Risk Discount Rates for Actuarial Appraisal Values of Life Insurance Companies

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Abstract

This paper is concerned with the theoretical and practical problems associated with determining and applying a risk discount rate for the purpose of calculating the actuarial appraisal value of a life insurance company. A number of actuarial papers have been written on valuing a life insurance company. Some of these papers address the issue of an appropriate risk discount rate and this paper further develops the theoretical framework for calculating a risk discount rate. A common approach appears to be the use of the capital asset pricing model (CAPM) and it is probably the most widely used model in both actuarial and business literature. Whilst there are many practical difficulties associated with applying CAPM, it remains an appropriate theoretical framework in this context and this approach has been adopted. This paper addresses the issues of an appropriate methodology for applying risk discount rates in practice. In particular, the paper examines the way different tax environments affects the risk discount rate and addresses the different approaches required under a classical and an imputation tax system. This paper also addresses the question of the determination of an appropriate risk discount rate for different components of the actuarial appraisal value. This paper attempts to bridge the gap between actuarial and business literature on this topic.

Key Words Risk Discount Rates, Actuarial appraisal values, Embedded Values, Net Worth, Goodwill, Value of in force, CAPM, Equity Premium, Risk free rate, Beta, Classical tax system, Imputation tax system, Imputation credits,

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1. INTRODUCTION

1.1 Actuarial appraisal values of life insurance companies are increasingly under the spotlight as security analysts and other interested parties pay more attention to the published appraisal and embedded values of both quoted and privately held insurance companies. In Australia, this trend is emphasised with more companies listing, and more privately held companies publishing actuarial appraisal values as a means of communicating the financial health and progress of the company to shareholders and other interested parties.

1.2 Appraisal values are the only truly international measure of life insurance company value where actuaries have been able to apply reasonably consistent standards around the world (as opposed to profit reporting where Margin on Services in Australia, GAAP in the US and Canada and various methods in the UK are used). It is important, therefore, that agreement is reached on an appropriate and consistent method and basis to calculate appraisal values.

1.3 One of the key assumptions in an actuarial appraisal value is the risk discount rate. This assumption is often published, along with the associated embedded or appraisal value. Very little explanation, however, generally accompanies the publication of the risk discount rate. Security analysts in general have an appreciation of the cost of capital and the calculation of risk discount rates and have views on the method and assumptions used in arriving at an appropriate risk discount rate for any given company. They may wish to make their own adjustments to the risk discount rate, and hence to the actuarial appraisal value in the light of their own assessment of market and company conditions, and would benefit from being given the information to enable them to do so.

1.4 Currently it is difficult to understand the derivation of many published risk discount rates for life insurance companies. However, what information is available suggests that there are inconsistencies in the derivation of quoted risk discount rates, in particular, the segmentation of the life insurance business into its component parts (in force business, new business and free assets) along with their associated risk discount rates, and the treatment of tax under different taxation regimes.

1.5 This paper puts forward the proposition that, while it has a number of faults, the capital asset pricing model (CAPM) can be used as a method of determining the risk discount rate (and this does appear to be the most widely used and accepted base). Given use of CAPM, the paper advocates more disclosure of the intermediate assumptions, and suggests a consistent application of the model.

1.6 The paper also proposes a framework for determining the risk discount rate appropriate for each part of an actuarial appraisal value. This framework allows segmentation between the three main parts of an actuarial appraisal value of a life office; net worth, value of in force and value of new business.

1.7 Whilst it is generally accepted in actuarial circles that some form of target surplus or capital adequacy requirement is built into an actuarial appraisal value, there is not unanimous agreement on the actual level of target surplus. In particular, different countries have different prescribed capital adequacy requirements and bases. Different levels of target surplus above those requirements are often built into actuarial appraisals.

1.8 There are a number of published actuarial papers on both the calculation of actuarial appraisal values and the selection of appropriate risk discount rates (including Burrows and Whitehead (1987), Mehta (1992), Coleman Edwards and Torrance (1992) and Hall (1991). There are also a number of papers published by business schools on the appropriate methodology for calculating the cost of capital using CAPM, particularly analysing the effect different tax environments have on the risk discount rate (including Officer and Hathaway, 1992). This paper attempts to synthesise the actuarial and the business school approaches to produce an appropriate method of calculating and applying risk discount rates for life insurance appraisal values.

Capital Asset Pricing Model

1.9 When performing an actuarial appraisal value, the choice of an appropriate discount rate to apply to the forecast earnings stream of a life insurance business is fundamentally a matter of judgement. There is a body of theory based on the Capital Asset Pricing Model (CAPM) and certain empirical evidence, which can be used to support that judgement.

1.10 As is often the case with theory, the practical application of CAPM is subject to shortcomings. Difficulties which arise in the application of CAPM to estimate discount rates include:

- CAPM relies upon the assumption of 'perfect' capital markets, which may not be valid in practice
- The estimation of relevant variables (such as risk premium) is subject to significant statistical error
- For industries such as the life insurance industry, market data is not available in Australia

- There is not unanimous agreement as to how to adjust for taxation; and

- The model is typically based on expectations and merely uses historic data as a proxy for expectations.

1.11 Although CAPM is well known and it has been used widely, there have been numerous empirical investigations of it, which have led to a number of criticisms of it as not completely explaining the returns in the market place.

1.12 Despite the widespread acceptance and application of CAPM, many companies rely on less sophisticated methods for estimating the cost of capital. For example, many businesses use relatively arbitrary 'hurdle rates' which do not vary from investment to investment or do not change significantly over time despite interest rate changes.

1.13 In general, as a result of the many difficulties associated with applying CAPM in practice, the approach to setting risk discount rates for appraisal values is often to use CAPM as a guide. In general, more emphasis is often placed on other aspects.

1.14 However, given that CAPM is both the most widely used and the most justifiable model in the market place for determining required rates of returns, this paper puts forward the view that in order to establish an appropriate theoretical framework, an accepted model is required and therefore the use of CAPM in this context is supportable.

1.15 When valuing life insurance companies, historically certain conventions have been used that may not be appropriate if a CAPM approach to setting the risk discount rate is adopted, for example -

- The risk discount rate quoted in appraisal value reports is the rate at which the in force business is discounted, not the total profit stream of the company. New business is generally discounted at a higher rate and capital (in excess of capital adequacy requirements) is taken at face value.

- Profits emerging from actuarial models are generally after tax profits, with no explicit allowance made for the value of imputation credits.

- The risk discount rate is determined using judgement based on the market and other considerations. The rate is generally applied to after company tax profits.

- When risk discount rates are published the treatment of tax is generally not made clear.

1.16 As this paper recommends using a CAPM approach to deriving the risk discount rate, the conventional approach to calculating actuarial appraisal values must also be examined to ensure consistency between the profit stream being valued and the CAPM rate of discount selected.

2. THE CAPITAL ASSET PRICING MODEL

2.1 In this paper, the CAPM model is suggested as the basis for selecting an appropriate risk discount rate. This model is well known and it has been used widely. There have been numerous empirical investigations of it, which have led to a number of criticisms of it as not completely explaining the returns in the market place. In particular, there is a move by investment professionals towards more complex models. Various multifactor models have been used in a variety of contexts, particularly in the valuation of traded stocks. Given, however, that CAPM is both the most widely used and the most generally quoted model in the market place for determining risk rates of returns, this paper uses CAPM for the determination of risk discount rates.

2.2 CAPM depends upon the following assumptions -

Liquidity	Investors are price takers
Price Continuity	Smooth, continuous price changes
Price fairness	All trades take place at fair prices
Divisibility	Securities can be traded in any size
Preferences	Function of mean and standard deviation only
Single period	A one-period model, any length
Risk-free security	Can be invested (long/short) at will
Homogeneous expectations	Investors have identical expectations (returns, standard deviation and covariances)
Taxes	Taxes are not explicitly accounted for.

2.3 The basic formula for CAPM can be stated as -

$$E(R_i) = R_f + \beta_i [E(R_m - R_f)]$$

where

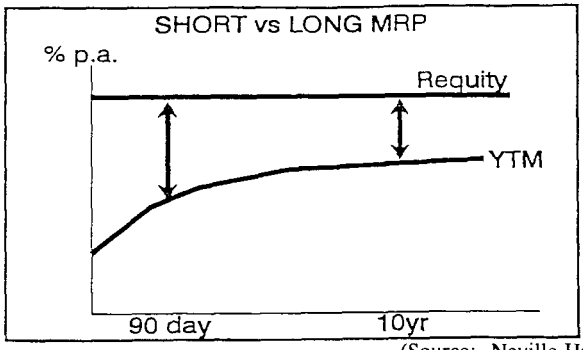
E is expected value
R_i is equal to the risk discount rate of return on asset
R_f is the risk free rate of return
R_m is the rate of return on the market
$R_m - R_f$ is commonly known as the market or equity risk premium
and β_i is the relative riskiness of the stock compared with the market as a whole

2.4 Each of these items will be described below, together with tax and gearing which are only implicitly included in the formula above.

Risk Free Rate of Return

2.5 There has been an extended controversy over whether the equity premium should be measured from the short end of the yield curve or the long end. The figure below illustrates potential differences between equity premiums for short and long term fixed interest securities.

MRP: LONG vS SHORT



(Source: Neville Hathaway)

2.6 The general practice for life insurance companies is to use the long bond rate for the risk free rate. The reason for this is twofold: first, the profits that are being discounted in the appraisal value are long term in nature; and second, the long term rate is generally not subject to the same volatility and artificial fluctuations as the short term rate.

2.7 The long term rate however will contain some element of risk premium to reflect the liquidity risk. Ibbotson and Sinquefield estimated that this was equal to around 0.5% in the US. This must be adjusted for if the long term rate is not used to estimate the equity risk premium. Obviously, it is always preferable to use a consistent risk free rate for estimating both the equity risk premium and the risk discount rate.

2.8 A further issue with the risk free rate is whether to use the spot long bond rate or a moving average of the long bond rate. There are a number of arguments on both sides, and in fact the appropriate rate will often depend on the use for the risk discount rate.

2.9 The equity premium is almost always based on a long term moving average, rather than any kind of spot value, which suggests that to be consistent, the risk free rate should also be calculated using a long term moving average. However, the general market practice is to use the spot rate for the risk free rate.

2.10 For a company publishing embedded values on a regular basis for reporting purposes, the more appropriate rate may be the moving average, however for the sale or purchase of a company the spot rate is probably the more appropriate. Each case must be judged on its own merits.

Equity Premium

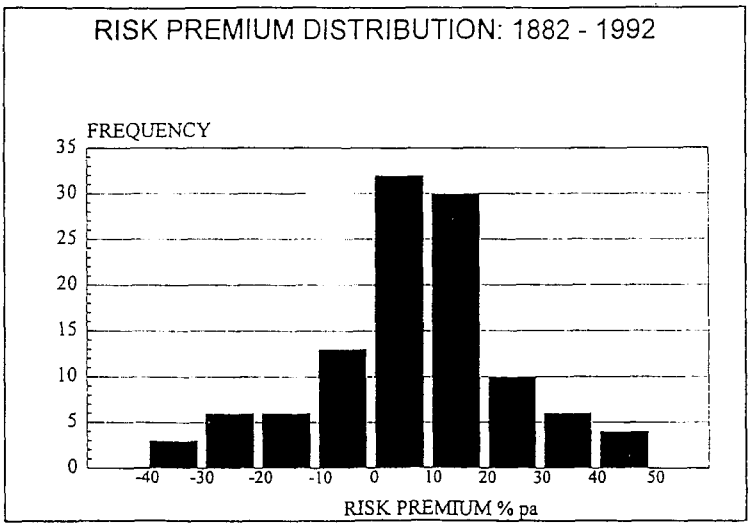
2.11 The approach adopted in this paper is to use an equity premium specific to the country being analysed. Specifically, research on equity premiums for Australian companies has been examined. However, there is an argument that there is a world capital market, and hence a worldwide equity risk premium. There is potential for further research by actuaries in conjunction with business schools to determine whether or not a worldwide equity risk premium for the life insurance industry is feasible. If such an approach is adopted, the beta for the life insurance industry by country should also be considered. There are also tax considerations due to different tax environments by country.

2.12 In determining the equity premium for an Australian company this paper examines the Australian market. The data in Australia is difficult to examine since interest rates have for long periods been controlled by government policy, real equity returns have been extremely volatile and any analysis is highly dependent on the historical period selected. Australia is not unique in this.

2.13 The published data (including papers by Officer & Hathaway - see the bibliography) shows a reasonably wide range of returns in the Australian market, as well as in other similar economies. Ranges which have been used or implied by various studies are from 4% to 8%. Given that a view must be taken on the equity premium in order to determine a risk discount rate, it should be possible to publish the equity premium chosen as part of the derivation of the risk discount rate. The equity premium chosen will generally not vary greatly at different times - as it has been based upon long term data in its derivation.

2.14 Hathaway (1995) comes to the conclusion that an appropriate equity premium is between 6% and 6.6%. This study used data that went back to around the mid-1950s. The study includes the effect of dividend imputation in the value of the equity premium. Other studies of equity risk premiums have been performed in overseas markets. Wilkie (1995) suggests that equity risk premiums are around 5% but that this rate is too high and is likely to decrease. Ibbotson and Sinquefield's USA study finds equity risk premiums are more in line with Hathaway's paper. Currently for the Australian market, it is appropriate to derive an equity premium from Australian data. If, however the further research on world markets is developed, then it may be possible to use a worldwide equity premium.

2.15 The Hathaway study shows some reduction in the equity risk premium (excluding imputation credits from the return on equities) in recent years which appears to coincide with the introduction of imputation credits. Recent data in the study excludes the effect of imputation credits on equity returns. Section 4 discusses the treatment of imputation credits and the impact on the equity premium in more detail.



(Source: Neville Hathaway)

Beta

2.16 The beta selected must accurately reflect the risks of investing in life insurance companies. Few companies are listed on the Australian stock market even have life insurance characteristics (FAI Life and National Mutual Holdings are currently the only pure life companies listed, and National Mutual has a strong Asian focus). This is not sufficient to develop a justifiable beta from the market statistics alone.

2.17 There is information in Australia on betas for the general insurance and banking sectors - at December 1996 these were 1.25 and 1.08 respectively. However, these businesses are still sufficiently different from the life insurance business to make it difficult to use these betas for the life insurance industry with any confidence. In particular, gearing in these industries is quite different from that of the life insurance industry.

2.18 The US and UK stock markets are the only markets with sufficient life insurance stocks to enable a beta to be calculated. There are a number of studies of both markets that develop a beta for life insurance companies. Using these betas in risk discount rates for Australian companies implies making a number of assumptions about the similarity of companies in those countries and Australian companies, including -

- Size and composition of business (both life products and non-life products).
- Debt (gearing).
- Similar capital and target surplus requirements (and hence risk).
- Reliance of investors on reported profits, which may not be a true reflection of actual profit.

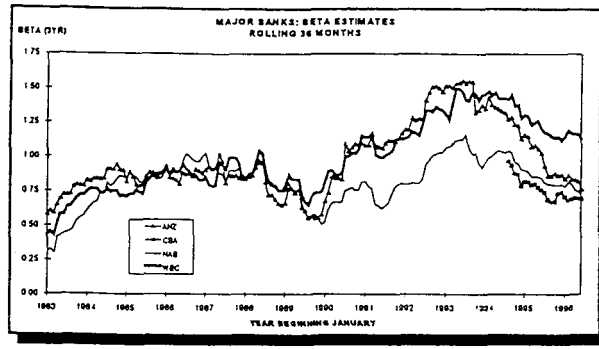
2.19 The use of the betas from overseas markets should be adjusted with reference to each of these factors.

2.20 An analysis of UK Life Offices by the London Business School at December 1996 has indicated that when equally weighted, Life Offices have a level of risk equivalent to an investment in the UK equity market as a whole, ie a Beta of 1.0. When weighted by size of company gives a Beta closer to 1.1.

2.21 Life insurance companies in Australia are not generally perceived to be in a favourable position in the financial services industry and this may worsen following the Wallis Inquiry, which may point to some increase in beta. Counteracting this, however, is the fact that the stronger capital adequacy requirements of the Life Insurance Act (1995) may move the whole industry onto a lower risk basis.

2.22 In selecting a beta for the Australian life insurance industry, a view must be taken as to whether to place more weight on overseas data or Australian financial services data. All of the above discussion suggests a beta of at least 1 for the Australian life insurance industry. An appropriate range might be 1 to 1.3 for the industry as a whole

2.23 The beta of a sector need not apply to an individual stock in the sector. A good example of this can be seen in the banking sector -



(Source: Neville Hathaway)

2.24 Having determined a suitable industry beta, there are a number of factors that will influence the choice of beta for an individual life insurance company, some of which are listed below -

- the level of reserves compared with market averages - the higher the reserves the lower the beta
- the control the company has over future expense levels - the higher the level of control, the lower the beta
- the predictability of other assumptions such as lapses, mortality and morbidity - the more predictable the assumptions, the lower the beta
- the variability of the profit stream with investment market movements - the less variable, the lower the beta
- market sentiment or perceived market position
- business mix of the company
- whether the company's market position is increasing or declining
- relative size.

Allowance for Gearing

2.25 The CAPM formula produces the required rate of return on a whole company. The required rate of return should not depend on the method of financing the company. The implication, therefore, is that if the company is geared, then the combination of the required rate of return on the equity, and the rate of interest payable on the debt will result in the required rate of return on the whole company.

2.26 The consequence of this is that if the equity premium derived from the market depends on geared companies, then using that equity premium to derive a risk discount rate for an individual company will effectively assume the same level of gearing for the equity of the individual company as in the overall market. The risk discount rate which is derived from the CAPM formula by looking at the overall (geared) market in this case is R_m, where

$$R_m = R + (R - G) * L/E$$

where

R is the risk discount rate with no allowance for the method of funding
G is the rate of interest on debt
L/E is the gearing ratio of the market (debt divided by equity).

2.27 If the rate of return derived depends upon gearing in the market, then it must be adjusted to allow the same level of gearing as the equity of the company being valued.

2.28 This feature of CAPM is addressed in detail in Mehta (1992).

2.29 It is only necessary to make this form of adjustment if there are differences between the gearing of the individual company being valued, and the stocks that were used to determine the equity premium and beta. The beta and equity premium may or may not imply gearing in the market. There will be gearing of some kind implied in the formula *if* the gearing of the Australian market (used to derive the equity premium) is different from the gearing of, for example, the UK or US market where there is data on industry betas.

Target Surplus and Capital Adequacy Requirements

2.30 The 1995 Australian Life Insurance Act defines prescribed levels of Capital Adequacy requirements for Australian life insurance companies. It is appropriate to incorporate these levels of capital adequacy into an actuarial appraisal value. This is generally allowed for by locking in this

capital, so that it is assumed to earn less than the risk discount rate until it is released.

2.31 For those countries where there is no prescribed capital adequacy requirement, or where the level is thought to be insufficient, a target surplus requirement is often defined. In Australia, an insurance company must fully meet the capital adequacy requirements, in order to pay dividends to shareholders. It may, therefore, be appropriate for a small target surplus over capital adequacy to be held. This should be incorporated into an actuarial appraisal value in the same way as above.

2.32 It might be possible to define a worldwide level of target surplus to ensure consistency of actuarial appraisal values on a worldwide basis. This would be a useful area for further research.

Consistency of Assumptions

2.33 Risk rates of discount are generally related to the other assumptions used in a projection. It is important that other economic assumptions, in particular, relate to the risk rate of discount.

3. SEGMENTATION OF THE CAPM DISCOUNT RATE

3.1 The appraisal value for a life insurance company is generally segmented into three parts; namely net worth (or free assets), value of business in force, and the value of new business (or goodwill). Different discount rates are generally used to value each segment of the company.

3.2 In Mehta (1992) there is considerable discussion of various ways of segmenting the cashflows of a life insurance company, both by product type and by cash flow type. Mehta discusses different discount rates for broad product groups, as well as new business, and also looks at separating the cash flows by level of risk. This paper does not go into that level of detailed segmentation, but rather looks at the three broad categories which are usually separated in an actuarial appraisal value.

Rate for In Force -v- Rate for Total Company

3.3 Conventionally, the risk discount rate quoted in the valuation of a life insurance company is the rate that is used to discount the business in force. This is not necessarily the same rate that CAPM would produce to value the total profit stream of the insurance company. Indeed it would be quite coincidental if these two rates were the same. The rationale often given for using the same rates is that the discount rates for net worth (lower than derived above) and new business (higher than derived above) broadly cancel out, so that the main determinant for the risk discount rate for life companies as a whole is the business in force.

3.4 CAPM produces a risk discount rate for valuing the total profit stream of the life company and this rate should not automatically be applied to valuing the in force business. It is possible to determine the implicit discount rates that will apply to the in force and the new business separately, such that when the company is viewed as a whole the overall discount rate is equal to the CAPM rate.

3.5 The net worth component is free capital in excess of the capital adequacy requirements. There are arguments for assuming the full CAPM rate on this amount. Equally there are arguments for assuming the actual asset allocation of the net worth and using the resulting earned rate. This paper suggests that the net worth be valued at face value, ie that the implicit risk discount rate used to value that net worth is the expected earning rate on the assets backing the net worth.

3.6 The problem now is to determine how much riskier the new business is than the in force business. One method of allowing for the extra risk on the value of new business is to assume an additional risk rate of return up to point of sale of the business.

3.7 Increases in risk discount rate of around 10% have been used in practice for the additional risk to point of sale, although it should be noted that there is no theoretical justification for this. Again, further research would be helpful in this area. Using the extra risk assumption and the estimate of value of one year's new business, the equivalent increase in the discount rate for new business above the CAPM rate can be estimated.

3.8 Using the rates and values associated with the net worth and the new business, this paper suggests that these weights be used to determine the risk discount rate for the in force business which will produce the overall risk discount rate for the company rate derived using CAPM. The Attachment shows an example of this calculation.

4. TAX

4.1 Taxation is a complex feature when determining the CAPM risk discount rate. There are a number of features that must be carefully examined before concluding how, if at all, the rate determined above should be adjusted for taxation.

4.2 The discount rate used in determining a company value may be before company tax, after company tax and before personal tax, after company tax and after personal tax, or a number of other intermediate cases, *provided* that the cash flow streams valued are consistent with the definition of risk discount rate. In other words, in valuing a security, gross profits can be discounted at a gross risk discount rate or after tax profits can be discounted at an after tax rate (determined to give the same total value).

4.3 Care, however, must be taken when adjusting a risk discount rate for tax as it is not appropriate to tax effect a risk discount rate at the same rate t that is used to tax profits. Taylor (1991) states that:

> "... the profits actually receivable by the owners of an insurance business are net of tax. This suggests that the expected profit μ, brought into [the net present value], should be net of tax.
>
> It would then follow from the construction of [the net present value] that the ROR (Rate of Return) r, included in it, should also be net of tax.
>
> However, it should also be noted that a gross ROR r, if derived from market data, will include implicit allowance for tax at the rate typically experienced by "the market". To the extent that the object of the present valuation is typical of the market in its tax liability, gross of tax profits may be included in [the net present value] provided that the ROR used in that formula is also gross of tax.
>
> A valuation of net profits using a net ROR would also be correct, but care would be needed in the conversion of the gross ROR to net. In particular the simple device of conversion by multiplication of a tax factor would be incorrect. That is, if μ and r are gross of tax, then

$$\sum_{j=1}^{\infty}[1+r(1-t)]^{-j}\mu_j(1-t) \neq \sum_{j=1}^{\infty}(1+r)^{-j}\mu_j$$

> In any projection of future profits μ net of tax, it will usually be preferable to begin with a projection of gross profits and then reduce these by projected tax payments. Projection of future net of tax profits directly from past net profits is usually undesirable because of changes in the effective tax rate which may have occurred in the past or may occur in the future. For example, tax rates will be especially influenced by carried forward losses and extraordinary ("below the line") items of profit."

Classical -v- Imputation Taxation System

4.4 CAPM was developed in a classical tax environment. In a classical tax system operating income is taxed after allowing for interest costs on debt capital. The profit, after company tax is distributed to shareholders by way of dividends or is retained in the company. Either way, a shareholder can be subject to additional personal tax either by way of income tax in the case of dividends or capital gains tax (which may be deferred) on retained earnings. Thus shareholders suffer double tax under a classical tax system.

4.5 In general, CAPM has been developed on an after company tax basis but before personal tax. This is because most securities are traded on an after company tax but before personal tax basis. The exception is equities under an imputation system.

4.6 The risk discount rate arising out of CAPM is, in a classical tax system, after company tax but before personal tax.

4.7 In contrast, in an imputation tax environment, credit is given to shareholders for the company tax paid by way of attaching imputation credits to the dividend. Under a full imputation tax system a shareholder can claim full credit for company tax. Effectively, company tax can be regarded as a prepayment of personal tax.

4.8 This has implications both for the risk discount rate and for the interaction of the risk discount rate used and the profits which are discounted at that rate.

4.9 CAPM depends on the assumption that the profits that are being discounted are after company tax and before personal/shareholder tax. Therefore, to determine profits consistent with CAPM, the value of the imputation credits attached to the profits emerging from a life insurance company should be added to the profit stream being valued.

4.10 The profit stream to discount, therefore, is the after life insurance company tax profit stream that can be derived from an actuarial model, adding back the value of the imputation credits associated with this profit stream.

4.11 It is important to note that life insurance companies in Australia are not taxed on profits. Therefore imputation credits are not proportional to profits and hence a simple grossing up of the profits by a factor will not give an accurate assessment of after life company tax/ before shareholder tax profits. The value of future imputation credits must therefore be estimated and added to the future profit stream to give the appropriate profit stream to be discounted.

4.12 The imputation credits which are added to the profit stream should be compared with the profits to ensure that they are all able to be passed on to the shareholders of the company. If the company has insufficient profits, then some imputation credits may have no value or have to be carried forward to future years. Since there is no relationship between profit and imputation credits, a company may have more or fewer imputation credits than it could potentially pass on to shareholders.

Valuing imputation credits

4.13 A complex issue is the *value* at which imputation credits are introduced into the calculation. Based on a number of studies, the market appears to value imputation credits at around 65-75% of face value, although this is not completely clear, as there is no direct market for imputation credits. The 65-75% (of face value) valuation of imputation credits is based on various studies that have been performed whereby imputation credits have been valued at 68% of face (McKinsey 1994); 58% to 82% of face (Officer and Hathaway 1992) and 72% of face (Brown and Clarke 1992). These studies have all used the so called "drop off" method whereby share prices are analysed cum and ex dividend, in an attempt to determine how the market values the imputation credits attached to the dividend paid.

4.14 It is worth noting that the "drop off" method used in the above analyses, values the imputation credit at less than the face value but appears to be ignoring the fact that tax will have to be paid on the imputation credits.

4.15 An alternative way to look at the valuation of imputation credits is to examine the extent to which imputation credits are a prepayment of personal tax. Under this scenario, to the extent that imputation credits are not a prepayment of personal tax they have no value. If it is assumed that 100% of Australian shares are held by foreign investors then no imputation credits should be added back to the cash flows as there is no prepayment of personal tax. What emerges is a classical tax system in which profits are discounted after company tax at the CAPM discount rate.

4.16 Therefore, by estimating the proportion of shareholders that treat imputation credits as a prepayment of personal tax, it is possible to derive a 'value' for the imputation credits to incorporate into the profit stream.

4.17 JB Were (1996) can be used to estimate foreign ownership of Australian shares (Foreign Corporate (9%), Foreign Portfolio Investors (22%)). Additionally, other investors unable to redeem imputation credits (e.g. non tax paying institutions, etc) are around 3% of the market. This implies that 34% of shareholders will not redeem their imputation credits. Provided it is assumed that all other classes of shareholders redeem their imputation credits then 66% of shareholders will redeem full credits.

4.18 In estimating the value of the imputation credits it is necessary to allow for further complexities. For example, most foreign owned shares would claim back the 15% withholding tax on dividends paid overseas, effectively valuing these imputation credits at 27% of face value (grossing up 15% by 64/36). Also there is a "secondary" market in imputation credits, and a percentage of owners unable to claim full value for their imputation credits might choose to sell on the secondary market. Finally, there may be some deferment of utilising the franking credits by both domestic and foreign holders that could be adjusted for either directly or in the projection model.

4.19 Taking the 27% value times the 34% not redeemed plus 100% value times the 66% fully redeemed at face value gives a 75% value of imputation credits. If there is no deferred element or deferral is not built into the projection model then this could be further adjusted.

4.20 Given the approximate nature of this analysis, an assumption of around 25-35% for the unredeemed proportion of franking credits seems reasonable. An assumption of around 25-35% is consistent with the market discount on the value of imputation credits quoted in the McKinsey (1994), Officer and Hathaway (1992) and Brown and Clark (1993) papers on this subject.

4.21 In other words, the profit stream must be adjusted by adding 65-75% of future anticipated imputation credits. Additionally any imputation credits in the franking account must be considered.

Consistency with equity premium

4.22 On the risk discount rate side of the equation, Officer's paper suggests that market derived CAPM rates are after company tax and before personal tax. This was plainly evident under the old classical tax system where dividends paid after company tax were then subject to personal tax. This also holds under an imputation tax system except where some

personal tax payments are implicitly capitalised into the equity risk premium. A quote from Officer (1994) may help:

> "If the imputation system does not affect the cost of capital on an after company tax basis as I have argued, then we could estimate the CAPM cost of capital using historical rates under a classical tax regime. However, where estimates of returns are derived under an imputation tax, some personal tax payments will be capitalised into the risk premium which will be consequently lower. In these circumstances an adjustment will be needed to include the personal tax credits so that the cost of equity capital is calculated to reflect an after company tax but before personal tax return *consistent* with the definition of cash flows."

4.23 When estimating the risk premium, it is important to use data (such as that derived by Hathaway (1996)) which has removed the effect of the imputation system.

4.24 To allow for tax, therefore, in CAPM under an imputation credit system, this paper suggests that the equity premium can be determined directly from the market and that the imputation credits which are generated by the company for shareholders of the company are a prepayment of tax and should therefore be valued as part of the valuation of the company. Imputation credits should not necessarily be valued at face value, as not all investors can use them, and their market value appears to be lower, and the paper suggests a value of 65-75% of face value as a starting point.

5. CONCLUSIONS

5.1 Actuarial appraisal values and the assumptions that go into them are becoming increasingly part of the public domain.

5.2 Security analysts and other interested commentators are justifiably questioning the results of actuarial appraisal values and questioning the approaches used to determine key assumptions, particularly the risk discount rate.

5.3 Given the world wide trend towards publishing embedded and appraisal values, particularly amongst listed companies, it is increasingly important for actuaries to provide enough information for analysts and other interested parties to understand risk discount rates, which are one of the driving forces of actuarial appraisal values.

5.4 The most widely used and generally accepted model for determining risk discount rates is CAPM. This paper concludes that CAPM is an appropriate model to use in this context. It attempts to set out a rigorous framework for applying CAPM for life insurance companies and for disclosing the assumptions used. Key assumptions which should be disclosed include:

- Risk free rate
- equity risk premium
- beta
- impact of tax on risk discount rates and profits
- treatment of imputation credits

5.5 The risk discount rate arising from the application of CAPM is the risk discount rate for the life insurance company as a whole. There appear to be a number of inconsistencies in the application of the risk discount rate. In particular, it is incorrect to use the CAPM discount rate as the rate to value business in force without at least considering segmentation issues. The usual practice of applying the company CAPM risk discount rate to value the business in force and assuming that new business and net worth offset, is not necessarily correct.

5.6 The correct rate to use for the value of in force business and value of new business can be determined by investigating an appropriate relationship between the total company risk discount rate and that used for the in force business and the new business.

5.7 In order to allow for tax under an imputation tax system within the CAPM framework, future profit streams should be valued *after life insurance company tax but before shareholder tax* using a consistent definition for

the risk discount rate. In order to develop a correct profit stream it is suggested that the *value* of imputation credits be added back to the profit stream emerging from the model to give an after life company tax but before shareholder tax profit stream.

5.8 Finally, target surplus is a crucial part of the calculation of the embedded or appraisal value of a life insurance company. Target surplus must be specifically allowed for in the appraisal value calculations. Currently, target surplus and capital adequacy standards and approaches are different around the world. There is obviously an interaction between the risk discount rate and the capital adequacy standard and target surplus being applied to the company. This is an area where it should be possible for the actuarial profession to aim for broadly consistent standard around the world by influencing the various regulators in much the same way as central banks around the world are attempting to standardise capital adequacy requirements for banks in different countries.

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ATTACHMENT

Worked Example

This example shows how a risk discount rate might be calculated given a number of specified assumptions:

Risk free rate of return	10 year bond yield	8.0%	
Equity Premium		5.0%, 6.5%	
Beta		1.0, 1.3	
Risk discount rates	8.0% + 5.0% * 1.0	=	13.0%
	8.0% + 5.0% * 1.3	=	14.5%
	8.0% + 6.5% * 1.0	=	14.5%
	8.0% + 6.5% * 1.3	=	16.45%

This risk discount rate would be used (unadjusted for tax) to value the insurance business by discounting the appropriate profit stream including the value of imputation credits.

To determine a risk discount rate for the business in force, we would need some information about the company:

Value of net worth	$20 million
Value of in force	$80 million (approximately)
Value of new business	$50 million (approximately)
Risk discount rate for whole company	14.5%
Discount rate for net worth	10.0% (expected return)
Discount rate for new business	(x% + 10%) to point of sale + x% thereafter → solving this gives a risk discount rate on new business of x +3.5% (say)
Discount rate for in force	x%

Therefore, approximately,

$20 * 10 + 80* x + 50* (x +3.5) = 150 * 14.5$
$x = 13.85\%$

This is a very rough form of calculation, which does not take into account the pattern of future cash flows, or the fact that this value of the in force and the value of new business will change following the change to the risk the discount rate. However, it gives a starting point for the understanding of the relationships between the risk discount rate for the business in force and the risk discount rate for the company as a whole.