Market Risk Premium: Australian Evidence

Business Valuation research paper
by Macquarie University

MARKET RISK PREMIUM: AUSTRALIAN EVIDENCE

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PURPOSE: **Research Paper for the CAANZ Business Valuation Specialists Conference, 13-14 August, 2018**

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The authors acknowledge the contribution by Professor Bob Officer to research into the cost of capital and, in particular, the Market Risk Premium in Australia. Many of his contributions are reflected in this paper.

This research has been assisted by Chartered Accountants Australia and New Zealand ABN 50 084 642 571

CONTENTS

LIST OF FIGURES

LIST OF TABLES

SETTING AND PURPOSE

The cost of capital is an integral component of valuation-based decision making, performance assessment and components of financial reporting. For these purposes it is a market assessed opportunity cost, the minimum investors currently require to invest in an asset with similar risk.

While estimating return for debt investors require is relatively straight forward, estimating the cost of equity requires guidance from a model. The Capital Asset Pricing Model ["CAPM"] is the most widely used for this purpose. The expected market risk premium ["MRP"] is an integral component of the CAPM, it is the reward for bearing risk over and above a risk free rate of return on an asset with average risk, a beta of 1.

The purpose of this paper is to capture methods used to estimate or guide the estimation of the expected MRP. It endeavors to capture where current thinking is at with respect to estimating a MRP that reflects current circumstances and thereby provide guidance to assessing this important input to estimating a cost of capital.

The expected MRP will reflect the expected level of market risk and investor's degree of risk aversion. Neither of these is likely to be constant so the expected MRP is likely to change reflecting changes in these two drivers.

It is fair to say that currently no well-developed and accepted method to capture changes, only general guidelines.

Interestingly, survey evidence suggests practitioners in Australia tend to use the same MRP over time; most appear to use 6% despite apparent changes in market risk and possibly in risk aversion. This can lead to outcomes that don't reflect current market conditions and situations that are hard to substantiate. For example, in the so-called Global Financial Crisis and its aftermath, use of a 6% MRP leads to a narrowing of the risk margin between debt and equity and, in at least one regulatory decision, the cost of debt being higher than the cost of equity. This does not make economic sense.

Why many valuers don't change the expected MRP to reflect current market conditions is not clear. Some possibilities include the behavioral finance notion of anchoring; lack of clear guidance as to how to change it, safety in the sense that courts and regulators will not rule against convention or perhaps other ad hoc changes are made to the cost of equity to compensate in some way. It is not the purpose of this paper to explore the reason for maintaining the same MRP under different economic conditions, but it is an interesting question.

This document is structured to:

- summarise guidance from the theory as to how to think about and estimate the market risk premium;
- review issues associated with measurement of an historically based MRP;
- summarise prior research into estimates of MRP
  - historical estimates
  - implied MRP from forward looking data
  - survey evidence
  - regulatory decisions
- update an historical based estimate and examine some issues associated with its estimation
- review forward looking evidence and recent research in this regard;
- provide some general guidelines to assist estimate an expected MRP.

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[1] 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 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.

The cost of equity, as a component of the weighted average (of debt and equity) cost of capital, ["WACC"] 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). Consequently, the MRP is an important input to estimating the cost of capital.

2 GUIDANCE FROM THE THEORY

Under the simplest version of the Capital Asset Pricing Model ["CAPM"][2], 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[3]. 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 the covariance[4] of the asset's 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 on the grounds that these influence investors' view of the future and that there is no better forecasting model available. It is common for MRP and beta to be estimated in this way.

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[1] 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).

[2] The model generally attributed to Sharpe, Lintner, Mossin, Tobin.

[3] The portfolio must lie on the "efficient set", the portfolio usually chosen is a broadly based share market portfolio, each share weighted by capitalisation.

[4] 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.

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. 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.;
- applies to all assets which also defines the market portfolio. This includes debt however the CAPM is not required to estimate a required return on debt as this is available directly.

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 measuring 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, making the models redundant insofar as they are based on risk or stochastic returns.

In such circumstances, it is perhaps inevitable that forecasts, 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.

Prior to reviewing the empirical research we examine some important measurement issues.

3.2 MEASUREMENT ISSUES

This section of the paper addresses the following important measurement issues associated with estimating a MRP.

- 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 RETURNS ANALYSIS 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 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[5] 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[6]. 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[7]. 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 was stationary over time then it would not matter whether monthly, annual or 10-yearly periods

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

[6] 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

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

[7] From the context of known mathematical functions that can be used to approximate returns.

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 Accumulation Index of the Australian Share Market or the S&P 500 Index in the USA. 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:

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

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 rates 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.

$$r_{i=1\to 4} = (1+r_1)(1+r_2)(1+r_3)(1+r_4) - 1.0\,. \qquad (2)$$

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. Consequently, 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 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.

It is more than in just passing that we note that our estimates of the MRP use the actual market return for a year less the yield on a 10 year government bond as at the beginning of the year. We assume an investor looks back at the return on the market and to the risk free investment undertaken at the beginning of the year. However rather than compute an actual (and variable) return on the bond, we assume it does not change from the yield at purchase (i.e. risk free). This is consistent with how the MRP is used in practice i.e. the MRP is added to the current yield on government bonds.

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.[8]

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), and

ϕ (theta) 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

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[8] 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.

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.

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[9] 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[10] 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[11]. 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.

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

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

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

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

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) 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.

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

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. [12]

Estimates of the VFC for the thirteen years from 1987 to 2017 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%.

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

4 REVIEW OF PRIOR RESEARCH

4.1 HISTORICAL-BASED RESEARCH

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 using his data 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),

[12] 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.

Brailsford, Handley and Maheswaran (2008), and NERA (2013) to name a few. In addition, there have been papers prepared for regulatory hearings that update the Officer data, examples include Gray and Officer (2005), Bishop (2007), and Handley (see for example, Handley, "Advice on the return on equity", October 2014, p19 and AER, Attachment 3, "Rate of Return: Ausnet Services distribution determination final decision 2016-20" May 2016, p3-221).

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 includes the Brailsford et al (2008) and NERA (2013) papers. These papers investigate 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 use adjustments advised by the ASX 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.

   NERA (2013) also make a series of adjustments to the dividend yield estimates in the pre 1958 market data Lamberton series that Officer originally used and Brailsford et al adjusted. The downward adjustment to the Lamberton series is not as large as for Brailsford et al. The outcome for a comparable time series from 1883 to 2012 is 6.5% compared with Brailsford et al at 6.14%.

   Other historical analysis includes Bishop and Officer (2009), Dimson, Marsh and Staunton ["DMS"] (2013) and, more recently, Duff and Phelps.[13] Duff and Phelps publish annually historical MRP data for many countries around the world, including Australia, largely based on the DMS data updated.

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. Except for the section dealing with imputation tax, we report MRP data with and without a return from imputation whereby the imputation benefits are valued at $1. In this paper we use the DMS equity market data from 1883 to 1958 and the

[13] Duff and Phelps continued on from Ibbottson when Morningstar acquired Ibbottson.

updated Bishop and Officer data from 1959 to 2017. The DMS data draws upon the NERA adjusted Lamberton series pre 1958. This data is used:

- because they and Duff and Phelps 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.

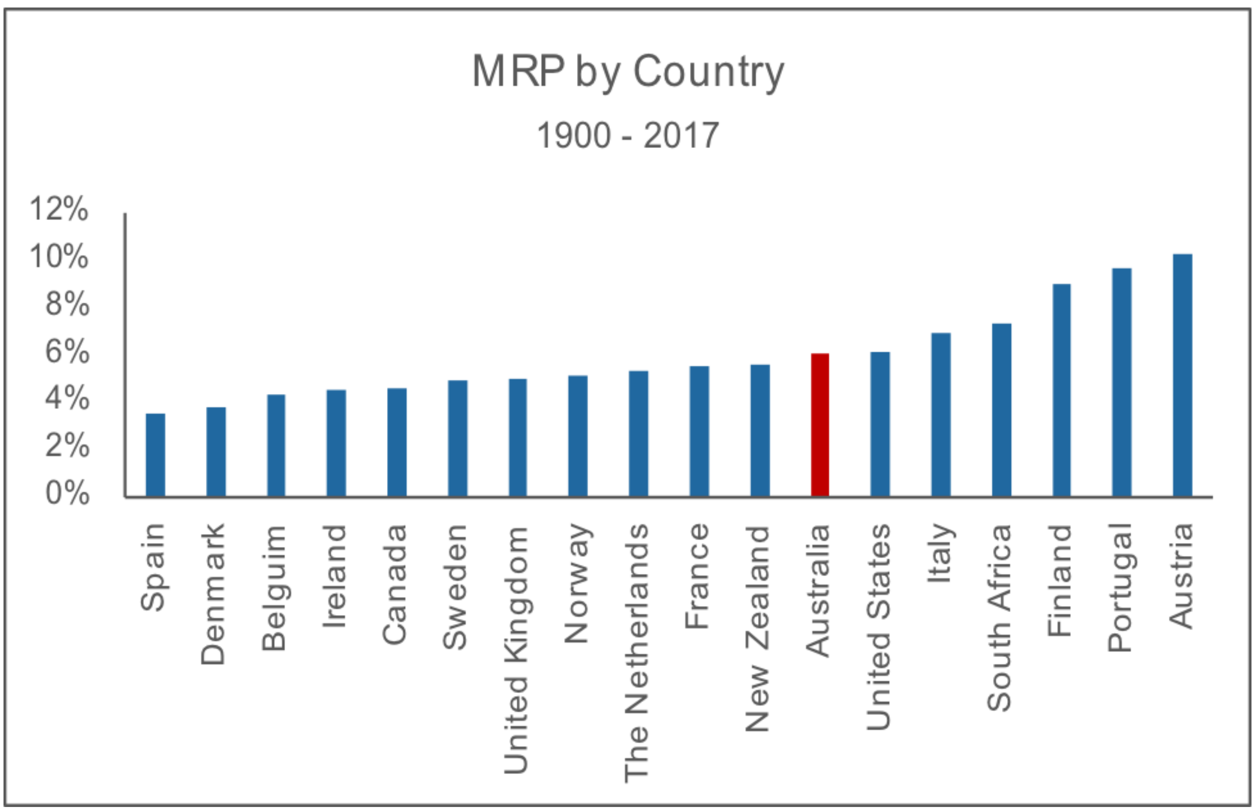
We cover each of these points in turn.

Dimson, Marsh and Staunton ["DMS"] (2018) present geometric MRPs (relative to long term bonds) for 21 countries using 117 years of data from 1900 to 2017. This is presented in Figure **1** below. This data is based on a geometric rather than arithmetic average, the former being lower than the latter. Further, DMS use realised returns for bonds whereas the norm in Australia is to use the yield. Their results are presented here to show the relativity across countries – the arithmetic MRP will be higher for all countries.

The (unweighted) average for the 21 countries is 3.6%. The Australian geometric average was 5.1% and this excludes any adjustment for imputation tax benefits (this corresponds to an arithmetic average of circa 6.1%). Nine of the 16 countries had geometric MRPs greater than 5%. The Australian historical MRP is at the higher end but not dissimilar to the US, Italy, Finland. Austria, Germany, South Africa and Japan based on these data.

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, "Credit Suisse Global Investment Returns Yearbook 2018.. The MRPs are calculated here as Mkt Return less R_f. This will give a higher premium than that calculated as (1+Mkt Return)/(1+R_f rate) -1. Bishop estimates the arithmetic MRP of 6.4%

compared to the geometric MRP for Australia (excluding imputation return) as 4.4% for the same period. Bishop uses the yield rather than realised returns for Bonds..

4.2 FORWARD DATA BASED RESEARCH

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. 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.

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:

$$r_e = D_1/P_0 + g \qquad (7)$$

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. Estimates of g require assumptions concerning growth rates in eps, payout ratios, and returns on new investments. 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:

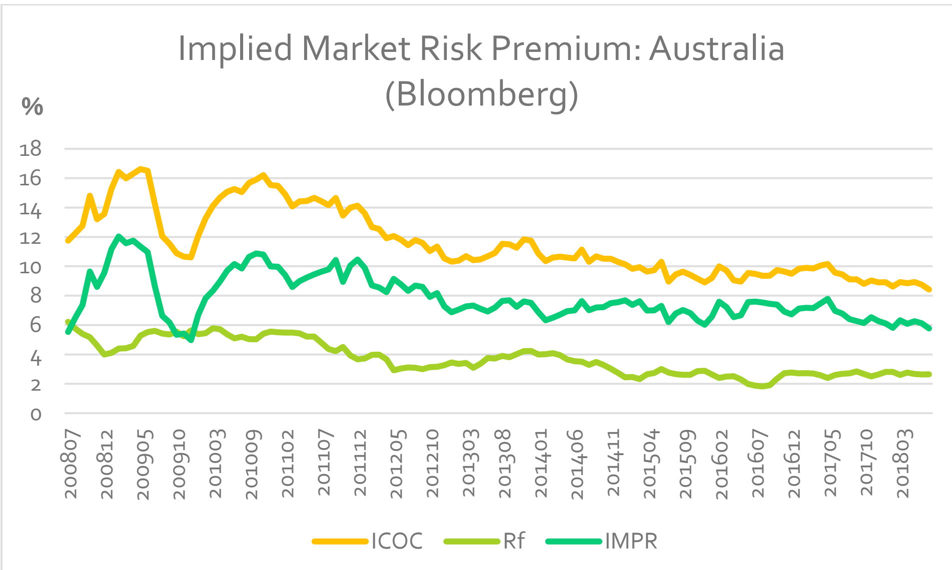
> *". . . this model's estimate of the market risk premium is even more imprecise than the estimate obtained by using historical data."*

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. They 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 are two sources of forward looking estimates of the MRP in Australia. Bloomberg follows a similar approach to Harris and Marston when estimating a forward looking MRP. Bloomberg develops 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.

Bloomberg now publish historical estimates of their MRP estimates. Daily estimates of the Bloomberg MRP from 30 July 2018 can be accessed under the CRP tab. Results since 2008 are presented in Figure 2.

Figure 2: Bloomberg estimates of MRP



Another source is the Web site http://www.market-risk-premia.com/au.html, operated by a German group of finance practitioners. This tracks the market implied risk premium for different markets at a monthly frequency. For Australia, the implied risk premium is available since January 1998. Different from Bloomberg, this Web site uses a two-stage growth model. As a result, the market implied risk premium estimates made by this website will generally be lower than those in Bloomberg. Figure 3 presents the monthly Implied Market Return, Implied Market Risk Premium and risk free rate from January 1998 to June 2018. In Figure 4, we compare the annual historical MRP with the end-of-year IMPR from 1998 to 2017. We calculate the historical MRP as the average of MRP from 1883 to the most recent observation. It is evident from Figure 3 that IMPR is typically lower than historical MRP and the only exception is 2008, where the market was suffering the Global Financial Crisis.

Figure 3: Australian IMRP (Monthly, January 1998-June 2018)

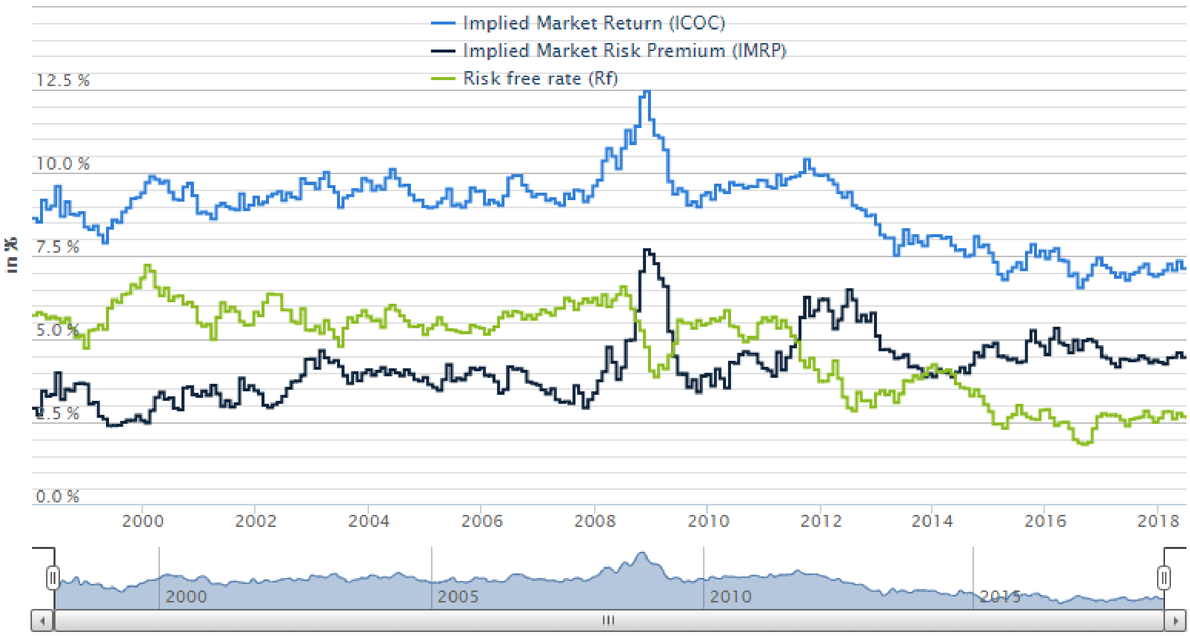
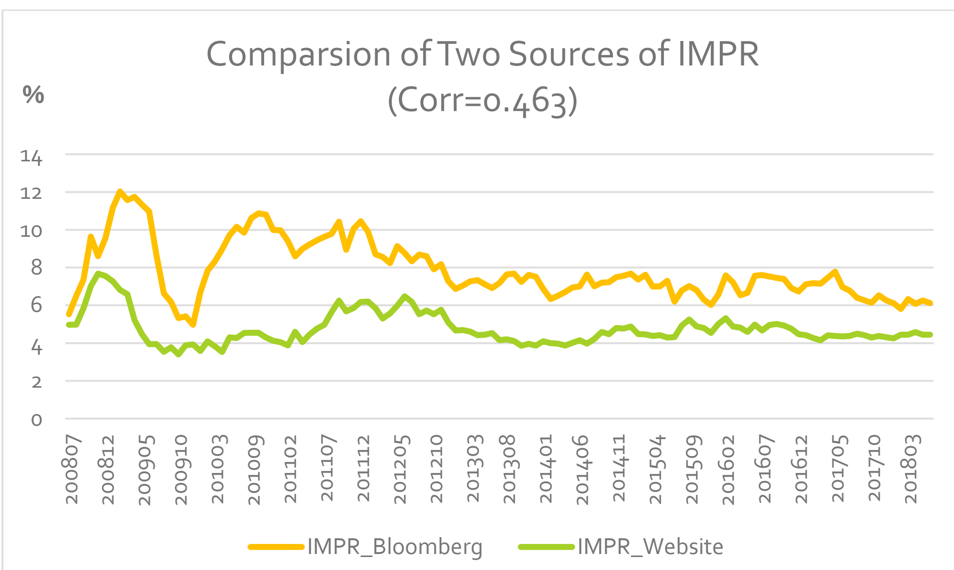


Figure 4 presents a comparison of both methods. This figure shows, firstly, the constant difference between these two approaches and secondly, they do not move synchronously. A correlation of 0.46 would be considered low for methodologies directed at measuring the same underlying variable.

Figure 4: Comparison of MRPs from Bloomberg and 'marketriskpremium.com'



From both these sources, it is clear that 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 Figure 4. 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. 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. In a regulatory environment, in particular, use of an MRP by regulatory authorities from this source (exclusively) will involve changing the MRP from decision to decision. We are of the view that regulatory certainty that is derived from using an average over time rather than a changing number is tantamount.

4.3 A SUMMARY OF MRPS USED IN REGULATORY PRICE DETERMINATIONS IN AUSTRALIA

An estimate of the MRP is used in regulatory price determinations. The return on capital component of the revenue build up process, used in these determinations, is generally the largest single component. The return on capital component is the Regulatory Asset Base (a measure of capital invested) multiplied by an estimate of the WACC. Given the large amount of capital invested in the regulated monopoly assets, a small change in the WACC can have a substantive impact on "allowed" revenue. It is not surprising therefore that the WACC and the MRP component have been subjected to considerable research, argument and debate fostered by the opposing views of the interested parties viz. those acting for customers and those acting for the regulated monopolies.

A market risk premium of 6.5% has been widely used in regulatory price determinations by the Australian Energy Regulator ["AER"]. This was increased from 6.0% in May 2009 and is still current at the time of writing. The reason for the change in 2009 is summarized by the AER as:

> *". . . the AER has now adopted a market risk premium of 6.5 per cent (whereas, the AER proposed a value of 6 per cent in its explanatory statement) in this final decision, which recognises the additional uncertainty on a forward looking basis associated with the global financial crisis"*[14]

The AER has recognised that the MRP may vary over time but has only made the one change noted above[15].

This relative stability is in contrast with decisions by IPART which now estimates a MRP from an average of the historical MRP and 6 other (largely forward looking) estimates[16]. IPART had used an historical estimate in the range 5.5% to 6.5% (mid-point at 6%) but departed from this in its 2013 methodology by formally recognising that the forward looking MRP is variable. The estimate is achieved by weighting the historical estimate (mid-point of 6%) with a range of forward implied estimates. As a result, its biannual estimate has varied from 6.95% at February 2014 to 7.75% at August 2017 with the latest estimate at February 2018 at 7.55%.

Other regulators have generally used estimates similar to the AER[17].

4.4 A SUMMARY OF SURVEY EVIDENCE

Surveys of cost of capital estimation techniques and inputs to its estimation are becoming relatively more frequent. They are useful to assist an understanding of what is being used in practice and, to a much lesser extent, how the

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[14] AER "Final decision. Electricity transmission and distribution network service providers. Review of the weighted average cost of capital (WACC) parameters, May 2009 p iii

[15] See, for example AER Attachment 3 Rate of return ElectraNet transmission draft determination 2018 p 285

[16] IPART, "Review of our WACC method. Final Research Report", February 2018 p52-56.

[17] AER note the range used between August 2015 and December 2015 was from 6% to 7.3%. AER Attachment 3 Rate of return AusNet Services distribution determination 2016 to 2020 May 2016 p 248

MRP used may change over time. However, there are challenges associated with them and should be treated with some caution.

Surveys of Australian practice reviewed here have been published by by Kester et al (1999), Truong, Partington and Peat (2005), Lonergan (2001), KPMG (2005), (2013), (2017), Ernst and Young (2016), Jardine Fleming Capital Partners (2001), Fernandez (all years 2008 to 2018 excluding 2009) and Institute of Actuaries (2011 to 2016).

In this research, reviewed here, the MRP commonly used is generally in the range 5 - 8% with 6% being quite frequent. It is assumed that this is relative to the 10 year Government Bond Rate but this is not always clear. Equally, it is not always clear whether this is inclusive of an expected return from imputation benefits (if any) or not. The results are summarised In Table 1, however these should be read in conjunction with the comments below.

Table 1: Summary of Average MRP from various surveys

Year	Truong et al	KPMG	Ernst Young	Jardine Fleming	Fernandez	Institute of Actuaries
2001				5.87%		
2005	5.94%					
2005		6.2%				
2008					5.9%	
2009						
2010					5.4%	
2011			6.0%		5.8%	4.7%
2012					5.9%	4.6%
2013		6.3%			6.8%	4.8%
2014					5.9%	4.4%
2015		6.0%			6.0%	4.9%
2016					6.0%	5.3%
2017		6.3%			7.3%	
2018					6.6%	

Some of the challenges with survey results are touched upon in the review below but, in summarising, challenges include being able to assess:

- The quality of the question asked of respondents e.g. does it set the context of the use of the estimate? e.g. a forward or backward-looking estimate, a current-long term or short-term view, is it relative to long term bonds or short term bills;
- Does it ask whether an estimate of the return on imputation credits has been, or should be, included? (the Institute of Actuaries surveys, for example. does make this clear in their questions and summary of results but it is not clear in many other surveys). Further, whether asked or not, it may not be clear what the answers assume in this regard;

- Are the respondents "experts" in assessing an MRP, or followers who take a common usage approach rather than an approach that reflects current conditions? Further, are they actually engaged in investing, valuations or valuation advice?;
- Are the respondents engaged in litigious activities whereby precedent is often more important than departing from it, thereby provide a very conservative response?;
- The behavioural economists recognise that the concept of "anchoring" is prevalent in decision making, thus responses may reflect this rather than a view that reflects changing conditions;
- Change in the respondent mix to an annual survey can make it difficult to assess whether a change in an average outcome is due to a change in view, a change in underlying conditions or simply due to a change in the respondent set how have a different view to prior respondents;
- Whether the average outcome has been influenced by extreme views that may be inconsistent with a reasonable range for the estimate. For example, both the Fernandez and Institute of Actuaries surveys had very high estimates (25% and 15% respectively) while the former had a very low estimate of zero. With small samples these extremes may bias the report's average. As a reader of the survey outcomes, it is hard to know the basis for these extreme estimates and whether of not they should be given any weight – as similar issue can arise with less obvious extremes;
- Whether respondents make trade-off across other parameters in the CAPM e.g. they use an average risk free rate (above current relatively low risk free rates) but a lower MRP;
- Whether there is a bias arising because the response group are not representative of the views of the wider set of investors or valuation practitioners;
- Whether respondents were basing their estimates on geometric or arithmetic return.

In addition, it is unlikely that the survey results are independent of other estimation techniques such as the historical and forward looking approaches, as these will be important inputs to views about the MRP.

Summary of Research

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, while 11% added a risk premium 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 essentially 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)[18] however more used a rate higher rate than a lower rate. Oddly the average was reported as 5.94%. 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

[18] 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.

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 2 below.

Table 2: 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.

KPMG have undertaken a number of surveys of valuation practitioners. The MRP rates used are captured in Table 3. The 2005 survey includes a review of independent expert reports while later surveys are data collected by asking a specific question about the rate used by valuation practitioners.

The majority (> 70%) of respondents in all years used an MRP rate of 6% with the 2013 and 2018 surveys showing an increase in the number using greater than 6%. Two of the surveys provided a small number using a rate less than 6%. The data provided does not allow an assessment of whether the changes across surveys are due to changes in the rate used by particular valuation practitioners or are a reflection of different respondents across the years.

Table 3: KPMG Survey Responses to MRP used in valuations

MRP Range	2005 a	2013 b	2015 b	2017 d
> 7.5%	3%	2%		5%
7.00%	12%	21%	4%	18%
> 6% to 6.5%	9%			5%
6.00%	76%	74%	78%	71%
< 6.0%	0	5%	8%	
Implied Weighted Average	6.2%	6.3%	6.0%	6.3%

a Survey of Independent Expert Reports.

b Estimated from data in 2015 survey of valuation practitioners.

c Estimated from graph, presented numbers don't add to 100, Survey of valuation practitioners.

d Estimated from graph. Survey of valuation practitioners.

Ernst Young also examined rates used in Independent Expert Reports issues between 1 January 2008 and 31 December 2015. They explicitly report 16 MRP's used of which 15 used 6% and one used 7%.

Jardine Fleming Capital Partners Ltd (2001) presented the results of a survey to "Trinity Best Practice Committee". The results for Australia are captured in 4.

Table 4: 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

Data on the expected equity premium has been omitted (i.e. 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 than 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.

Fernandez et al undertake annual surveys of the market risk premium used / recommended by practitioners and academics. The summary results arising from the responses for Australia are summarised in Table 5.

Table 5: Fernandez et al Survey Responses to view of MRP

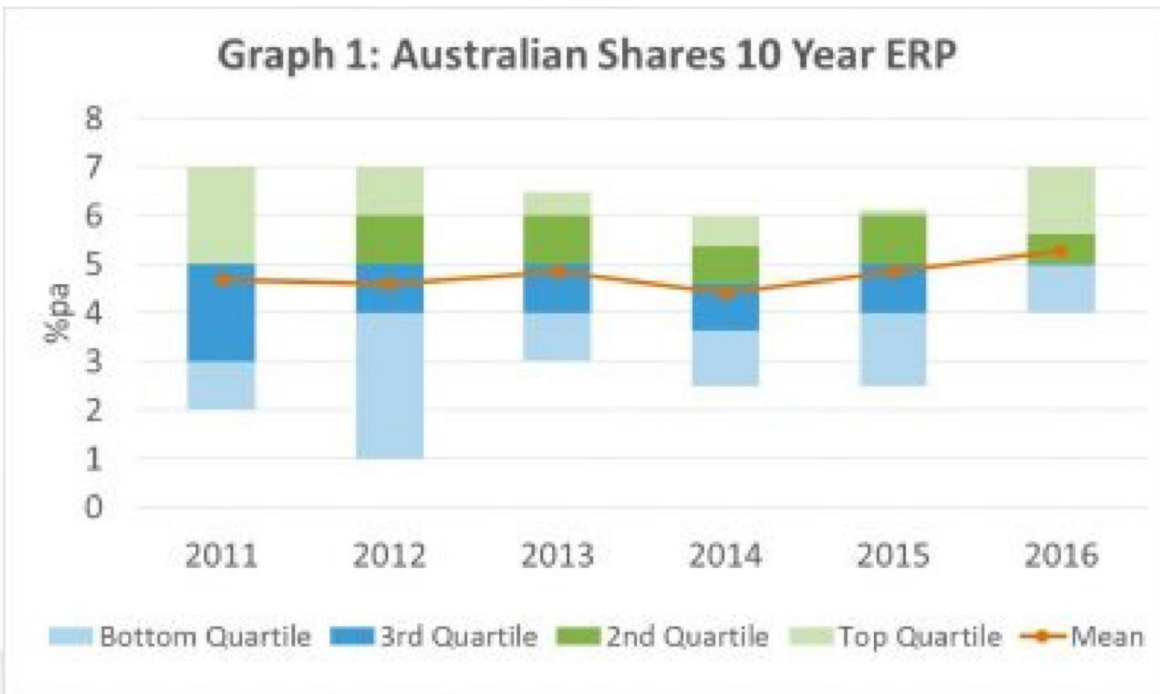
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Average (%)	5.9	na	5.4	5.8	5.9	6.8	5.9	6.0	6.0	7.3	6.6
Standard Deviation (%)	1.3	na	0.7	1.9	1.4	4.9	1.6	4.0	1.6	1.2	1.4
Maximum (%)	7.5	na	6.0	14.0	10.0	25.0	15.0	19.0	10.0	15.0	10.2
Minimum (%)	2.0	na	4.1	3.0	3.0	3.0	3.0	1.5	5.0	3.0	3.3
No. Respondents	23	na	7	40	73	17	na	40	87	26	74

The average result for 2013 and 2017 are higher than other years while that for 2010 is lowest. The 2010 survey has the smallest number of respondents, viz. 7. As noted in comments for the KPMG survey, the data provided does not allow an assessment of whether the changes across years are due to changes in the rate used by particular valuation practitioners or are a reflection of different respondents across the years. On this score, it is apparent the number of respondents does vary considerably from year to year. Of concern, is the maximum MRP response in many years. It would of value to better understand how respondents estimated the MRP's of 14% and higher, 25% in one instance. These appear well above the average and other survey responses. The 25% maximum may well be an explanation for the higher than most hears average in 2013 given the relatively smaller number of respondents and highest standard deviation

The Institute of Actuaries publishes an annual survey of Actuaries' view of the expected market risk premium. These generally capture an average expectation in the range 4.4% to 5.3% over the period 2011 to 2016. This range of expectation is lower than the historically based MRP and is similar to the forward looking MRP estimated from analysts forecasts and current share prices (discussed later). It is noted in the 2016 survey report that "most people (52%) use a variety of methods for determining the equity risk premium, with forward looking measures (26%) more prevalent than historical data (17%)".

Figure 5 and Table 6 below summarise the results of each survey. The actuaries surveyed work in four areas, viz. Life Insurance, Investments, General Insurance and Super.

Figure 5: Survey Responses: Institute of Actuaries



Source: David Carruthers, "Equity Risk Premium Survey 2016", Digital Actuaries, Magazine of Actuaries Institute. March 2017, p25

Table 6: Expected MRP derived from surveys of Actuaries

	2011	2012	2013	2014	2015	2016
Average	4.7	4.6	4.8	4.4	4.9	5.3
Median	5.0	5.0	5.0	4.6	5.0	5.0
Ave excl Franking	*4.1*	*4.1*	*4.3*	*3.5*	*3.8*	*4.3*
Maximum	15.0	12.0	7.0	6.0	6.0	7.0
Minimum	2.0	0.0	0.0	0.2	2.5	4.0
No. Respondents	45	49	46	29	29	24.0

It appears that some "extreme' forecasts have been excluded in the graph for 2011 to 2013 (at least) as the numbers differ from the data reported in the base documents. The medians shown in the Table were not reported for some years, so a number was read from the graph in these years.

5 UPDATE OF HISTORICALLY-BASED MARKET RISK PREMIUM

5.1 HISTORICAL PERSPECTIVE

As noted, a MRP of 6.5% is now widely used in regulatory price determinations in Australia while 6% appears more commonly used by valuers, as is apparent from the survey evidence. It is likely that use of the 6% number has been influenced by the historically based empirical work of Hathaway and Officer[19], and subsequent work of academics, and become a standard.

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

1. This empirical evidence by Hathaway and Officer examined MRPs without any adjustment for a value for imputation tax benefits;
2. There is a high degree of variability in historical estimates of MRP's, consequently the 95% confidence interval around an average is quite large (circa 6% for the entire data series 1883 to 2017). The range of historical annual MRPs from 1883 to 2017 is -44% in 2008 to 53% in 1993. Given these ranges, precision to several decimal places is not warranted. Consequently, it is questionable using even one decimal point.

The average MRP has been estimated here both with and without an estimate of the value of imputation tax benefits. However, including an adjustment for imputation tax benefits requires a view on the value of a dollar of benefits paid to shareholders. For simplicity it has been assumed that this value is $1 despite the short delay between tax being paid to the ATO and shareholders claiming it back. A value that recognises this delay of circa 7 months is likely to be circa $0.90.

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

5.2 DATA AND APPROACH

The historical MRP was estimated annually for the period 1883 to 2017 on a calendar year basis. A monthly and daily series was also estimated from January 1980 to December 2017, the time period being the longest for which easily available and consistently determined data is available. The MRP 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. The post 1987 period reflects the entire period for which the imputation tax system has operated. So, the MRP with imputation included reflects a weighting of the pre 1987 period without imputation benefits and the post 1987 period with imputation benefits. If the historical average is used as a proxy for a forward view, then there is an argument that the approach taken will underestimate the MRP as the full rather than weighted value of the impact of imputation benefits should be added.

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[20].

> *"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. NERA argued that Brailsford et al had overstated their adjustment and

[20] 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.

re-estimated the dividend yield to 1957[21]. This NERA data is used by Dimson, Marsh and Staunton and is used for the analysis below.[22]

The series from 1980 to 2017 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[23], 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, using Equation 4, presented earlier:

$$VFC_t = d_t \left(\frac{T_{ct}}{1 - T_{ct}}\right).f_t.\Phi \ldots \qquad (4)$$

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

[21] NERA Economic Consulting, "The Market Risk Premium: Analysis in Response to the AER's Draft Rate of Return Guidelines", October 2013

[22] It is noted that the AER have rejected the NERA approach and use the Brailsford et al data (as updated). See for example, AER Draft Decision Electranet transmission determination 2018 – 2023: Attachment 3 – Rate of Return October 2017 p 275.

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

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 using 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 2017. 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.

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 by using a value of 1 (and zero). Zero is a natural outcome of excluding imputation tax benefits while 1 is the other extreme (and unlikely[24]) 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.[25] 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.

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*

[24] 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.

[25] http://www.ato.gov.au/large/content.asp?doc=/content/1471.htm

> *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[26]."*

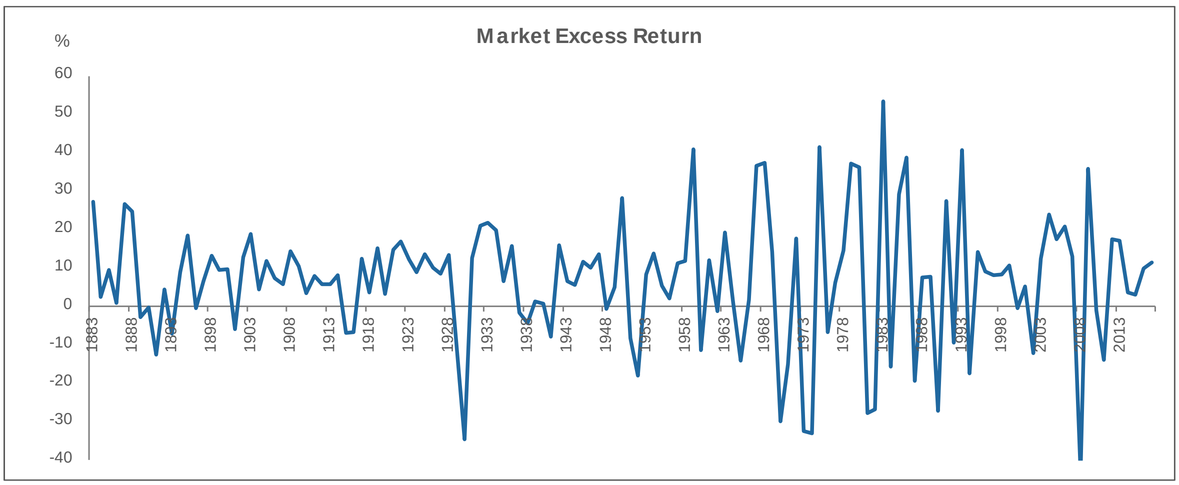
The risk free proxy series from December 1969 to 2017 was collected from the Reserve Bank of Australia ["RBA"] website.

5.3 RESULTS AND COMPARISONS

5.3.1 MARKET RISK PREMIUM (MRP)

The historical annual MRPs (or market excess returns), were calculated as the difference between the historical market return and the opening Treasury bond yield. The MRPs including imputation benefits are presented in Figure 6. The average of all excess returns is 6.9% while the average is 6.5% excluding imputation benefits.

Figure 6: Market risk premium 1883 - 2017

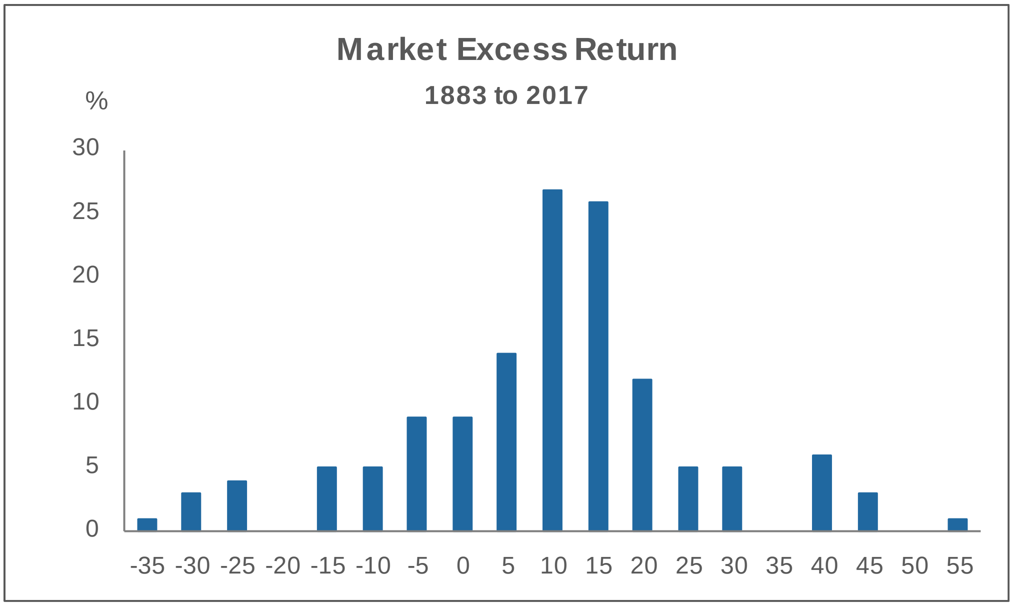


Of note is the considerable volatility in the historical series. The range is from -44% to 53%. Also apparent from an eyeball test is the greater volatility post 1929.

Figure 7 presents an histogram of the data.

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

Figure 7: Market risk premium 1883 - 2017



Summary information is presented in Table 7. The MRP in this Table does not contain an adjustment for any value that might be attached to imputation tax benefits.

Table 7: Average MRP over increasing observation intervals

							Confidence Interval		
From		To	No. Years	Ave	Std Devn	Std Error	Low	High	Range
2008	-	2017	10	2.5%	21.0%	6.6%	-10.5%	15.5%	26.0%
1998	-	2017	20	5.4%	16.4%	3.7%	-1.7%	12.6%	14.4%
1988	-	2017	30	4.9%	17.3%	3.2%	-1.3%	11.1%	12.4%
1978	-	2017	40	6.6%	21.5%	3.4%	0.0%	13.3%	13.3%
1968	-	2017	50	5.3%	22.7%	2.3%	0.8%	9.8%	9.1%
1958	-	2017	60	6.0%	22.0%	2.9%	0.3%	11.8%	11.5%
1948	-	2017	70	5.8%	20.8%	2.6%	0.7%	11.0%	10.3%
1938	-	2017	80	5.7%	19.7%	2.3%	1.2%	10.3%	9.1%
1928	-	2017	90	5.8%	19.4%	2.1%	1.8%	9.9%	8.1%
1918	-	2017	100	6.3%	18.5%	1.9%	2.5%	10.1%	7.6%
1908	-	2017	110	6.2%	17.7%	1.8%	2.8%	9.7%	6.9%
1898	-	2017	120	6.4%	17.1%	1.6%	3.3%	9.6%	6.3%
1888	-	2017	130	6.2%	16.7%	1.5%	3.3%	9.2%	5.9%
1883	-	2017	135	6.5%	16.6%	1.4%	3.7%	9.3%	5.6%

Source: Officer, Bloomberg, RBA

Table 7 shows the average MRP for the 'cleanest' data i.e. post 1958, The arithmetic average for this more recent 60 year period, excluding an imputation tax benefit adjustment is 6.0%. It is 6.9% if imputation tax benefits are included at full value.

Table 7 also displays the 95% confidence interval, assuming normality[27] 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 3.7% to 9.3%. 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 8 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 improved statistical reliability from examining the greatest number of observations against 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

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 8. It shows that with imputation tax benefits valued at $1 per dollar, there should be an addition of 90 basis points over the period 1958 – 2017 bringing the average MRP to 6.9%.

Table 8: Impact of Imputation on MRP

				Average Excess Return	
From		To	Years	Excl Imp	Incl Imp
2008	-	2017	10	2.5%	4.1%
1998	-	2017	20	5.4%	6.7%
1988	-	2017	30	9.8%	10.5%
1978	-	2017	40	6.6%	7.8%

[27] 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!

1968	-	2017	50	5.3%	6.8%
1958	-	2017	60	6.0%	6.9%
1948	-	2017	70	5.8%	6.6%
1938	-	2017	80	5.7%	6.2%
1928	-	2017	90	5.8%	6.4%
1918	-	2017	100	6.3%	6.8%
1908	-	2017	110	6.2%	6.7%
1898	-	2017	120	6.4%	6.9%
1888	-	2017	130	6.2%	6.8%
1883	-	2017	135	6.5%	6.9%

6 FURTHER ISSUES IN ESTIMATING AN HISTORICALLY BASED 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 on the 2000 paper, 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[28], 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:

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

Our data does reinforce this view that 100 years is too short from the perspective that the 95% confidence interval around the average for our 135 years of data is from 3.7% to 9.3%. Despite this wide interval of 5.6%, 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. Figure 8 shows the average MRP and associated confidence interval for increasing number of observations (i.e. moving further back in time).

Figure 8 shows there does appear to be stabilisation of the average around the long term average of 6.5% (excluding imputation) after 100 years. Note also the 'narrowing' of the 95% confidence interval reflects greater precision resulting from 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 (60 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 9. 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.

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[28] We should also note the original analysis of Dimson, Marsh and Staunton (2003) who introduced an 'adjusted historical' estimate. They argued historical estimates were overstated as they are measured over a period when expected returns were increasing and required returns were declining, which led to realised returns exceeding current required returns.

Figure 8: MRP as a function of the number of years of observations

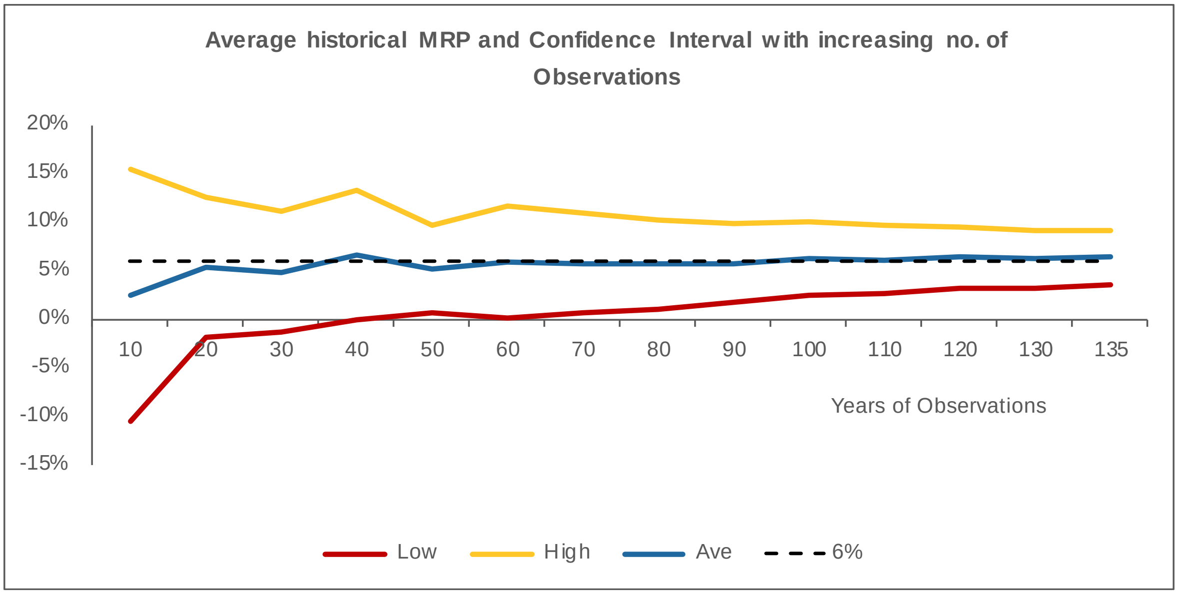
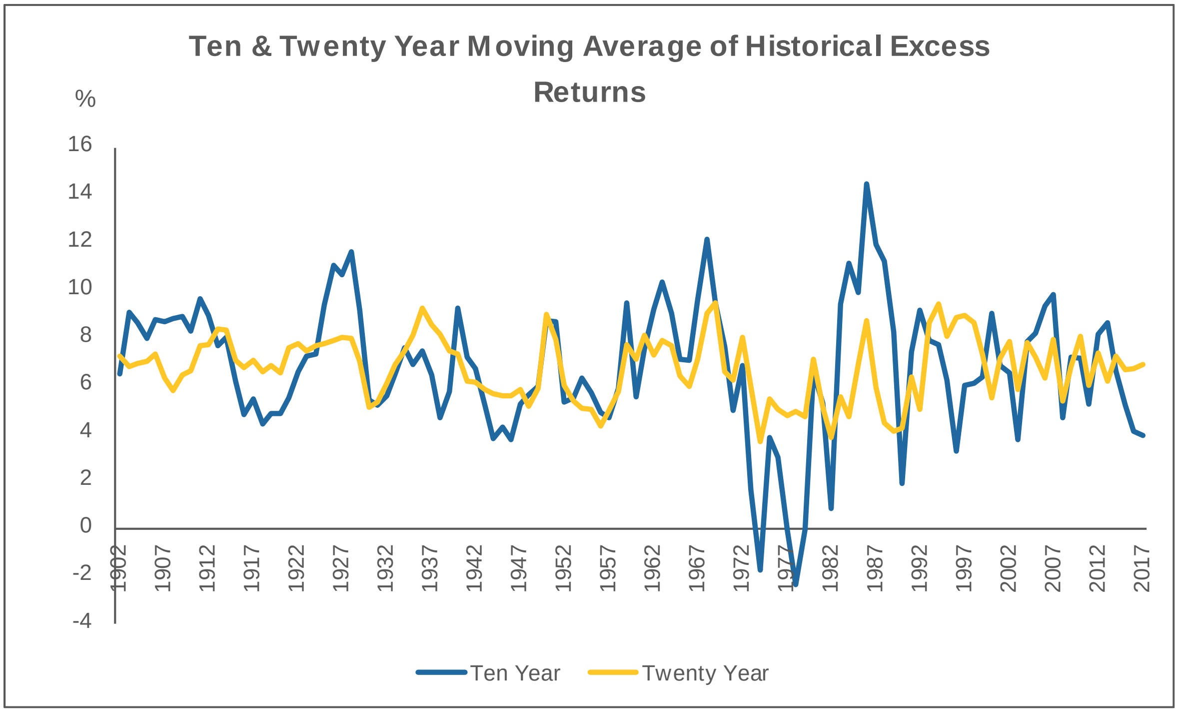


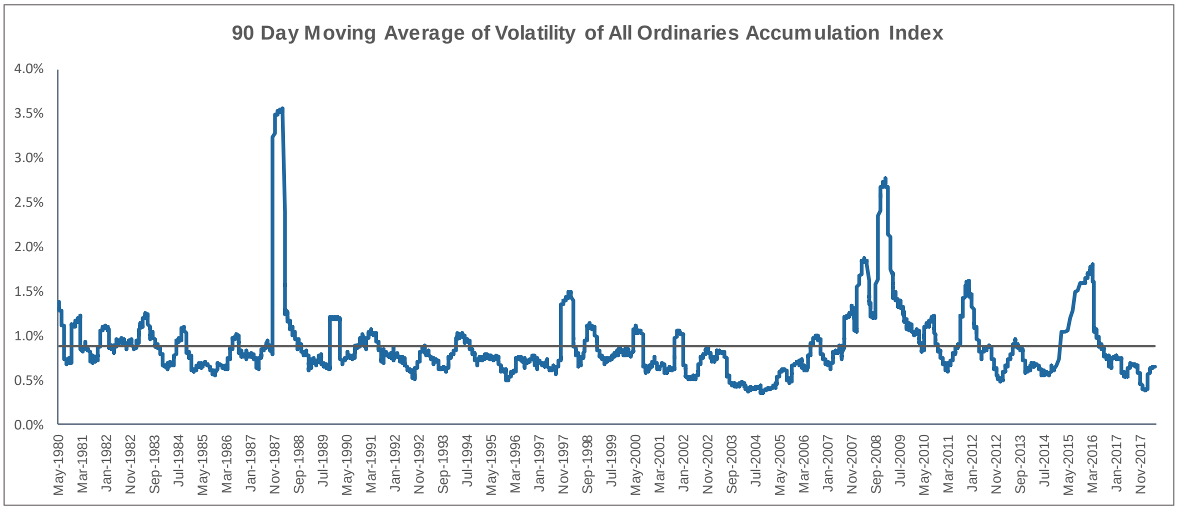
Figure 9: Moving average of historical excess returns



6.2.1 HAS MARKET VOLATILITY CHANGED?

Figure 10 shows the standard deviation of 90 observations of daily returns for the All Ordinaries Accumulation index using data from 2nd January 1980 to 30 May 2018. The time period was defined by data availability. Also plotted is a simple average of all observations viz. 8.8%.

Figure 10: 90 day volatility of All Ordinaries Accumulation Index



The 'eyeball' test shows that volatility over the 3 months to June 2008 was at its highest since the October 1987 crash but the period 2015 to 2016 was also high. Certainly, the last decade has seen considerable swings in volatility.

Figure 11: Ten year volatility of All Ordinaries Accumulation Index

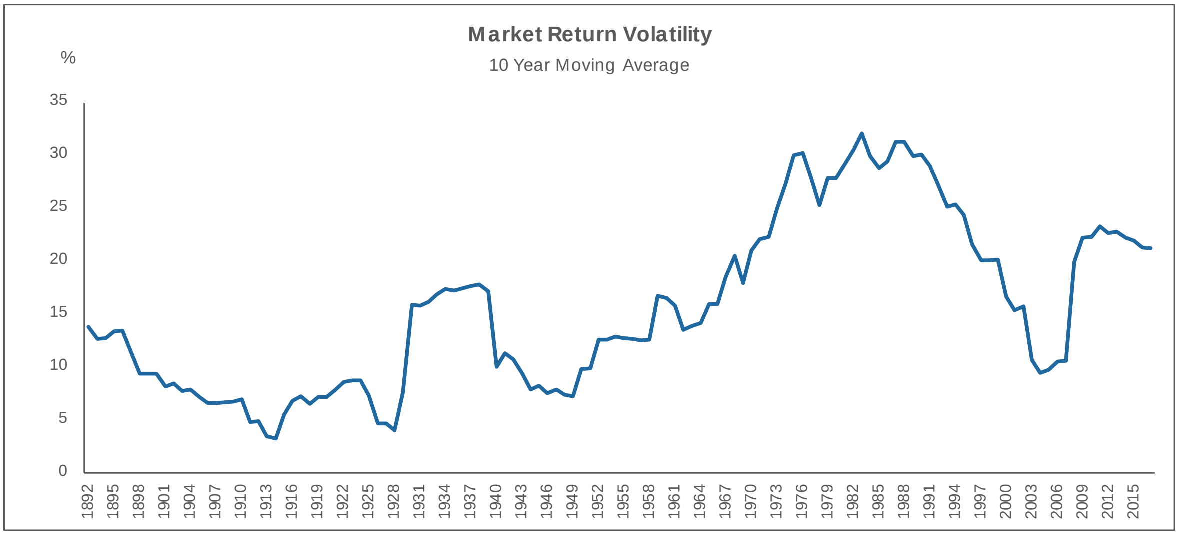


Figure 11 presents the 10 year moving average of volatility of annual market returns based on the 1883 – 2017 period. A decline in volatility is apparent since the late 1980s but it remains above the long term average.

The data demonstrate the challenges in drawing conclusions about any recent decline (or increase) in volatility from both 'noisy' data and from short time series which is why we prefer to look at the longest time series possible.

7 WHAT TO LOOK FOR IF CONSIDERING A CURRENT VIEW OF THE MRP

The focus in the last section was on using an historical view of the MRP as a basis for an expected MRP. However, as stated, the expected MRP is unlikely to stable. Unfortunately, there isn't a well-developed model to guide us in how to asset a MRP based on current information. What we do know is that the MRP will be a function of a view of the amount of risk in the market and investors attitudes to risk (degree of risk aversion) i.e.,

E(MRP) = E(Risk) * Degree of Risk Aversion.

Neither of these items are directly observable, however there are some factors that can be used to inform a view about a current view of the E(MRP). The emphasis is on *inform* as there isn't an exact relationship between these factors and the expected MRP.

Considerations discussed below include;

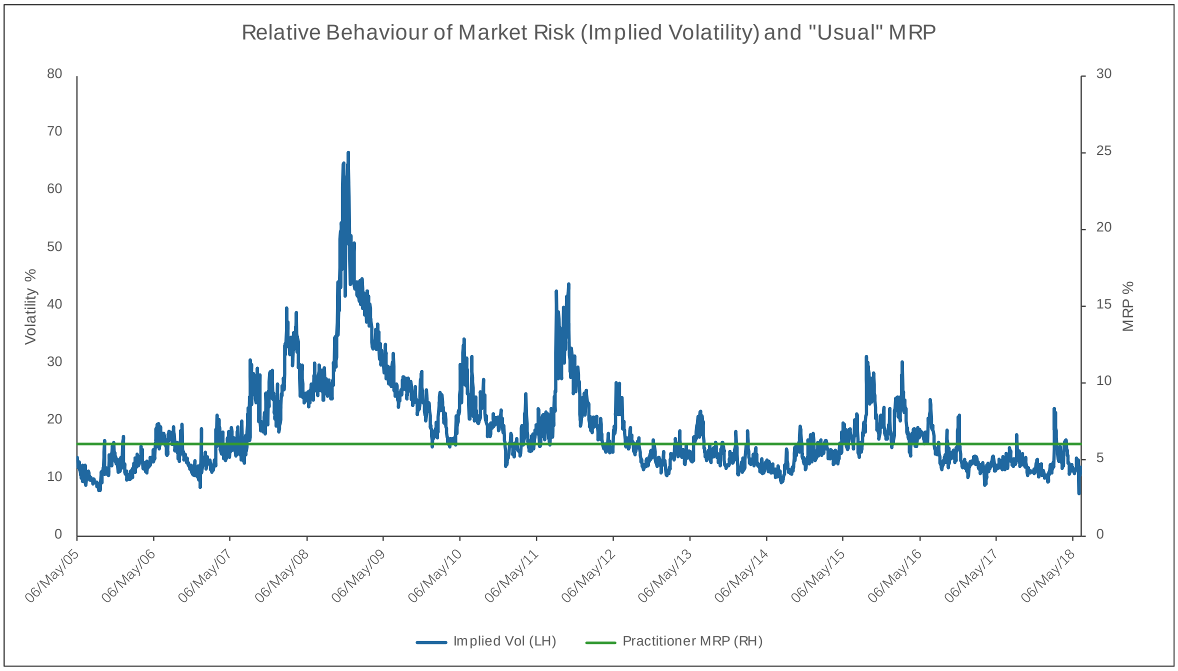
- Changes in the level of implied volatility of equity markets;
- The implied MRP from Dividend Growth Models;
- Changes in the risk premium on corporate debt;
- Changes in equity market indexes.

7.1 IMPLIED VOLATILITY OF EQUITY MARKETS

A current view of market risk or volatility can be derived from trades in options on the S&P/ASX 200 Index. The Black and Scholes option pricing model describes these prices in terms of 5 variables, namely the current value of the index, the volatility of the index, the term to maturity of the option, the exercise price of the option and the risk free rate. A key determinant of the price of these options is a view of the volatility of the market. Given observations of the price of an option, the implied volatility can be derived as the only 'unknown' variable in the option pricing relationship. By construction it is therefore a forward looking estimate of the risk of the market. Estimates of this implied volatility are available from the VIX and data sources such as Bloomberg.

The S&P / ASX 200 VIX (XVI) is a measure of a 30 day forward view of expected volatility. Its history is captured in Figure 12 below, along with a line representing a common MRP used by practitioners of 6%.

Figure 12: Implied market volatility: S&P / ASX 200 VIX



Clearly, short term expected volatility is not stable. Numerous spikes are evident with early and late November 2008 (so called Global Financial Crisis) being the largest but other significant spikes in late 2007, early 2010 and 2011, late 2015 and early 2016. In addition, there are periods of low volatility expectations as well with some recent low levels.

Unfortunately, long term implied volatility (e.g. 10 year) data is not available since long term options on the ASX do not trade / exist. So there is a challenge translating this short term expectation into a long term expectation.

One approach to capture the information in this forward view of volatility was reported in JASSA. Bishop, Fitzsimmons and Officer (2011) assumed the MRP would be mean reverting and so estimated a current MRP using current volatility and assumed it would revert to the historical average over time. The current view was estimated by assuming market participants had a constant expected MRP per unit of risk and applied this to the current view of risk.

> *Our estimate of the unit price of risk implicit in empirical estimates of the parameters of CAPM is about 43 basis points i.e. a 6% MRP with an annual average standard deviation (volatility) of 14% implies 43 basis points per unit risk (6%/14%) . This can then be applied to the current implied volatility. The implied MRP from such observations is 9.7% (22.5% * 0.43 bp) where the implied volatility of the longest call option (12 months) is 22.5%.*

This current view of an expected MRP was assumed to revert to the historical average over 3 years. The choice of 3 years was informed by i) looking for cycles in the history of the implied volatility ii) the average period for a major recession to recover on the other and iii) the time it took for a trading strategy based on buying when the index rises (i.e. the market falls) and selling short when the index rises (market rises). The test was how long it was before the return from such strategies stabilized. The last information source implicitly assumed volatility (and the market index) would return to a normal level. Approach i) suggested at least 3 years, approach ii) suggested 5 ½ years on average while approach iii) suggested 3 to 4 years.

So this approach suggests a time profile in the cost of equity. The MRP would be 9.7% declining to 6% over, say 3 to 5 years.

There are challenges in using the approach including:

- It is unlikely that the MRP per unit of risk will be constant, for example investors may well have become more risk averse following the GFC and less risk averse in the bull market leading up to the GFC;
- The MRP per unit of risk is dependent up the inputs used however provided consistency is maintained between the method of calculating it and the forward metric employed, this issue may be alleviated
- The reversion time is at best an informed estimate.

Nevertheless, the method does assist informing a view as to whether the current MRP is above or below the long term average and lays our clearly the assumptions employed.

7.2 THE IMPLIED MRP FROM DIVIDEND GROWTH MODELS

This approach was discussed in Section 4.2 whereby a forward view of the MRP can be derived. Further, it is noted that IPART implicitly assume a current estimate of an expected MRP reverts to an historical estimate of 6%. IPART use a simple average of the maximum and minimum of six forward estimates and then take an average of this number and an assumed normal rate of 6% to obtain its point estimate of the MRP. This is then used in estimating a regulatory WACC[29].

So here is an example of using a forward rate in practice. The 6 forward view models are largely dividend discount models but include a regression method using economic indicators to estimate an uncertainty index. The regression model developed by SFG Consulting can capture changes in 10 year government bond yields and the term structure, debt risk spreads and dividend yields.[30]

A practitioner could choose to use the IPART view of an expected MRP which is available on their website [https://www.ipart.nsw.gov.au/Home/Industries/Special-Reviews/Reviews/WACC/WACC-Methodology-2017?qDh=2].

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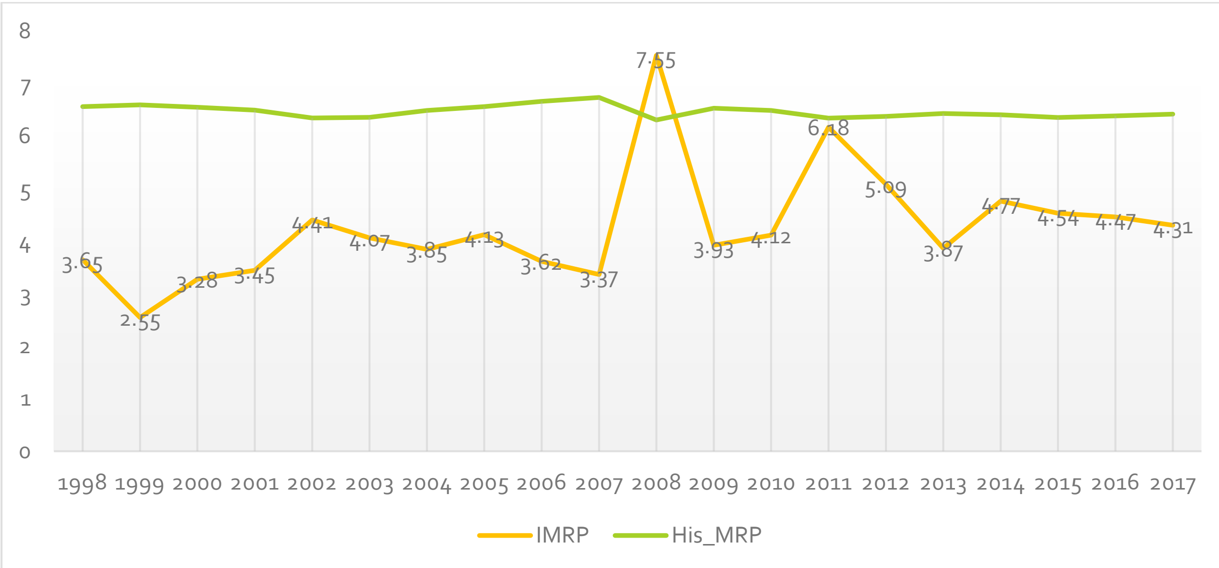
[29] The six forward methods are described in IPART, "Review of WACC Methodology: Research – Final Report", December 2013.

[30] See attachment to the IPART paper above.

Figure 13: Australian IMPR and Historical MRP (Annually, 1998-2017)



7.3 CHANGES IN THE RISK PREMIUM ON CORPORATE DEBT

Changes in the spread of corporate debt rates over yields on government bonds will reflect a likely change in the expected MRP. Corporate debt is a financial asset just as is equity so the CAPM is applicable to pricing corporate debt. The only challenge in using the CAPM for pricing corporate debt (or inferring an MRP from its yield) is partitioning the yield into systematic and unsystematic components. Certainly, there is a large systematic component to default risk on corporate debt – a downturn, or upturn, in the economy affects the default risk of corporate debt.

This is apparent in Figure 14 which captures the spread on BBB debt compared with the implied volatility of options on the ASX 200 whereby there is a relatively close tracking. The spread was either a little slower in reacting to the drop in volatility post the GFC, or, a more likely explanation is that the spread reflected a longer term view of volatility than the short term implied volatility.

Figure 14: Relative behaviour of implied volatility and BBB spread

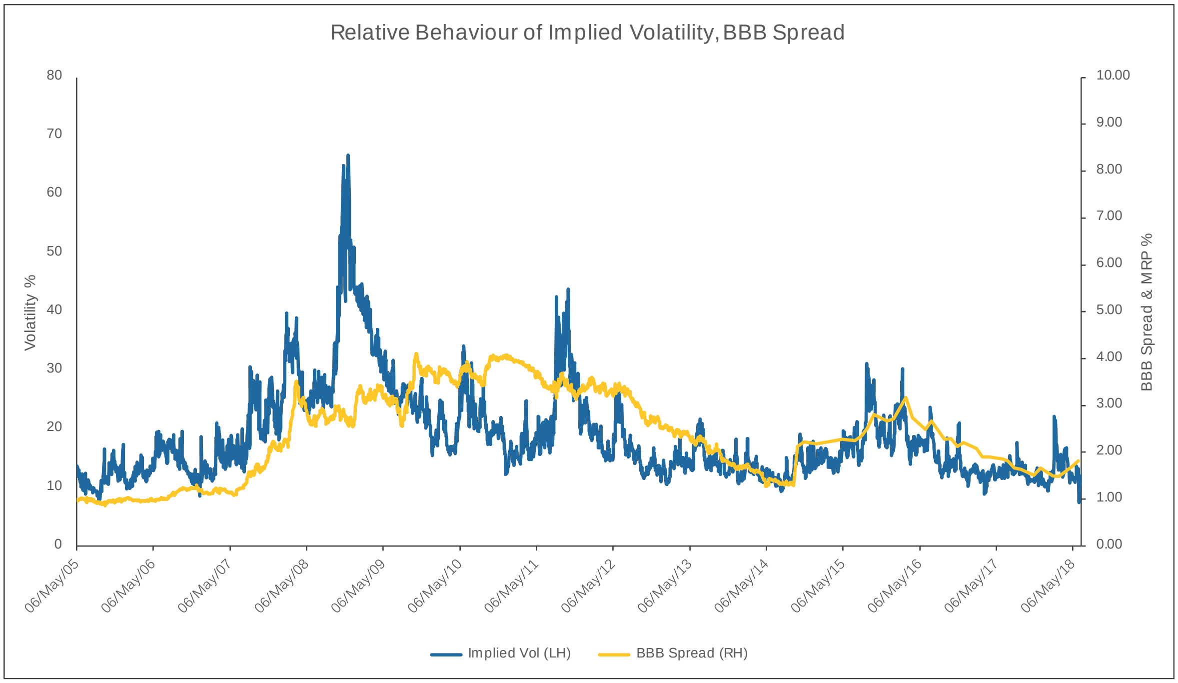
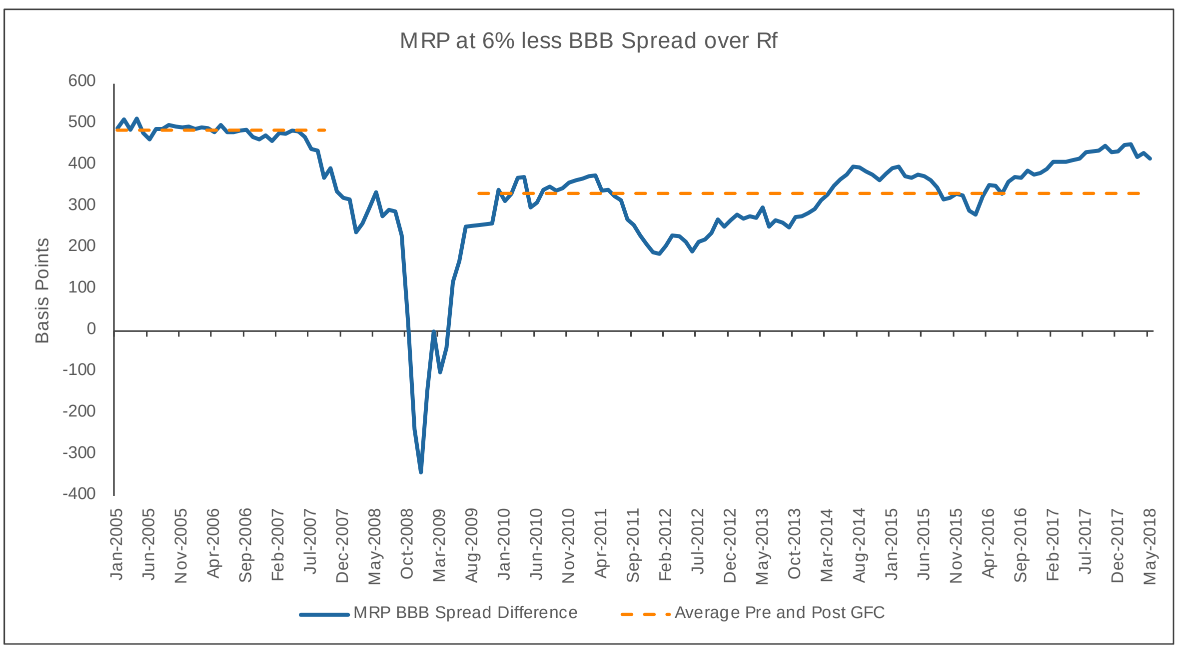


Figure 15 takes a slightly different look at the issue at hand. It maps the spread on BBB bonds over the yield on government bonds against a market risk premium of 6%. It shows the difference between a static MRP of 6% from a market based assessment of a debt risk premium.

Figure 15: Relative behaviour of implied volatility and BBB spread



The important messages arising are:

- Prior to the GFC, the MRP of 600 basis points was around 480 basis points above the debt risk premium i.e. average equity required an additional return of circa 490 basis points to cover the additional risk it bears (given the MRP of 600 bp);
- During the GFC, the debt risk premium was greater than 600 bp. So if a MRP of 600 bp was used for estimating a cost of equity, it would be lower than the cost of debt (for a beta of 1);
- Post the GFC the difference of around 310 basis points implies equity investors required a lower risk premium on equity relative to debt;
- The difference between the 6% MRP and the cost of debt appears to be returning to pre GFC levels.

The second two bullet points don't make economic sense. The spread between debt ad equity would not shrink and become negative when market risk increases. The opposite is more likely. So, this simple analysis confirms that a 6% MRP was not appropriate during the at least the decade from early 2007.

One way to form a view about an expected MRP from debt spreads is to assume the spread of equity over debt is around the pre-GFC levels of circa 480 bp. While this is likely to underestimate the MRP in a high risk environment (and vice versa), it is certainly better than assuming a fixed MRP of 6%.

7.4 CHANGES IN EQUITY MARKET INDEXES

Another factor to consider when assessing a change in the MRP is the behaviour of the market index. A change in the index reflects some combination of a change in expected cash flows from equities and / or a change in the discount rate, in turn reflecting a change in risk or attitudes to it. The relationship between a market index and a change in expected MRP is negative, i.e. if the expected MRP rises, then ceteris parabis, the market index will fall (and vice versa). For example, the GFC crash would have been, at least in part, due to an increase in MRP arising from some combination of increased risk and increased risk aversion.

So a fall in the index can signal a fall in the MRP. Similarly, a fall in the risk free rate can signal a fall in expected cash flows because growth and inflation expectations will have fallen.

7.5 ECONOMETRIC MODELS OF THE MARKET RISK PREMIUM

Neither the historical averaging approach and the forward looking models are explanatory models, in the sense that they both focus on direct estimate of the MRP. An alternative approach is to analyse the MRP in terms of its underlying economic drivers. As noted earlier these will by measures of the quantum of risk at any point in time, and the attitude to risk. Grey (2013)[31] estimate one month ahead MRP using the following market wide indicators: dividend yield, default spread, term spread (between 10 year and 2 year bond yields) and the Short Term Treasury Yield. Their model yields estimates higher than analyst based models (Table 2).

However, we need to be critical when using this approach. First, this kind of model typically focuses on forecasting short-term MRP, while in the valuation practice, we need to use an estimate of a long-term MRP. Second, whether these economic state variables do have forecasting abilities is still in hot debate. Welch and Goyal (2008) comprehensively examine the predictive power of 14 commonly used variables in the US market from 1926 to

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[31] Included as Appendix A to the IPART Review of WACC (2013).

2005.[32] When compared with the historical average, they find little evidence of the role of conventional predictors in predicting the equity premium out-of-sample. In contrast, Campbell and Thompson (2008) and Rapach, Strauss, and Zhou (2010) show that the out of sample forecasting abilities of these variables can be improved either by imposing economic restrictions or by combining the forecasts together. Third, this approach typically relies on a linear regression, while the true relation could be indeed nonlinear and state-dependent, i.e., the forecasting abilities may be stronger during recession than in expansion (Henkel, Martin, and Nardari, 2011; Cujean and Hasler, 2017).

Duff & Phelps regularly update a view on the expected MRP in the USA using a similar range of variables[33]. They state that they consider a number of factors to guide the estimate they recommend. The factors they consider are consistent with the discussion in this section. They consider:

- Changes in the equity markets;
- Changes in the level of implied volatility of the equity market
- Corporate debt spreads
- Historical real GDP growth and forecasts
- Unemployment environment
- Consumer and business sentiment
- Sovereign credit ratings
- Implied MRP from Dividend Growth Model
- Default spread model

7.6 CLOSING COMMENTS

Survey results indicate that market participants use an MRP in the range 5% to 8% with most using 6%. This falls within the 95% confidence interval arising from the historical record of excess market returns over the prevailing risk free rate. Deviations from the base number can be made when economic circumstances are assessed to deviate from normal e.g. a sustained bull and bear market.[34] Certainly, use of the long term average was not appropriate in and around the GFC and also possibly in the sustained bull market prior to the GFC

There is no reason for the expected market risk premium to be constant. Regrettably, there is no formal model to mechanistically provide a current estimate. Consequently, judgement is required.

The first step in forming a view would be to look for market signals that it may have changed. These include:

- Changes in implied market volatility (VIX) above of below an assessed "normal" level;
- Changes in debt spreads. Certainly, it appears these have increased post GFC implying an increase in the expected MRP; and

[32] See attachment to the IPART paper above

[33] Included as Appendix A to the IPART Review of WACC (2013

[34] These variables are dividend–price ratio, dividend yield, earnings-price ratio, dividend payout ratio, book-to-market ratio, net equity expansion, stock volatility, Treasury bill rate, long-term yield of Treasury bonds, long-term Treasury bond return, term spread, default yield spread, default return spread and inflation. All these data have been updated to 2017 and are available at professor Amit Goyal's website at http://www.hec.unil.ch/agoyal/.

[36] The author used 7% currently based on a view that the MRP with imputation benefits is close to 7% and on a view that debt credit spreads have risen post the GFC.

- Changes in the equity market, e.g. substantive jumps in either direction e.g. a sustained bull or bear market.

While estimating an expected MRP may be a difficult task for a valuation practitioner, there are methods and sources of estimates to inform a choice. These include:

- Adding a constant risk premium to the risk premium on debt e.g. circa 500 basis points;
- Estimates used by regulatory Authorities, particularly IPART;
- Monitor / use forward MRP estimates from websites like that noted earlier;
- Monitoring websites like Duff & Phelps Cost of Capital site (noted above). which updates an estimate with reasons for any change.

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