed

T_{ct} is the statutory corporate tax rate in year t.

As noted above the dividend yield (d_t) for each year was calculated as the difference between the All Ordinaries Accumulation and Price indexes and represents the weighted sum of the dividend yield on each stock included in the index.

The percentage of dividends franked (f_t) was estimated in two ways. In the first case, data published by the Australian Tax Office on total dividends paid, broken in to franked and unfranked provided an estimate for each year from 1993 to 2007. A simple average of this percentage was assumed to apply in the years 1988 to 1992 for which tax statistics are not available. These data apply to all companies submitting tax returns which may differ from an estimate based only on the stocks included in the All Ordinaries Index. In the second case, the franked dividend percentage for each stock in the index for each year was extracted from Bloomberg data and weighted by the stocks weight in the index. This better aligns the franking tax credit with the dividend yield in the index.

The value of a dollar of imputation tax benefit distributed (ϕ_t) was not formally estimated. Instead we chose values to illustrate the impact of an imputation tax adjustment. In particular the values of 0, 0.5 and 1 were selected. Zero is a natural outcome of excluding imputation tax benefits, 0.5 is the value used in a number of regulatory price determinations for gamma (here it is used as the value of a dollar of imputation tax credit *distributed*) and 1 is the other extreme (and unlikely[31]) value.

The corporate tax rate in each year (T_{ct}) used was the statutory rate applicable from July of the year examined. The corporate tax rate was obtained from the Australian Tax Office website. There are a number of potential inaccuracies here that we have ignored. One is the fact that the market rate of return was based on a calendar year whereas the tax rate is based on a financial year. This may lead to a small inaccuracy in years when the tax rate changed

[30] A separate paper is being prepared for the ENA dealing with the value of these credits.

[31] Unlikely at least because there is a time delay between the distribution of the imputation tax benefit and the 'cash flow' benefit to the ultimate shareholder.

5.2.3 Risk Free Rate

Our estimate of the risk free rate is the yield on 10 year maturing Treasury Bonds. The data series from 1883 to 1968 was that collected in the "Officer" series:

> *"The intention was to use long-term Commonwealth Bond yields to approximate the behaviour of interest rates. Under generally accepted theories of the term structure of interest rates, changes in these yields will reflect changes in yields generally across the term structure. Moreover, we would expect the yields on company debentures to be similarly affected. For the period 1882-1914, yields were taken from New South Wales government securities traded on the London capital market (Hall 1963). For the period 1915-1949 the yields were on Commonwealth Government Securities maturing in five years or more (see Reserve Bank bulletins). Finally, for the period 1950-1982, yields were taken from 10-year rebateable Commonwealth Government Bonds (see Reserve Bank 1982) and from 1982-1987 non-rebateables were used. The reason for switching between rebateables and non-rebateables was the lack of trading and/or availability of data on one or other of these security types — the typical difference between the yields of the two types is low, of the order of 5 per cent of the security's total yield, which implies the effective tax rate of traders in these securities Is also low, approximately 5 per cent[32]."*

The risk free proxy series from December 1969 to 2007 was collected from the Reserve Bank of Australia ["RBA"] website.

The RBA data were checked against the Officer series where it overlapped. Except for one year, any differences were minor. Further the data were checked against the summary data in Brailsford et al and comfort gained that the series are consistent. In our opinion there is no material difference in the Officer series and the series used here.

5.3 Results and Comparisons

A key conclusion from our analysis is that there is not any compelling evidence from the historical series that ignores imputation tax benefits that would lead to a reduction in the 6% MRP widely used in historical price determination hearings. If there was a change that could be supported from the evidence then it would be an increase to 7% arising from the inclusion of the return from imputation tax benefits.

Despite examining an historical series from 1883 to 2007, we have placed greatest emphasis on the period 1958 to 2007. This follows the work of Brailsford et al who have carefully reviewed the market return data prior in the Lamberton series prior to 1958 and argue, amongst other matters, that the market return in this period overstated the dividend return component. In essence this was because the dividend yield was based on dividend paying stocks only and was not adjusted to reflect a zero dividend yield on non dividend paying stocks when applied to the index.

Our work updates the Brailsford et al work by including 2006 and 2007 data and potentially a more exact adjustment for the percentage of dividends that are franked.[33]

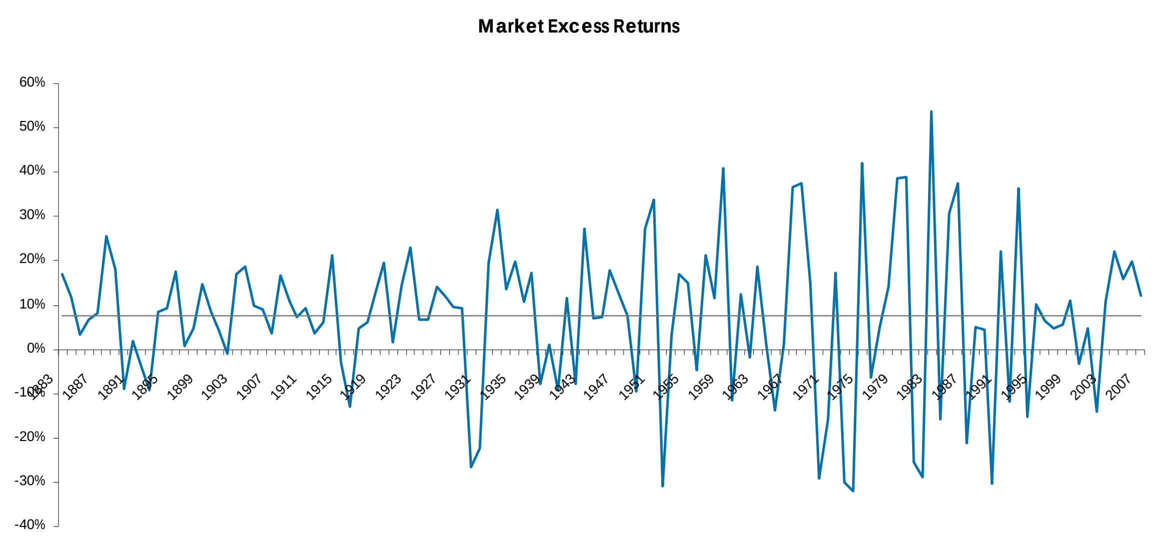
[32] See footnote for market returns for source (Officer 1989).

[33] We use the word 'potentially' as we do not fully understand the data sources for the Brailsford et al adjustments.

5.3.1 Market Risk Premium (MRP)

The MRPs were calculated as the difference between the historical market return and the opening Treasury bond yield. These are presented in Figure 2 along with the arithmetic average of the series (7.5%).

Figure 2: Market risk premium 1883 - 2007



Of note is the considerable volatility in the historical series. The range is from -32% to 54%. Also apparent from an eyeball test is the greater volatility post 1929.

Summary information is presented in Table 6. The MRP in this Table does not contain an adjustment for any value that might be attached to imputation tax benefits.

Table 6: Average MRP over increasing observation intervals

				95% Confidence Interval		
Period	No. Years	Average (%)	Standard Error	Low	High	Range
1958 – 2007	50	6.7	3.1	0.6	12.9	12.3
1968 - 2007	40	6.0	3.7	-1.2	132.	14.4
1978 – 2007	30	7.9	4.0	0.1	15.7	15.6
1988 – 2007	20	5.8	3.4	-0.9	12.5	13.4
1998 – 2007	10	8.4	3.4	1.7	15.1	13.5
1883 - 1957	75	8.0	1.4	5.2	10.2	5.5
1958 - 1987	30	7.4	4.8	-2.0	16.7	18.7
1883 – 2007	125	7.5	1.5	4.5	10.4	5.9
1888 – 2007	120	7.4	1.6	4.3	10.5	6.1
1898 – 2007	110	7.5	1.7	4.3	10.8	6.6
1908 – 2007	100	7.4	1.8	3.8	11.0	7.2
1918 – 2007	90	7.5	2.0	3.6	11.5	7.9
1928 – 2007	80	7.0	2.2	2.6	11.4	8.8
1938 – 2007	70	6.8	2.4	2.0	11.6	9.6
1948 – 2007	60	7.0	2.8	1.5	12.4	10.9

Source: Officer, Bloomberg, RBA

Table 6 shows the average MRP for the 'cleanest' data according the Brailsford et al research i.e. post 1958, and the same information for the period 1883-1957. The arithmetic average for this more recent 50 year period, excluding an imputation tax benefit adjustment is 6.7%. This number is smaller than the 8.0% for the 77 year prior period, perhaps partially due to the potential overstatement of the dividend yield noted by Brailsford et al. The Table also shows the average for the pre and post imputation tax period however little can be interpreted from this given the high standard deviations (the difference is not statistically significant) and exclusion of the imputation tax benefits.

Table 6 also displays the 95% confidence interval, assuming normality[34] in MRPs, associated with the average for the differing time intervals. Over the entire period it can be stated with a 95% degree of confidence that the average falls in the range 4.5% to 10.4%. This is a wide range highlighting concern for accuracy of dealing with multiple decimal points when looking at averages. Note how the range for the 95% confidence interval generally increases as the number of observations decreases (see Figure 4 for a graphic representation). This means the average number has decreasing 'reliability' as the time period reduces. As noted elsewhere (see Section 3.1), there is a trade off between statistical reliability from examining the greatest number of observations and concern that there may have been some underlying structural change in the required market risk premium during the period.

5.3.2 Impact of Imputation Tax Benefits

As noted above, Stock Market Accumulation Indexes computed in Australia reflect a dividend yield and a capital gain yield. They do not contain any yield from imputation tax benefits that may have arisen from the introduction of the imputation tax system in July 1987.

Our estimate of the adjustment to the market risk premium to reflect imputation tax benefits under different assumptions of the value of these benefits is presented in Table 7. It shows that with imputation tax benefits valued at $1 per dollar, there should be an addition of 70 basis points over the period 1958 – 2007 bringing the average MRP to 7.4% (. On the other hand, if imputation tax benefits were valued at $0.50 per dollar, there should be an addition of 34 basis points over the period 1958 – 2007 bringing the average MRP to 7.1%.

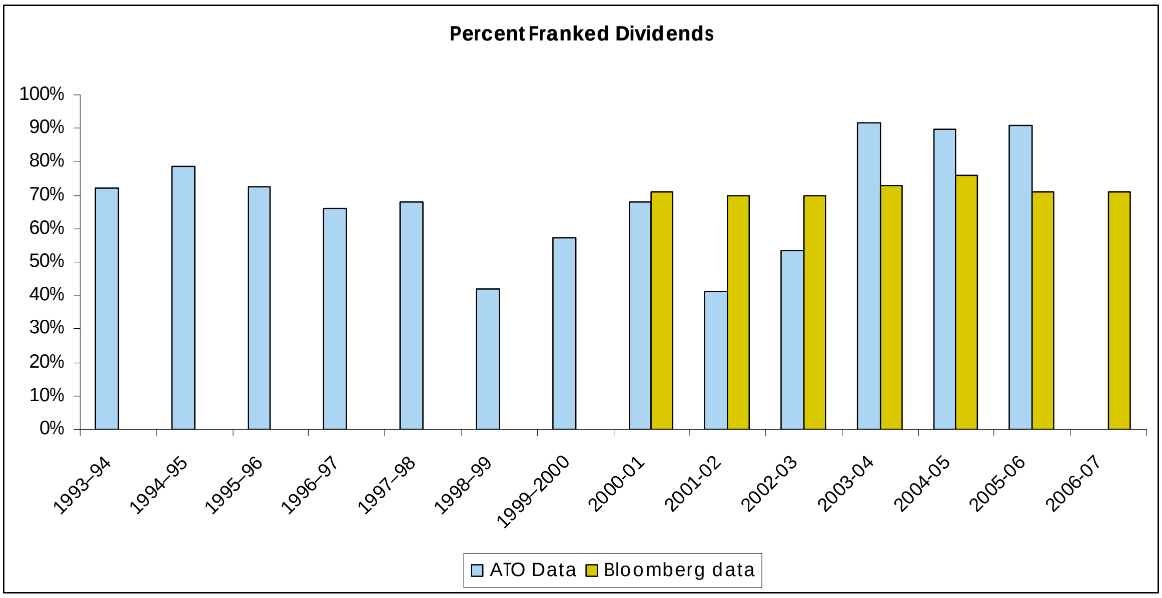
Table 7: Impact of Imputation on MRP

Period				Market Risk Premium				
				$\phi = 0$	$\phi = 0.5$		$\phi = 1$	
			Years		Adj.	With Imp	Adj.	With Imp
1998	-	2007	10	8.4	0.9	9.3	1.7	10.1
1988	-	2007	20	5.8	0.9	6.7	1.7	7.5
1978	-	2007	30	7.9	0.6	8.5	1.1	9.1
1968	-	2007	40	6.0	0.4	6.5	0.9	6.9
1958	-	2007	50	6.7	0.3	7.1	0.7	7.4
1948	-	2007	60	7.0	0.3	7.2	0.6	7.5
1938	-	2007	70	6.8	0.2	7.1	0.5	7.3
1928	-	2007	80	7.0	0.2	7.2	0.4	7.4
1918	-	2007	90	7.5	0.2	7.7	0.4	7.9
1908	-	2007	100	7.4	0.2	7.6	0.3	7.7
1898	-	2007	110	7.5	0.2	7.7	0.3	7.9
1888	-	2007	120	7.4	0.1	7.6	0.3	7.7
1883	-	2007	125	7.5	0.1	7.6	0.3	7.8

[34] This is a usual assumption but one that is likely to be violated and therefore the interpretation of the probability of the 'true' MRP falling within the range has to be treated with a great deal of scepticism!

As noted earlier, the percentage of dividends franked was estimated in two ways. In the first case, data published by the Australian Tax Office ["ATO"] on total dividends paid, broken in to franked and unfranked provided an estimate for each year from 1993 to 2007[35]. This varied from year to year as is evident from Figure 3. Also included in Figure 3 is the weighted percentage of franked dividends for companies included in the index from 2001 – 2007.

Figure 3: Mix of franked and unfranked dividends, all companies



Source: ATO Table 6, Bloomberg

According to ATO data[36], recent franked dividends in the last 3 years above have been in the order of 90% of total dividends. This is well above the overall average of 66% for the period for which data is available. This overall average percentage was assumed to apply in the years 1988 to 1992 and 2006 to 2007. These were the years for which tax statistics are not available. The actual percentages and dividend yields were used for other years to arrive at a (time and dividend yield) weighted adjustment to the MRP.

The ATO statistics cover a range of companies that are broader than those included in the All Ordinaries Index. Consequently there may be a difference between this number and that applicable to the index. We note Hathaway (2004) estimates the percentage of dividends franked to be 70% for 1988 – 2004 based in a capitalisation weighting of his data file of listed companies. We also note that Brailsford et al use 70% to represent the percentage of dividends that are franked and apply it for the post imputation tax introduction period[37]. Both these are above the 66% average from the tax statistics but are consistent with our estimate for the index over the period 2000/01 to 2006/7 as noted in our second approach below.

In our second approach to estimating the adjustment to the market index to reflect a value to imputation tax benefits, the franked dividend percentage for each stock in the index for each year was extracted from Bloomberg data and weighted by the stock's weight in the index. This better aligns the franking tax credit with the dividend yield in the index. Bloomberg history was only accessible back to 2001.

[35] We note that the ATO published numbers can change from publication to publication

[36] Company Table 7 www.ato.gov.au/corporate

[37] The paper says "For the period 1998-2005, we use the (weighted) average imputation credit yield on the ASX All Ordinaries Index for the 12 months ending December of each year, as sourced from the Australian Taxation Office."

The comparative outcome with the ATO statistics is presented in Figure 2. There was quite a bit of difference in the year by year statistics yet the overall average percentage for common years for franked statistic was similar at 72% for both.

Franking of dividends was largely binary with circa 47 - 50% in number being fully franked and 40 – 43% being either non dividend paying or unfranked over 2001 – 2007. As noted, the capitalisation weighted average was circa 72%.

Also of interest was that the capitalisation weighted percentage of non dividend paying stock was, on average, 6% over the 7 year period.

If imputation tax benefits are fully valued then the adjustment to the market risk premium would be, on average, 170 basis points using our second approach above. This is below the Brailsford et al estimate of 190 basis points but above the Hathaway estimate of 105 basis points. The latter difference can be explained by a difference in dividend yield – Hathaway posited 3.5% as the dividend yield whereas we used the yield derived from the difference between the accumulation and price indexes for each year. This was greater than 3.5% on average. We haven't fully explored the difference to the Brailsford numbers at this time.

6. Further Issues in Estimating an MRP

6.1 Introduction

A number of measurement issues associated with estimating the MRP were addressed prior to presenting and discussing the historical series of MRP. In this section we use the data to address some additional issues and to illustrate the points made earlier about measurement challenges and about formulating a view of an appropriate forward looking MRP.

We reiterate that our objective is to form a view about the MRP for the CAPM. The MRP should be what investors expect from an investment with a beta of 1 i.e. it is forward looking however we are using the past to guide a view about this 'forward looking" MRP.

By way of organising our commentary we refer to Dimson, Marsh and Staunton (2000). These authors present three reasons why it may make sense to look beyond historical data to form a view about the MRP to use in a CAPM based cost of capital. Paraphrased, these are:

a) The 100 year history may be too short to "iron out good and bad luck. Even with a Century of data, standard errors are still high"
b) The equity risk premium could change over time – perhaps due to overall less risk or more diversification opportunities
c) Past drivers of stock market performance may not repeat.

To the extent these points may be valid and appropriate to 15 other markets reviewed by these three authors they may also be valid to the Australian market. Nevertheless we rely on historical data to formulate our view as to an appropriate MRP essentially because, in our view, there is no other reliable method for establishing an 'evidence-based' view. While we have great sympathy with the arguments many commentators make in a similar vein to Dimson, Marsh and Staunton, they don't really help when we are attempting to establish a MRP that is supportable and appropriate for long term investment decisions.

In particular we address these points but under the headings below (slightly different wording to the 3 points above) with reference to our data series that excludes a value for imputation tax benefits and uses the Officer series prior to 1958[38]:

i. The length of time over which the MRP should be estimated
ii. The variability in MRP over time and the challenge of identifying structural shifts
iii. Adjusting for drivers of stock market performance that may not repeat

6.2 The length of time over which the MRP should be estimated

One hundred years of data may be too short to iron out the good and bad luck which is why we argue for the longest period possible. However it is not without a cost as noted by Fischer Black (1993):

> *"Estimating expected return is hard. Daily data hadly help at all. Only longer time periods help. We need decades of data for accurate estimates of the averageexpected return. We need such a long time period to estimate the average that we have little hope in seeing changes in expected return."*

---

[38] We are attempting to access the Brailsford data.

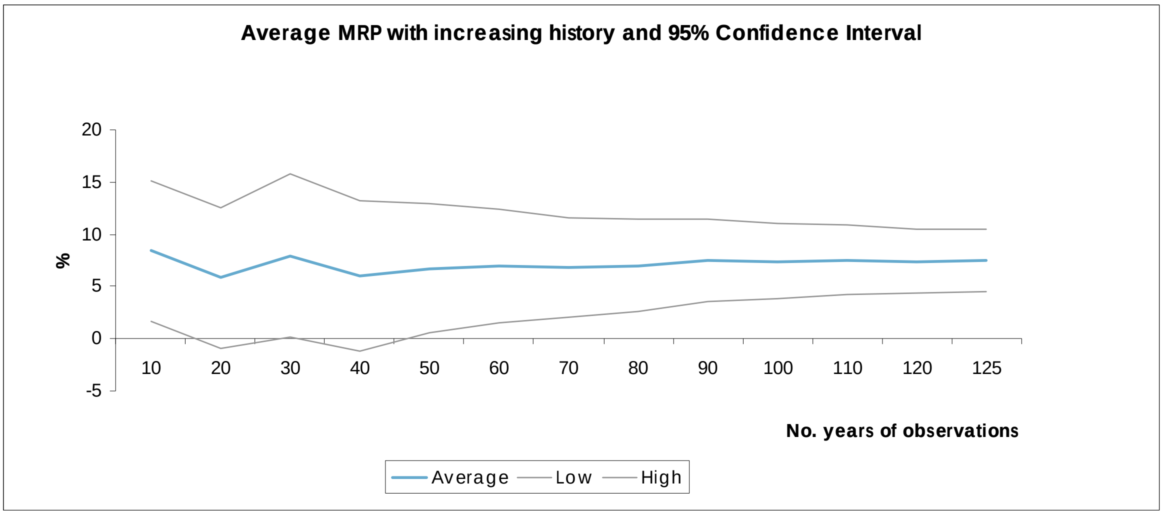
[40] Note that we are using the Officer series from 1883 to 1958 which may overstate the market return for this period according to Brailsford et al. At the time of writing we do not have access to these data however we do

Our data does reinforce this view that 100 years is too short from the perspective that the 95% confidence interval around the average is from 4.5% to 10.4%. Despite this wide interval, observation of the data does shed some light on how the average 'stabilises' and the confidence interval narrows as the number of historical observations increases.[40] Figure 4 shows the average MRP and associated confidence interval for increasing number of observations (i.e. moving further back in time.

Figure 4 shows there does appear to be stabilisation of the average around the long term average of 7.5% after 90 years[41]. Note also the 'narrowing' of the 95% confidence interval reflects greater precision as a result of the increased number of observations. However the confidence interval is still 'large' giving rise to the Dimson, Marsh and Staunton comment about 100 years not being long enough to iron our good and bad luck. Note also how this confidence interval continues to narrow as the data goes further back in time from 1958 (50 observations) demonstrating, at least, the benefit of the longer data series from a statistical precision perspective.

This 'stabilisation' is in marked contrast to a moving average of 10 (and 20) years as presented in Figure 5. In this case there are periods of negative MRP which is clearly nonsensical as an estimate of a forward looking MRP simply because risk averse investors will demand a premium over a risk free rate before being enticed to invest. Consequently we would not advocate looking at 10 years of data to form a view about the level or trend in MRP when making long term investment decisions.

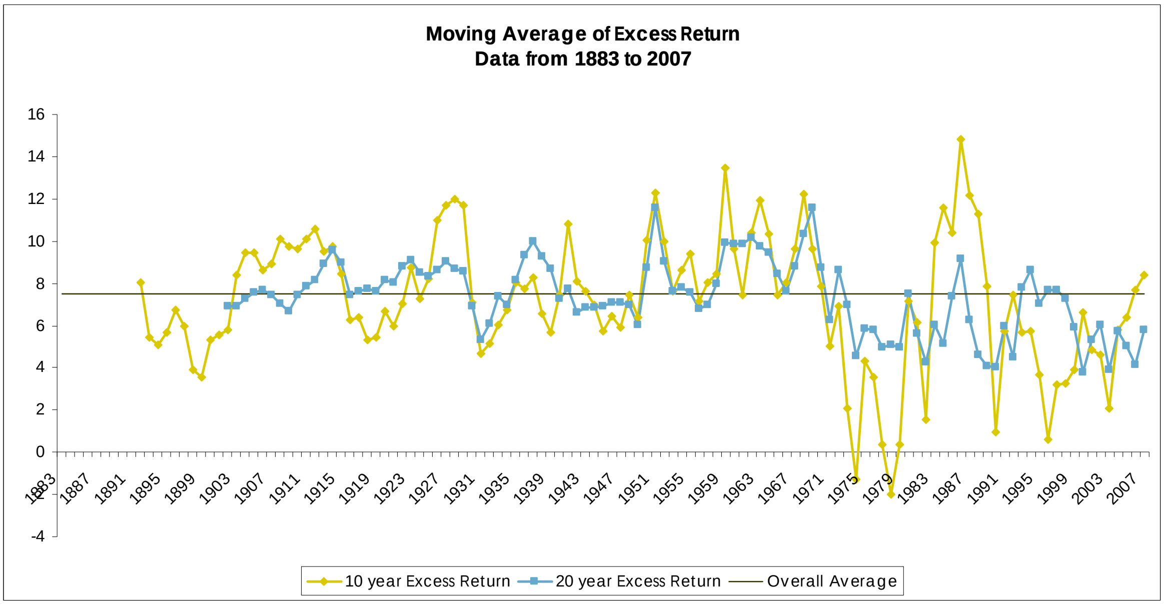
Figure 4: MRP as a function of the number of years of observations



not believe the strength of our argument is diminished because of this. There may be some refinement to the numbers arising from using the revised data.

41 Note again that this is the Officer series rather than that assessed by Brailsford et al consequently the absolute average number may be higher however we would expect the same 'stabilisation' and narrowing of the 95% confidence interval.

Figure 5: Moving average MRP



6.3 The variability in MRP over time and the challenge of identifying structural shifts

It is clear from Figure 2 & Figure 5 above that the historical MRP is highly variable. It is also reasonable that the expected short term MRP (forward looking) will also change over time. As an illustration, the current spread on corporate bonds (all grades) has increased substantially over the last year. This can be viewed as a market risk premium on risky assets but on (usually) lower risk assets than the overall market. The premium has also varied over time so the challenge for funding decisions is around whether it will revert to a mean and how to time debt funding.

As the Fischer Black quote highlighted, a long run estimate of the historical MRP is needed to 'iron out' this variability but in so doing it makes it hard to identify structural shifts. There has been argument advanced that a downward structural shift has occurred

Argument has been made that there may be a decline rather than an increase. Dimson, Marsh and Staunton (2000) for example, argue that increased openness of international capital markets enables further international diversification therefore a reduction in risk. This in turn could mean a lower market risk premium. They also argue their may be lower risk because of a more secure business environment because of economic and political lessons learned. However these are assertions. Further we often see statements like:

> *". . . there is a growing body of financial economics literature that has as a central belief that the current (expected) market risk premium is lower than the long run (historical) average of the premium to equity."*
>
> *and*
>
> *"In the academic literaure there are few participants who now dispute that the MRP has fallen to low historical levels."*[42]

These arguments appear in papers from time to time and we note the careful use of the word 'belief' in the first quote above. Supporting these views with empirical evidence is challenging give the variation in observed MRPs.

42 Memorandum to Essential Services Commission of South Australia from The Allen Consulting Group 28 June 2006 p 7 & 8

In addition to the challenge arising from detecting change given the underlying 'large' variability in the observed MRP, if there was a decline in MRP or variability, an underlying challenge is to identify the underlying cause. It is probably more likely to be gradual rather than a once off structural break. Since we do not have a well articulated theory of the determinants of the MRP, other than expected volatility, it is difficult to articulate what constitutes a structural shift and the timing of it to enable empirical testing.

In our opinion it would be hard to support a view that the market risk premium had fallen in the current market environment.

To illustrate the challenges in empirically detecting a permanent or structural decline (or a rise) based on changes in observed volatility in returns or trends in average data we present data on market volatility and trends over time. We argue that alleged trends (in either direction) have a habit of reversing and it can often be misleading to form a view based on recent data. It is more appropriate to examine data in a long time frame before drawing conclusions based on a short time frame. In this respect we present:

a) Two graphs of historical volatility that can lead to quite different interpretations if examined in isolation;

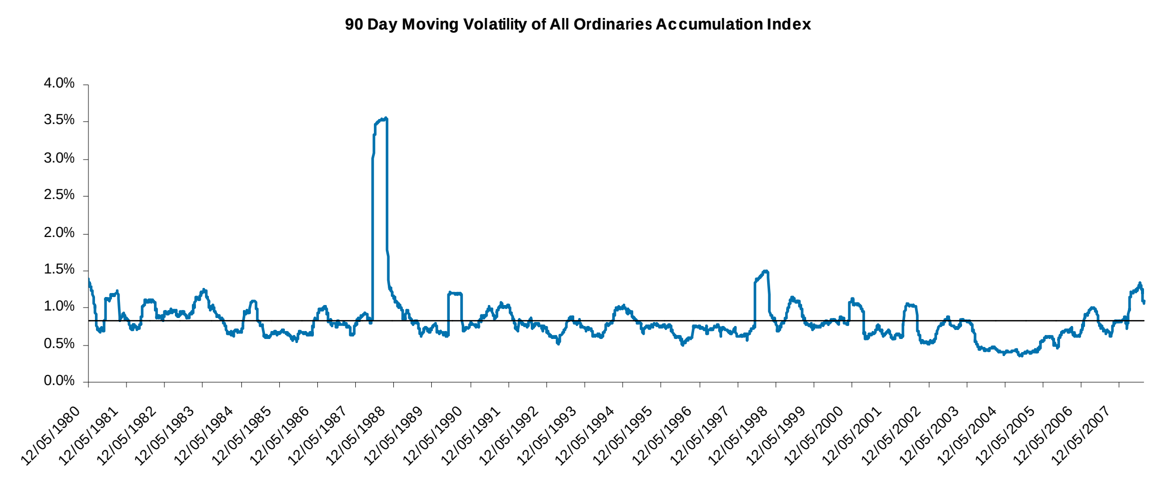
b) Data that looks at reward per unit of risk (i.e. $(r_m - r_f) / \sigma$) as an alternative to the absolute reward, $(r_m - r_f)$) which can also be interpreted as highlighting a challenge in discerning any noticeable trends; and

c) An update of a study that used a statistical technique to discern a trend downwards in the MRP. The update shows a reversal of the alleged trend.

6.3.1 Two graphs of historical volatility that can lead to quite different interpretations if examined in isolation;

Figure 6 shows the standard deviation of 90 observations of daily returns for the All Ordinaries Accumulation index using data from 2nd January 1980 to 30 June 2008. The time period was defined by data availability. Also plotted is a simple average of all observations.

Figure 6: 90 day volatility of All Ordinaries Accumulation Index



The 'eyeball' test shows that volatility over the 3 months top June 2008 is at its highest since the October 1987 crash. While there appears to have been a period from early 2003 to early 2005 when volatility declined this has not been maintained. It would be hard to argue for a decline in volatility driving a decrease in the MRP from these data.

Figure 7: Ten year volatility of All Ordinaries Accumulation Index

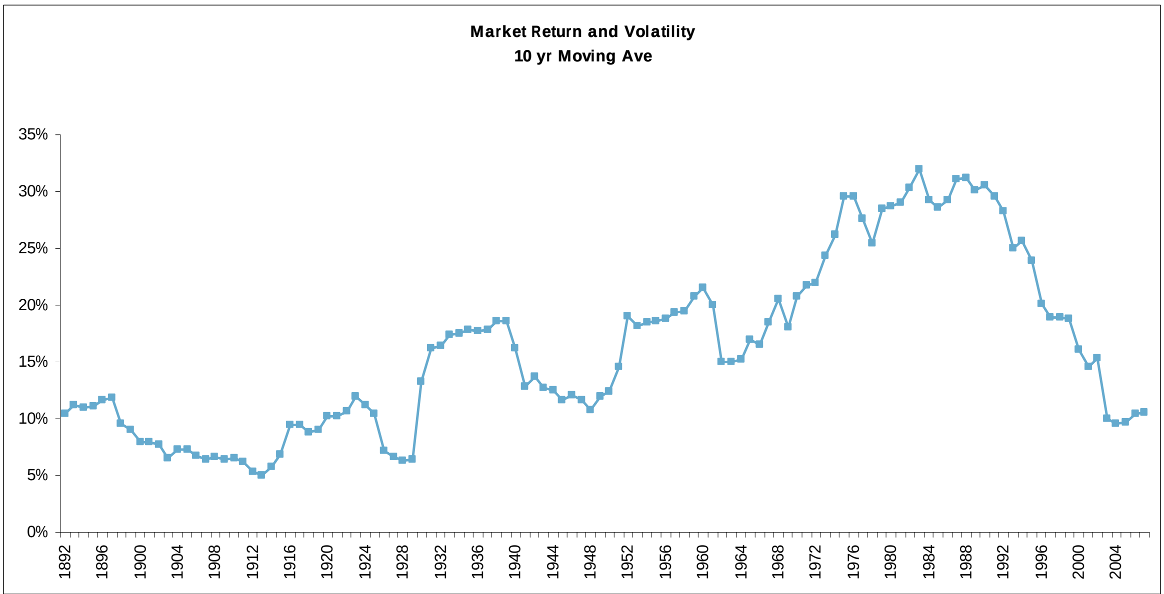


Figure 7 presents the 10 year moving average of volatility of annual market returns based on the 1883 – 2007 period. If the 1980s forward was examined in isolation, it could be concluded that there has been a decline in market volatility. This could lead to a very different view from one deduced from examining the entire period. While Brailsford et al have expressed concerns about the veracity of the Officer data (based on Lamberton) from 1883 to 1958, it is instructive to examine the volatility of the longer series. A very different picture emerges here. A decline in volatility is apparent since the late 1980s but this is from an all time high in the 1960's and 1970's.

Officer (1983) discovered a similar general outcome when investigating claims that market volatility in the US had fallen over the period 1926 to 1960. His research noted the decline however when examined in the context of volatility data from 1897 to 1969, the decline was more in the nature of a reversion to prior levels from an all time high in the 30's.

The data demonstrate the challenges in drawing conclusions from both 'noisy' data and from short time series which is why we prefer to look at the longest time series possible.

6.3.2 Data that looks at reward per unit of risk (as an alternative to the absolute reward)

Argument that a decline in volatility in recent decades leads to a decline in MRP implicitly assumes there is either a constant or declining reward per unit risk required by investors. Thus when experiencing a decline in volatility, the MRP will fall.

Evidence is mixed both as to whether there is a decline in volatility and whether there is a constant reward to risk ratio.

Merton (1980) noted the challenge in estimating the MRP arising from the volatility of the historical series. He postulated that the MRP per unit risk might be more stable.

Consequently, he examined the relative stability of three formulations of an MRP. These were:

1. $(r_m - r_f)$
2. $(r_m - r_f) / \sigma_m$
3. $(r_m - r_f) / \sigma_m^2$.

Where σ_m and σ_m^2 are the standard deviation and the variance of the market return respectively. Note that the relative risk measure ('beta') will be different in each case.

Note if σ_m^2 is constant over time then Merton's additional models effectively reduce to the first formulation where $(r_m - r_f)$ is constant over time. However, there is evidence that variance of the market return (σ_m^2) is not constant over time as is apparent from the last 2 Figures. Further, it is important to note that the variance cannot be observed and must therefore be estimated. Using MRP formulations of this form, it will only be helpful if σ_m^2 can be estimated with more precision than $(r_m - r_f)$. Given prior evidence suggests that this is likely and therefore Merton expressed some hope that the second or third formulation of MRP may be more precise than the first.

Merton estimated the three different formulation of MRP in the US using data over the period 1926 to 1978 and found that the approach added little i.e. the mean and standard error is essentially the same as using a simple average. This is not to say that it couldn't have helped, because it may have been that $(r_m - r_f)/ \sigma_m^2$ is constant and therefore $r_m - r_f$ moves with variance, however that turned out not to be the case.

Figure 8: Market return per unit volatility

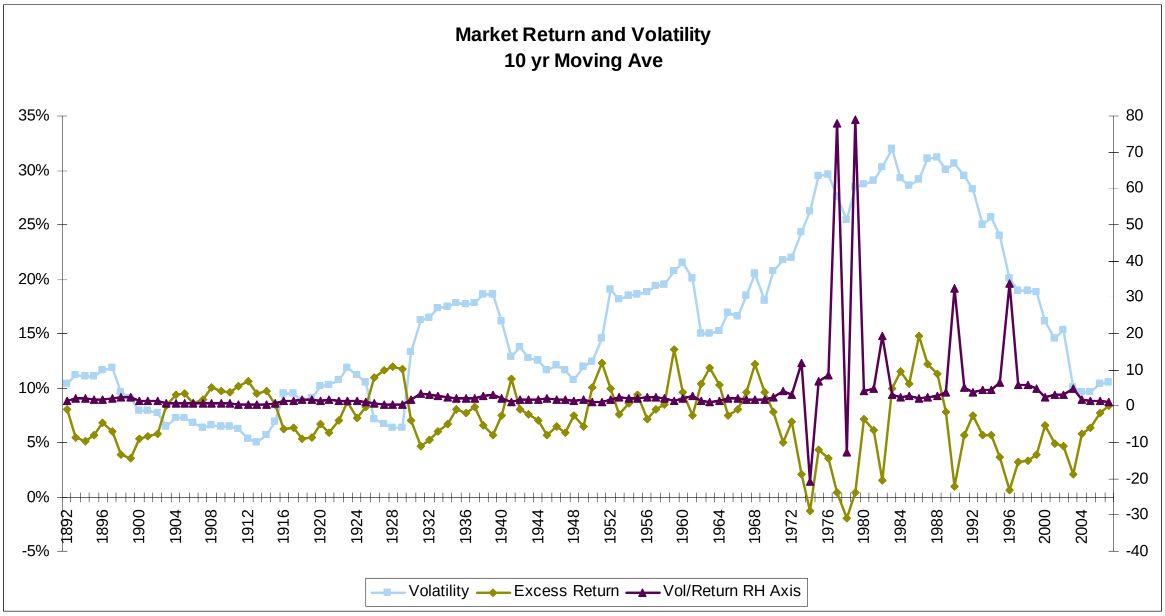
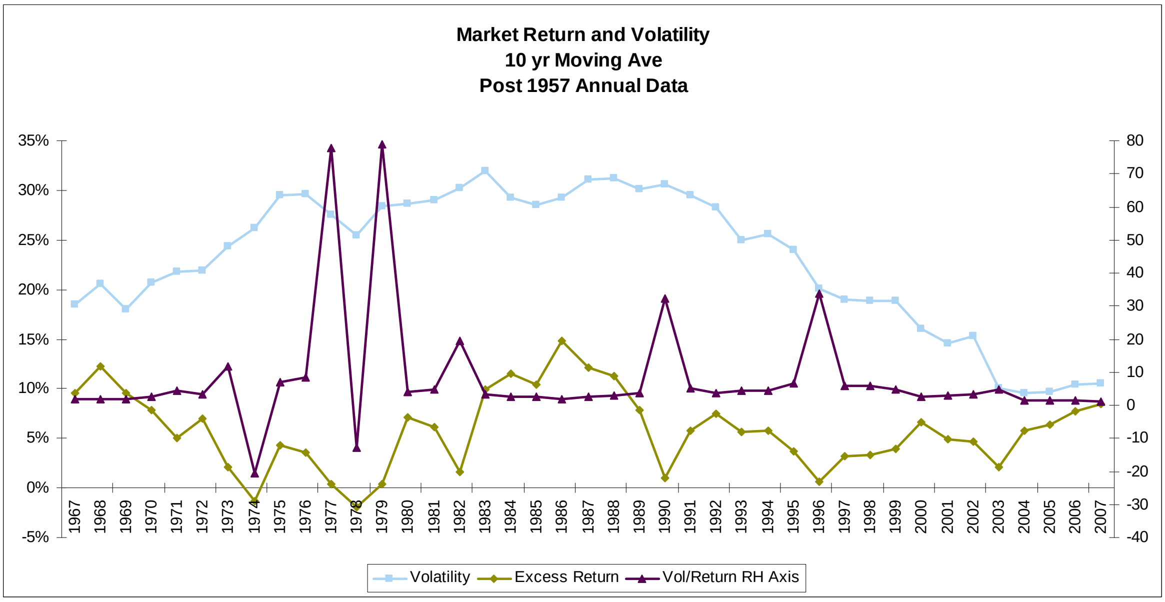


Figure 9: Market return per unit volatility – post 1958 data



6.3.3 An update of a study that used a statistical technique to discern a trend downwards in the MRP.

Our update of a prior study that showed an apparent decline in MRP now shows a reversal of the alleged trend. Again, we are of the view that taking a long term average mitigates making changes based on shorter term data.

Hancock (2005) uses a Hodrick-Prescott filter technique[43] to assist identify any trend in the historical MRP data. Officer and Gray (2005) question the appropriateness of this

[43] This technique was developed by Hodrick Prescott (1997). It is a statistical method of attempting to identify any underlying trend as well as any cyclical component of a time series of data.

approach. In a Monte Carlo simulation[44] using mean and standard deviation data analogous the historical MRP data, they find:

> *" . . . these results suggest that the results from the HP filter are relatively unreliable and that this technique might not be appropriate for the purpose of estimating MRP from historical data."*

Bishop (2007) updated the Hodrick-Prescott filter work to include data to December 2006 and noted a change in the downward trend back to the longer term level apparent in the majority of the data series.

For completeness we have updated this analysis to include monthly data to December 2007 and it is presented below.

Hancock focused on the period 1974 to 2003 essentially because this was the period for which AGSM provided 'reliable' monthly market returns. With these data, the paper examines both annual non-overlapping and annual overlapping historical MRPs. It is argued by Hancock that the latter provides more data points than the former thereby providing a richer data set.

Table 8 and Figure 10 present updated historical MRPs. These data include the calendar years 2004 – 2007 in addition to the 1974 to 2003 data presented by Hancock. We did not have the same data set as Hancock consequently there are some small differences in averages for the common period, particularly for the overlapping data.[45] Note that the heading 'No Overlap' in Table 8 refers to the average calculated with no overlapping data – each annual observation is independent of the others. The 'overlap' heading refers to calculations based on a 'moving year' through the monthly data series. A calculation is made for 12 months then the next involves dropping the first of the 12 months and adding another year. Thus there will be 11 months of common data between adjacent 'years'.

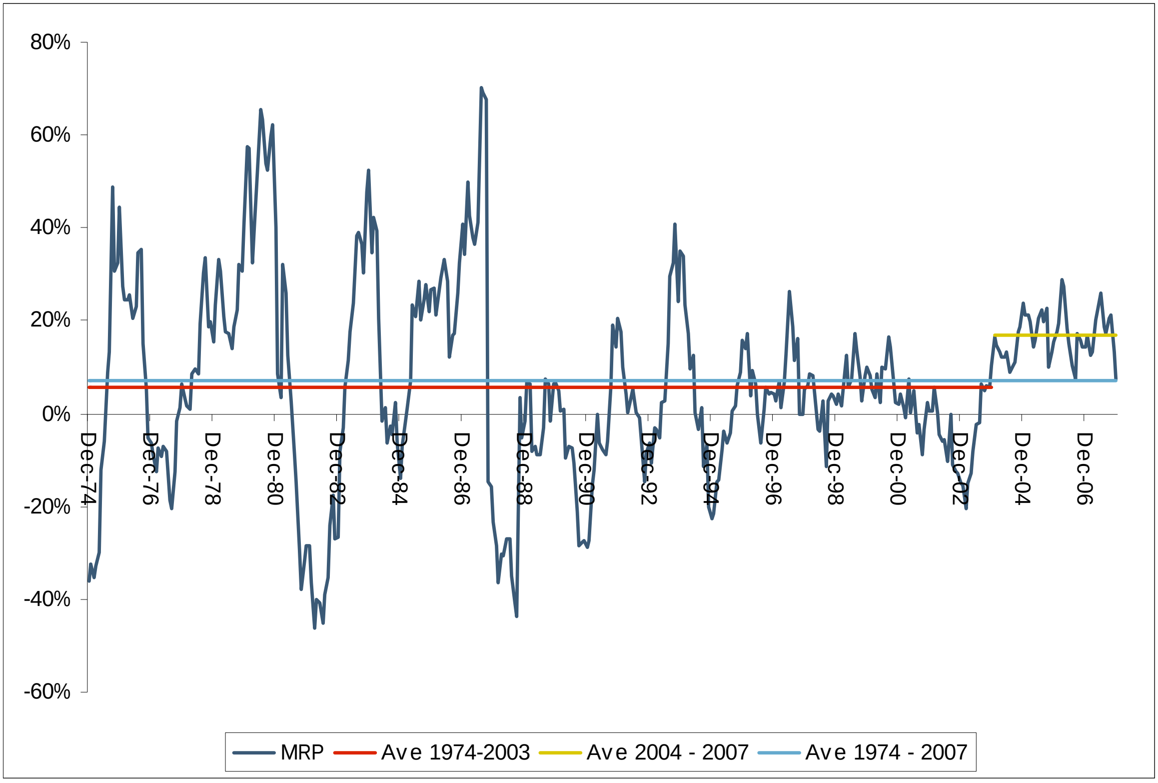
Table 8: Average Market Risk Premia post 1974

	Hancock		Bishop Officer	
Period	No Overlap (%)	Overlap (%)	No Overlap (%)	Overlap (%)
1974 – 2003	6.0	5.9	6.0	5.7
1974 – 2007			7.4	7.1
2004 – 2007			17.3	16.8

44 Mont Carlo simulation involves repeating calculations many times by randomly drawing possible inputs from distributions of possible values of the input.

45 Monthly market return data for 1992 - 2007 was obtained from Bloomberg based on the S&P Accumulation Index. This was used by Hathaway. Monthly market data for 1974 to 1992 was obtained from the AGSM index. There were 3 months of data in 1993 that used the All Ordinaries index to bridge the gap in the other 2 series. The risk free rate was the 10 year Government bond rate obtained from RBA. The opening bond rate for each year was used to compute the MRP. The annual market return was the product of the monthly price relatives.

Figure 10: Historical Market Risk Premia Post 1974, overlapping data



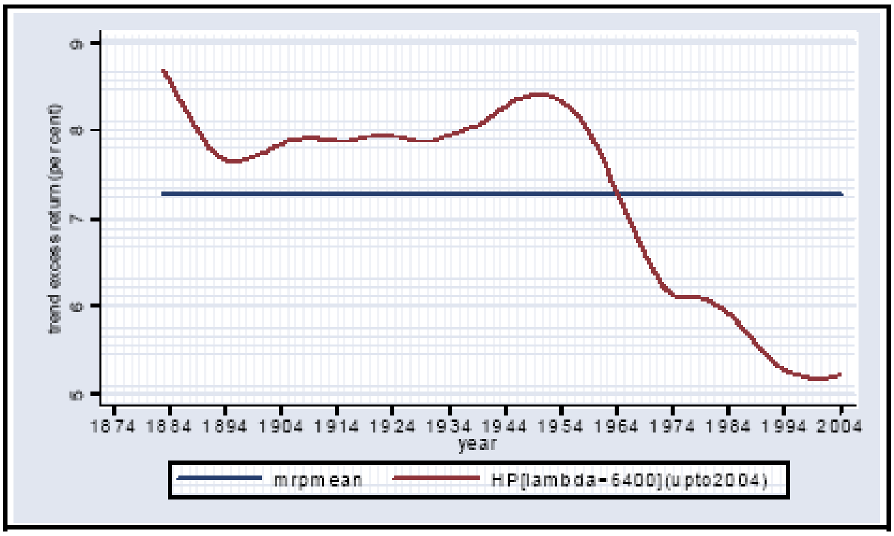
The recent data is not consistent with a decline in the MRP as predicted by Hancock and Hathaway. Simple examination of the graph alone suggests that if any downward trend was apparent in the Hodrick-Prescott trend estimate up to 2004 then it would be arrested if not reversed by more recent observations. This proposition is examined in the next section.

These data are not consistent with any decline in the MRP, in fact they suggest the reverse. The average of 7.4% for the period 1974 – 2007 is in line with the reported average of 7.3% over 122 years for what is called the Officer series in Hancock (p45), and with the 7.5% for the 125 year period reported in this paper. It is above the 6.3% reported by Brailsford et al in the post 1958 series.

Hancock (2005) used a filtering technique called Hodrick-Prescott filter to assess whether there was a change in the long term trend of MRPs. The figure containing the output as presented in the paper is presented below. The paper notes:

> *"It is readily apparent that filtering the data in this way suggests that the MRP has dipped substantially, and has recently been at all time lows around 5 per cent." (p iii)*

Figure 11: Average Excess Returns & Hodrick-Prescott trend estimate of excess returns (Ex Hancock)

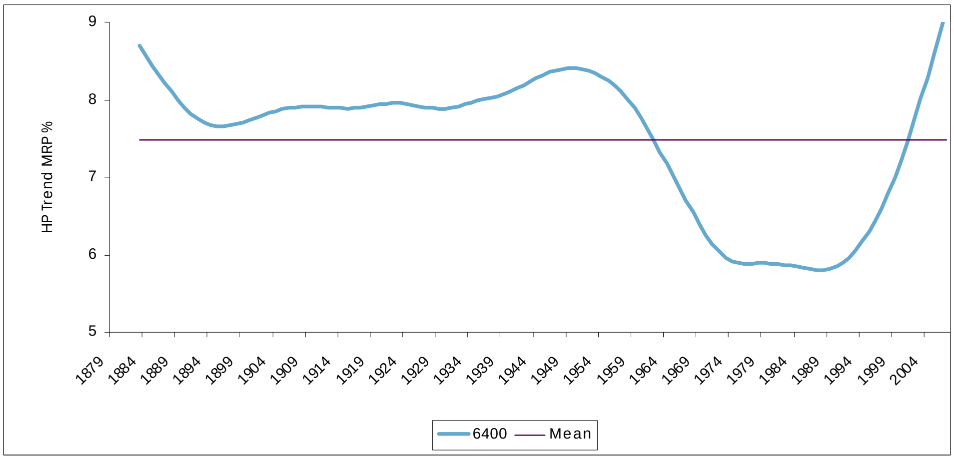


Source: Hancock (2005)

We applied the Hodrick-Prescott filter to the updated data to 2007 using the lambda of 6400 applied by Hancock. The result is presented in Figure 12 below.

It is apparent from this update that the 'smoothed' MRP does continue the apparent decline in the data to 2003. The trend has moved back to a higher level as was predicted from recent MRP observations. The apparent downward trend in Figure 12 has been substantially reversed. Clearly this has been influenced by the strong performance of the stock market in recent years and the figure highlights the challenge in selecting an appropriate time series.

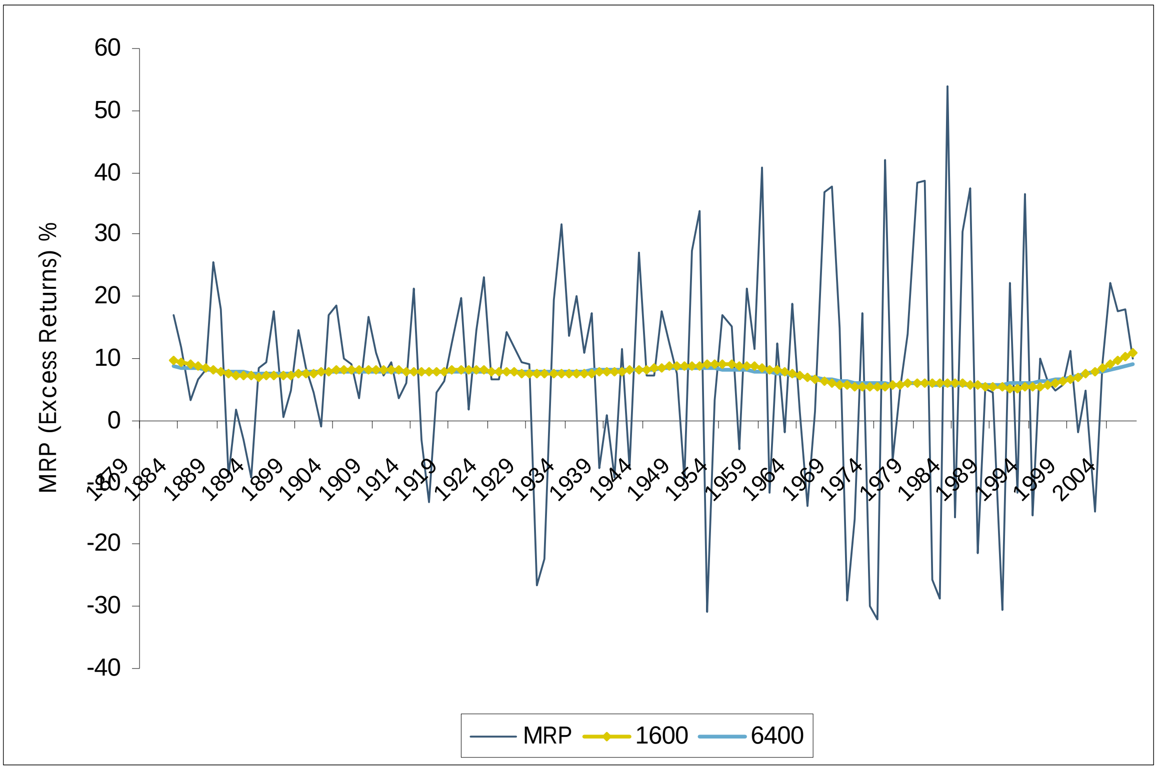
Figure 12: Average Excess Returns & Hodrick-Prescott Trend Estimate of Excess Returns (update to 2007)



The Figures above accentuate the overall picture by the choice of scale. Naturally the point of interest is the behaviour and band of the mean however, as noted earlier, the data series is extremely noisy (hence the use of filtering techniques to help discern underlying trends).

Figure 13 puts the prior figures, including the Hodrick-Prescott filter with lambda set at 1600, within the perspective of the underlying actual data. Non constancy in the filtered trend is evident as is any clear signal that the mean has declined in recent years.

Figure 13: Excess and Average Excess Returns with Hodrick-Prescott Trend



This again demonstrates the challenge in arguing that the MRP has fallen in recent years. It is simply hard to identify.

6.4 Adjusting for drivers of stock market performance that may not repeat

Dimson, Marsh and Staunton (2000), for example, hypothesize that recent economic performance (i.e. second half of 20th C) may have out-performed expectations and this will not be repeated. As a consequence, they argue, the historical series overstates a forward view. They hypothesize that the outperformance that may not be repeated could be due to two factors:

- Unprecedented growth in productivity and efficiency and improvements in corporate governance;
- Diminished investment risk from learning how to better manage it and a reduction due to international diversification.

This hypothetical thinking is apparent in Hancock (2005) and Hathaway (2005) who argued for what amounts to adjustments to a MRP derived from an historical time series.

Both papers argue that the MRP has declined in recent years and the most appropriate rate is less than the 6% widely used.

We have commented on these papers and the adjustments elsewhere nevertheless we summarise the key points below for completeness.[46]

[46] Gray and Officer (2005): Gray Stephen and R R Officer, "A review of market risk premium and Commentary on two recent papers: A report prepared for the Energy Networks Association", August 2005
Bishop S (2007), "Market Risk Premium: Commentary on Recent Papers," Capital Value, prepared for Envestra Ltd.

Both Hancock and Hathaway argue that the historical average MRP required adjustment for potential biases.

Hancock identifies 2 possible biases:

i. The introduction of dividend imputation in 1987 which was argued to produce a large unanticipated return. This was estimated to require a downward adjustment in the 30 year average by 2/3 per cent over the 30 years; and
ii. A long term downward movement in discount rates that has led to unanticipated higher stock returns. This was argued to require a 1/3 per cent adjustment to the average MRP.

The paper identified a third possible bias arising from a survival bias i.e. there is an over-representation of companies that succeeded. However no explicit adjustment was made for this.

Overall Hancock recommended adjusting the historical average downward to account for these effects. If the logic held this would lead to an adjustment of the updated MRP average from 7.3% to 6.3%, still above the MRP used in most regulatory price determination in Australia.

On the other hand Hathaway does not make adjustment for the same factors as Hancock. Hathaway argues that there has been a stock market price re-rating over the period circa 1980 to 1990. This, he argued, is evident in the PER (price earnings ratio) for the market being re-rated from around 9 times to 17 times. As a result, he argues the MRP will be overstated by this once off event. The outcome was that Hathaway recommends adjusting the more recent geometric MRP of 6% (last 30 years) downwards to 4.5%.

Hathaway also points out that the historical MRP will be incorrectly measured for the period post the introduction of imputation tax. He estimated this to be, on average, in the order of 53 basis points and, as best we can determine, incorporated this in the average he computed (although this is not clear).

We agree that this is a downward bias in the measured MRP and will also be evident in the Hancock data. No explicit allowance was made for this by Hancock. If his adjustment of approximately 2/3 per cent was to be accepted then it should be offset by the downward bias arising from excluding the imputation benefits.

The challenge with making adjustments of the type recommended by Hancock and Hathaway is that there is no real guiding theory or model that informs us as to what drives the determination of a MRP. Consequently we have no real way of assessing what is an event that might lead to a bias. How do we assess what is a one off event and what isn't?

Hancock and Hathaway, independently and for different reasons, identify what they regard as upward biased in the MRP but provide no discussion of possible events that could bias the MRP downwards (save for the measurement problem arising from franking tax credits identified by Hathaway). There may well be many events that could be identified as once off having either an upward or downward impact on the MRP. For example, why not exclude the 1987 crash as a once off event? Why not exclude the impact of the introduction of capital gains tax as a once off event (like imputation tax)? It would be relatively easy to extend the list.

As noted, there is no formal way to identify which events to include or exclude. Adjustments are really ad hoc and, by themselves, represent a source of potential bias arising from the researcher's bias. For this reason we do not support ad hoc adjustments.

As noted by Gray and Officer, the MRP arises because there are unexpected economic events. The MRP is a 'reward' for bearing unexpected market wide risks. To exclude market wide events from the data set is to potentially exclude the events that give rise to it in the first place.

Variation in market returns arise from unexpected events. Thus one could argue if the data series were to be adjusted for once off unexpected events then all variation, not just some spikes, should be excluded from the analysis. This clearly is a nonsensical extension of the argument to exclude selected events.

In this section we have examined three reasons suggested as to why it may be necessary to look beyond historical data to form a view about the future. While we have great sympathy with the views put forward, in our opinion there has not been evidence provided that suggest that there is a better estimate of the MRP than one based on a long history of data.

7. Conclusion.

The average historical market risk premium i.e. the observed market rate of return less the yield on Government bonds, is estimated as 6.7% over the period 1958 to 2007 if there is no value placed on a return to investors for imputation tax benefits[47].

A market risk premium of 6% has been widely used in regulatory price determinations in Australia. We have reviewed and updated the historical empirical evidence and we have examined the argument for change in the MRP in light of forward looking as well as historical evidence. We are of the view that there is no persuasive evidence to reduce this market risk premium but there is some persuasive argument to increase it to 7%.

The best source of a forward looking market risk premium is, in our view, a long term average of historical MRPs – the longer the time period the better. Data is available from 1883 to the present. A recent paper (Brailsford et al 2008) reviewed data prior to 1958 and questioned its appropriateness in reflecting a broad market return. After a 'best efforts' adjustment to this data by the authors, the historical MRP over this period (1883 – 1957) was 6.1% compared with 8.0% from the prior 'Officer' unadjusted data. Whether of not the Brailsford et al adjustments are appropriate does not change our view of the recommended MRP.

The market risk premium of 6% was originally based on evidence that excluded any explicit consideration of a component to reflect any value of imputation tax benefits in the historical MRPs. Consequently the 6% can be viewed as an estimate of the MRP when this value is zero (the term 'gamma' is usually used to reflect the value of $1 of imputation tax benefits created by a firm however we are concerned with the value of a dollar of imputation tax benefits once distributed given that we are adjusting observed market returns). The inclusion of an estimate of the imputation tax benefits in the historical estimate of market equity returns forms the basis of our recommendation that the MRP be increased from 6% to 7% as qualified below.

We recognise that precise estimation of both the MRP without imputation tax benefits and the estimation of imputation tax benefits is a challenge due to 'noise' in historical data. An overlay of the need for regulatory certainty encourages us to recommend that there be no change in the widely used 6% under a view that imputation tax benefits have no value but it this is not enough to prevent our recommendation of 7% when imputation benefits are included. While we have not focused on estimating an explicit value of gamma or the value of imputation tax credits once distributed in this paper, regulatory practice places a value on gamma of 0.3 and greater. Under these circumstances we recommend the MRP be 7%.

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[47] The statistical precision of the estimate is low given the high variability in the historical data.

A number of suggestions have been made as to why there may be reasons to look beyond a long historical series of observed MRPs to arrive at an estimate of the MRP. These include suggestions that structural change may have occurred and there are historical events that may not be repeated and should be excluded from the MRP estimation. After reviewing these suggestions in light of our data, we are of the view that longest time series should be used and that there should not be any removal of observations because past events may not repeat.

8. References

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