SWAPPING YOUR FUNDING BASIS

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Presented at the Actuarial Society of South Africa's 2013 Convention
31 October–1 November 2013, Sandton Convention Centre

ABSTRACT

Corporate entities with defined benefit obligations (e.g. post-retirement medical aid subsidies and defined benefit pension funds) are exposed to various financial risks. One such financial risk is the misalignment of the obligation's funding strategy and investment strategy. In other words, the risk that the way in which the expected costs of the obligation are estimated (liability value) is not consistent with the way in which funds are actually being invested to cover the expected costs. This risk in turn highlights the importance of answering the question as to what constitutes an appropriate funding strategy for a given defined benefit obligation and more specifically, what discount rate assumption should be used.

In this paper we look at a framework for determining an appropriate discount rate. Within this framework, we then consider the relative merits of a traditional bond-based funding strategy vs. a "new world" interest rate swap-based funding strategy. Relevant numerical application examples are used to illustrate the two funding strategies in question. Consideration is also given to current international practices.

This paper can be viewed as a value-added consideration to be included in the decision making process of valuators in determining which funding strategy to use. From a pure actuarial viewpoint, the ultimate aim is to give corporate entities the financial freedom to better manage their company's financial risks.

KEYWORDS

Defined benefit obligation; sponsor covenant; funding strategy; investment strategy; discount rate; risk-free rate; government bonds; interest rate swaps; International Accounting Standard 19; Pension Funds Act; liability driven investments

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1. INTRODUCTION

Many companies in South Africa have defined benefit obligations towards their active and retired staff for services rendered by them whilst in the employ of the company. The challenge faced by companies (or sponsors) is that the cost of the defined benefit obligation cannot be projected or hedged with certainty. This can have an adverse effect on the company's financial accounts by introducing unwanted balance sheet volatility. The main contributing factors are the uncertainties underlying the obligation itself and the sponsor covenant.

As a result, a company needs to decide on appropriate funding and investment strategies that will deal with the overall uncertainty and the impact thereof on the expected benefit cost. Various assumptions are required to arrive at a particular funding and investment strategy. These assumptions allow the actuary to incorporate the different uncertainties in his/her recommendations to the company.

This paper can be viewed as a reference guide for the various factors that an actuary and company should consider when formalising a defined benefit obligation's funding and investment strategy. We place specific focus on a funding strategy's discount rate assumption and give a framework within which the suitability of a particular discount rate can be assessed. The two main discount rates we focus on are Government bonds and interest rate swaps.

In addition, we conducted an ASSA survey to gain deeper insight into the framework used to value defined benefit obligations in South Africa. The feedback received from the 105 participants has been contextualised within the relevant sections of this paper. A high-level numerical example is used to illustrate the applications of the valuation framework. Brief insight is also given into the determination of the discount rate in different environments.

It is important to note that the purpose of this paper is not to recommend the use of any particular discount rate assumption. We want to highlight that the considerations around setting the discount rate might be bigger and more complex than envisaged by the actuary and/or the company. These considerations can also assist the actuary in assessing how any new investment and funding solutions can be used to provide solutions to meet the specific needs of the company.

2. DEFINED BENEFIT OBLIGATION

2.1 Definition and Examples

Many interpretations and definitions exist for a defined benefit obligation. For the purpose of this paper, the defined benefit obligation for an employer (i.e. company)

is defined as per International Accounting Standard 19 ('IAS19'): "… the expected future payments required to settle the obligation resulting from employee service in the current and prior periods."

These expected future payments are calculated by a predefined formula and rules. The stated formula and rules dictate the benefit amount payable to an employee at the occurrence of a specific event, e.g. retirement and how this benefit amount changes over time.

In South Africa, the number of open (i.e. allowing new employees) defined benefit schemes has decreased over the past few years. Adkins (2010) ascribes the historical popularity of defined benefit plans to the following four factors:

a) Defined benefit plans tend to afford employees a greater retirement benefit than what employees can expect to receive through other retirement schemes, particularly if employees live for a long period of time following retirement.
b) Defined benefit plans place the investment risks associated with market fluctuations upon the employer instead of the employee.
c) Defined benefit plans place the investment decision-making responsibility upon the employer instead of the employee.
d) Corporations tend to have a much longer time horizon than the life expectancy of employees. Therefore, it is believed that employers have a much greater capacity to absorb wide market fluctuations over various market cycles.

The two most common examples of defined benefit obligations within the South African context are defined benefit pension funds and post-retirement medical aid subsidies paid to entitled employees. Some deferred compensation arrangements can also be seen as defined benefit obligations, e.g. incentive share options. As at 3 September 2013, the total assets under management for defined benefit pension funds (all statuses) registered with the Financial Services Board was approximately R420 billion.

Under a defined benefit pension fund, an employee is usually entitled to a pre-defined pension at his/her retirement date. The pension amount can be paid monthly, quarterly, annually, etc. The pension increases to be granted during retirement will also be defined. An employee might also be entitled to other pension benefits, e.g. a spouse's and/or child dependent pension which is payable after the employee's death during retirement. A common standard formula for an employee's starting pension is expressed as:

$$\text{Annual pension} = \text{final annual fund salary} \times \text{accrued service} \times \text{accrual rate}$$

where:

— **Final annual fund salary** this is the average salary over the final years of an employee's career, e.g. the average pensionable earnings over the last 5 years leading to retirement. The averaging period differs between defined benefit

pension funds. The longer this averaging period, the greater an employee's exposure to salary inflation and hence the inflation erosion of the final annual pension at retirement.

— **Accrued service** this is the number of years of service the employee had with the sponsoring employer. To reward long-serving employees, an employer might decide to grant bonus service years, e.g. a 5% increase for accrued service in excess of 20 years.

— **Fund accrual rate** this is the rate at which members of a defined benefit pension fund build up pension benefits in the fund, e.g. 2% per annum. As with accrued service, the accrual rate can be increased for longer-serving employees.

The post-retirement medical aid subsidy of an employer to entitled employees can be defined in many ways, but it is usually much simpler than the pension entitlement under a defined benefit pension fund. For example, the subsidy can be expressed as a percentage of an employee's required total medical aid contribution during retirement. Alternatively, it can be a Rand-based amount determined in a set manner at retirement which increases in a predefined manner on an annual basis.

2.2 The Cost of a Defined Benefit Obligation and the Sponsor Covenant

As mentioned above, under defined benefit obligations, the sponsoring employer carries the ultimate financial liability for the stated benefits and is therefore required to disclose the obligations in its financial accounts (as per paragraph IN2(b) of IAS19). The financial liability for an employer refers to the employer's responsibility to ensure that it has sufficient funds available to make the benefit payments as they become due. It therefore refers to the expected costs the employer will incur while maintaining its defined benefit obligations. The financial liability is split between those employees who are yet to receive the benefit payments and those who already are in receipt of the payments.

The sponsor covenant is an important consideration in this regard. The Sponsor Covenant Working Party of the Faculty and Institute of Actuaries prepared a report in November 2005 titled "Allowing for the Sponsor Covenant in Actuarial Advice". Although the primary focus of this report was defined benefit pension funds, we view its content as relevant to the greater defined benefit obligation conversation.

It defines the sponsor covenant as follows: "the combination of (a) the ability and (b) the willingness of the sponsor to pay (or the ability of the trustees to require the sponsor to pay) sufficient advance contributions to ensure that the scheme's benefits can be paid as they fall due." The report confirmed that given the level of intrinsic difficulty in assessing the risk of corporate credit default with certainty, it should come as no surprise that finding a simple answer for the assessment of the sponsor covenant and its consequent incorporation into actuarial advice may be even more difficult.

2.3 Uncertainty and Cost

The financial liability of an employer is therefore not just exposed to the uncertainty attached to the sponsor covenant, but also to the high degree of uncertainty within the features of the defined benefit promise itself. The longer the time period until an employee is due to receive a benefit, the greater the level of uncertainty for the employer. To cater for these uncertainties in determining an employer's financial liability, assumptions are required that reflect both the level of uncertainty attached to specific features, as well as the uncertainty implied by the interaction between the different features.

Some of these features may be the same for different defined benefit obligations, but the impact of the combination of these features on the overall expected cost of the obligation is unique to a specific obligation. The different uncertainties an employer is potentially exposed to are listed below.

— Employee service period
— Salary increases
— Expected duration of benefit payments
— Benefit optionality
— Benefit increases
— Changes in legislation and accounting guidelines
— Discount rate assumption underlying a funding strategy

Each of the above listed benefit uncertainties is discussed in more detail under the Appendix of this paper for those readers who wish to familiarise themselves with the concepts.

2.4 The Greater Implications for an Employer

In addition to understanding the level of uncertainty underlying its defined benefit obligations, an employer should also appreciate the associated impact on its business and employee relations:

a) **Legal obligation** Any benefit promise to an employee forms part of the employee's terms of employment. Any inability of the employer to provide the stated benefits might have labour law implications.
b) **Employee motivation and productivity** The types of benefits offered to employees have an impact on their motivation and productivity levels. What is also of importance is the level of confidence in the employer being able to finance these benefits when they become payable.
c) **Financial disclosures** Any change in the overall expected cost of a defined benefit obligation will impact the employer's financial accounting and reporting. This introduces a degree of volatility in its accounts which in turn can influence the market's perception of the company.
d) **Competition and industry comparison** An employer should be aware of the benefits being offered by competing firms and try to understand how these firms

address the benefit uncertainties they are exposed to. For example, if a competing firm offers a similar benefit to its employees, it is worth looking at the value placed on that benefit in the firm's financial statements (if available), especially focusing on the assumptions used to value it. The same comparison can be done at industry level and even across different industries. For example, what is the average long term medical aid inflation assumption being used in valuing post-retirement medical aid subsidies.

e) **Investment strategy of the employer** How the employer chooses to fund its defined benefit obligation will have an impact on its business's overall asset class allocation requirements. Therefore, the asset class allocation for its defined benefit obligations cannot be considered in isolation of its other projects, products, liabilities and shareholder obligations. Consistency should be ensured where needed.

f) **Overall risk matrix** As mentioned earlier, under a defined benefit obligation the employer is fully exposed to the underlying level of risk. Therefore, an employer's overall risk matrix of its business should include an analysis of its risk exposure from its defined benefit obligations. This includes an understanding of all the associated risks, as well as the employer's overall sensitivity to a particular risk or combination of risks.

g) **Global and local economic environment** An employer should fully understand the impact of the current low interest rate environment (both locally and globally) on its defined benefit obligation and plan accordingly. An employer should also form a view on future interest rate expectations.

The list of considerations given above is by no means complete as each employer's set of defined benefit obligations is unique. As can be appreciated, the considerations span a very wide spectrum. This confirms the need for an employer to fully understand the level of uncertainty it is exposed to and the impact thereof on the other areas of its business.

Two important questions stem from the discussions and are vital considerations for determining the appropriate discount rate for valuing a defined benefit obligation:

— How to determine the expected cost of the defined benefit obligations (i.e. the funding strategy)?

— In what assets must the employer invest to fund its defined benefit obligations (i.e. the investment strategy)?

3. FUNDING STRATEGY FOR A DEFINED BENEFIT OBLIGATION

3.1 Definition

For any defined benefit obligation, the true costs of providing the stated benefits will only be known once the payment of the benefits has ceased. Until then, the remaining cost to employer can only be estimated as accurately as possible. For as long as assumptions are required for calculating the estimated costs, the difference between the actual payments and expected payments will require the employer to pay more

or less than expected. This is turn influences the volatility of the employer's financial accounts and reporting.

For the purpose of this paper, we define a funding strategy as the calculation of the present value of an employer's defined benefit obligation. In other words, what is the expected cost associated with the defined benefit obligation referring to both benefit payments which are yet to commence and those which are already in payment.

The most basic approach for calculating the expected costs of a defined benefit obligation involves using a cashflow projection model. This projects the expected benefit payments from the commencement date for the expected lifetime of the benefit payments. These future benefit payments are then discounted back to the current valuation date using an appropriate discount rate. As mentioned in Section 2.3, the expected benefit payments are projected using certain assumptions deemed appropriate to reflect the uncertainty underlying the benefit promise.

Examples of such assumptions include: salary increases, benefit increases, withdrawal decrements, mortality experience (both pre- and post the benefit commencing) and benefit optionality (e.g. how many employees will choose a certain benefit option). This paper's main focus is on the chosen discount rate assumption and will therefore not explore the other assumptions in too much detail. As mentioned previously, our intention is not to recommend a specific method for setting a discount rate, but rather to create an increased awareness around the issues to address and questions to ask when setting the discount rate.

3.2 The Discount Rate

Traditionally, the setting of a discount rate involves choosing a risk-free rate and then adding justifiable risk premiums and/or other adjustments to this risk-free rate. Various subjective justifications exist for the added premiums and adjustments to the risk-free rate. The more important considerations are the duration of the liabilities and how observable the chosen discount rate is in the market. Other considerations include making allowance for credit default risk and market liquidity. A "new world" approach might be to use a risk-free curve as the standard practice, instead of a point estimate. We look at the construction of such curves in more detail in Section 7.3 of this paper.

The following headings can be used to determine an appropriate combination of the factors listed above.

3.2.1 Purpose and Context

Daykin and Patel (2010) stated in their discussion paper prepared for the Institute of Actuaries and Faculty of Actuaries that the debate on the appropriate discount rate to use has exercised the actuarial profession, and others, for decades and will continue to do so for many more. In their research, they found that the purpose of the calculation and the context were the principal drivers of the particular approach selected. The above statement is definitely applicable to the South African context where currently there

is a difference between the discount rate guidelines under IAS19 and the guidelines under the Pension Funds Act. This in essence leads to two sets of valuation results for the same defined benefit obligation, given of course that the context differs between the two valuations. This does however lead to the question: should an employer view the IAS19 valuation of the defined benefit obligation as the expected cost to target, or the valuation thereof under the Pension Funds Act?

3.2.2 Assets vs. Liabilities – The Theory

The two main arguments centre on whether a discount rate should be representative of a defined benefit obligation's own liability characteristics or the characteristics of the assets backing the obligation. A motivation for using the expected return on plan assets as the chosen discount rate stems from economic theory and empirical work that argue that the correlation between returns on risky assets and the growth in average aggregate labour earnings are positively correlated in the long-run, although shortrun correlation is typically low (Andonov, Bauer & Cremers, 2012). Brown and Wilcox (2009) give two important dangers for defining the discount rate as the rate of return the assets are expected to earn:

1) The use of higher than appropriate discount rates reduces the value of the defined benefit obligation that is reported to the public and is likely to reduce the required contribution rate to pre-fund the obligation.
2) The link between the discount rate and the expected return on plan assets may encourage sponsors to invest in riskier investment portfolios in order to justify a higher discount rate. However, one can also argue that the higher discount rate compensates the employer for the additional risk associated with being invested in risky assets.

Using the expected return on assets as the discount rate is particularly useful for planning and budgeting as it is a simple way to navigate through actual market complexities (Daykin & Patel, 2010). In setting the discount rate in this manner, no consideration is however given to the concept of matching the liability cashflows.

Conversely, an argument can be made for setting the discount rate in such a manner that it takes into account the long-term nature and characteristics of the benefits payable under the defined benefit obligation. These characteristics include:

a) **Riskiness of the defined benefits** the chosen discount rate must have the same level of risk as the benefits payable under the defined benefit obligation. As such, treasury yields, municipal rates and swap rates can be used to discount pension liabilities because these rates reflect the low uncertainty pertaining to the promised benefit payments (Brown & Wilcox, 2009).
b) **Liquidity requirements** the long-term nature of the expected benefit payments imply that the chosen discount rate can relate to less liquid financial instruments.
c) **Future increases** if future benefit increases are linked to inflation, then the chosen discount rate should take into account future inflation expectations. This point

technically refers to the real discount rate, but it is still a valid point to consider as part of the greater discussion.

d) **Sensitivity towards interest rate movements** as mentioned by Vittas (2009), the 2008 financial crisis highlighted the weak financial condition of most corporate defined benefit plans. The underlying financial shortfalls were caused by a decrease in asset values and a simultaneous increase in liability values – in essence, a mismatch between assets and liabilities. A strong argument therefore exists for choosing a discount rate that accurately captures the interest rate sensitivity of the liability cashflows, but at the same time allows the employer to choose an asset that behaves in the same manner. This is of great importance if the primary aim is to follow a matching asset strategy.

A challenge with setting a discount rate according to the characteristics of the defined benefit obligation is that it is difficult to find individual financial instruments which exactly match these characteristics. This can be overcome by constructing a notional portfolio of market instruments of which the expected cashflows match most of the characteristics of the benefit obligation; some of the characteristics like longevity assumptions cannot be priced by financial instruments. The final discount rate is then implied by the market prices of the chosen notional portfolio.

On the other hand, financial markets are evolving and are becoming much more sophisticated compared to a few years ago. The flexibility of certain financial instruments, for example, interest rate swaps, allows for an accurate match of the liability cashflows' characteristics, whilst being regularly observable in the market. The approach of using swap rates to discount expected liability cashflows is a "new world" consideration for defined benefit obligations, but it is growing as standard practice for insurers in valuing their liability contracts.

3.2.3 Assets vs. Liabilities – The Industry Debate

Vittas (2010) stated the following:

> There is a strong debate about the appropriate discount rate between actuaries and financial economics theorists and increasingly so among actuaries. To a large extent, this reflects an evolving perception of the role of pension plans, linked to the growing maturity of pension plans and the concomitant changes in the structure of their liabilities. Traditional actuaries have long argued that pension liabilities should be discounted at rates that reflect the expected long-term returns on plan assets, while financial economists (and increasingly financial actuaries) have countered that pension liabilities should be discounted at market rates, either risk-free Government bond yields or at most yields on high-grade corporate bonds.

It is important to note that although this citation refers specifically to pension liabilities, we view it as equally applicable to any defined benefit obligation.

> Vittas went on to say that
> "the 2008 global financial crisis highlighted the fragility of banking and financial systems of advanced countries and the large exposure of commercial and investment banks to excessive and grossly imprudent risk taking. But the crisis also underscored the weak financial condition of most corporate defined benefit plans which, for the second time in a decade, reported in several countries large funding shortfalls.
>
> The shortfalls were caused both by large falls in equity prices and by large increases in liabilities. The latter were the result of the emergence of very low interest rates, especially on Government bonds. The shortfalls reflect structural weaknesses in the management of pension plans. These have their origin in the multiplicity of objectives of pension plans and in the use of an arguably misguided approach to the valuation of assets and liabilities and to the prudential regulation of pension funds even in countries where the primary objective of pension plans has been more clearly established.

Williams Walsh (*Finweek*, 2013) recently reported the collapse of Detroit's pension scheme where a deficit of $3.5 billion was reported due to the understating of in-payment pension liabilities. It caused the city to file for bankruptcy. The understating of the pension liabilities was blamed on too high discount rates being used in the valuation of the pension liabilities, instead of a low risk-free rate. The article raised the question as to whether actuarial standards were to blame for this, especially seeing that such an "error" occurred over a number of years.

The two most important conclusions we can draw from the theory and industry debates:

— It is clear that a consensus view does not exist as to what discount rate must be used in valuing a defined benefit obligation.
— If proper attention is not given to the discount rate choice, structural weaknesses can occur in the management of pension plans. This will have cost and balance sheet volatility implications for the sponsoring employer.

3.2.4 Looking into the Future

In setting the funding strategy for a defined benefit obligation and hence choosing an appropriate discount rate, consideration should be given to the future lifetime of the defined benefit obligation. For example, under a defined benefit pension fund (and even under a post-retirement medical aid subsidy obligation), the time will come when only pensioners are left under the obligation. This might lead discussions to the possible outsourcing of the remaining benefit payment obligations to an insurer which, of course, will have certain cost implications for the sponsoring employer. This is an important consideration for ensuring that the chosen discount rate is more representative of what an insurer will use in valuing the liability. This will ensure that the present value of the defined benefit obligation moves in line with the cost

of outsourcing the obligation to an insurer. This allows the employer to better plan for and time the termination of the defined benefit obligation. Overall, a focussed outcomes-based approach will be followed.

4. INVESTMENT STRATEGY FOR A DEFINED BENEFIT OBLIGATION

For the purpose of this paper, we define an investment strategy as the way in which available assets are optimally allocated to meet the expected cost associated with a defined benefit obligation. The cashflows underlying a defined benefit obligation are much like the coupon payments under a bond-type investment. Therefore, a strong motivation exists for primarily holding nominal or inflation linked bonds as the backing assets depending on the nature of the benefit promise. Such a bond investment should ideally match the expected costs of the liability obligation, as well as the expected cashflow profile under the obligation from a liquidity point of view. Any excess assets are then usually invested in more risk-seeking assets like equities. Together these asset holdings will aim to achieve a certain objective, e.g. a certain funding level, level of excess assets, etc. Other theories exist around how this optimal asset allocation should be done.

4.1 Types of Investment Strategies

a) **The optimal asset allocation** should be a function of fund maturity, salary growth and promised inflation protection. In principle, these variables should have similar effects across all funds, regardless of geographical region, regulatory requirements and plan type (public or corporate) (Andonov, Bauer & Cremers, 2012).
b) **Asset liability modelling** this includes modelling the expected liability cashflow profile and then finding a matching asset allocation strategy of which the return cashflow profile matches that of the liabilities. This approach can make use of different models at the same time, for example by modelling interest rates and mortality stochastically and independently of the greater valuation model.
c) **Mean variance portfolio theory** this is aimed at maximising the expected return for a chosen risk target and / or minimising the expected risk for a given investment return objective. Therefore, once the investment risk and return budget has been determined for the defined benefit obligation, this approach can be applied to determine the appropriate asset allocation.
d) **Asset matching vs. risk seeking assets** this involves dividing the available assets between matching assets and risk-seeking assets. A wide range of matching assets or strategies exists. The greater the degree of matching involved, the higher the associated investment costs. The remaining assets can then be used to generate a return to meet the overall investment strategy objective.

4.2 Matching Assets and Liabilities

Some of the basic asset-liability matching strategies are illustrated in Figure 1, where:

— **Funding strategy** refers to a balanced type investment mandate with a specified investment objective that was set based on the funding strategy of the obligation. This is expected to have the least amount of associated cost as the degree of (explicit) liability matching is the lowest. However, if the actual investment return achieved is less than what is required to meet the liability obligation, the overall cost will be higher due to the associated mismatch between assets and liabilities.

— **Liability driven investments** are discussed in more detail in the next section.

— **Cashflow matching** refers to buying a structured asset that guarantees to pay out a predefined set of cashflows equivalent to the projected cashflows under the defined benefit obligation. Any modelling error and deviation from assumed experience will influence the associated cost of mismatching the liability.

— **Buy-in policy** refers to the employer or fund entering into a perfectly matching investment policy of which the employer or fund is the owner. For example, an annuity policy providing the required pension payments to the fund which are then paid to the pensioners via the fund. In essence, the only risk that remains is the operational risk that the fund or employer does not make the payments as they fall due. Both the size and timing of the payments are matched by the policy under all economic circumstances.

— **Buy-out strategy** refers to the employer or fund transferring the full liability and hence all of the associated risks. For example, an annuity policy of which the individual pensioners are the owners. Therefore, no link is retained between the sponsor and the beneficiaries.

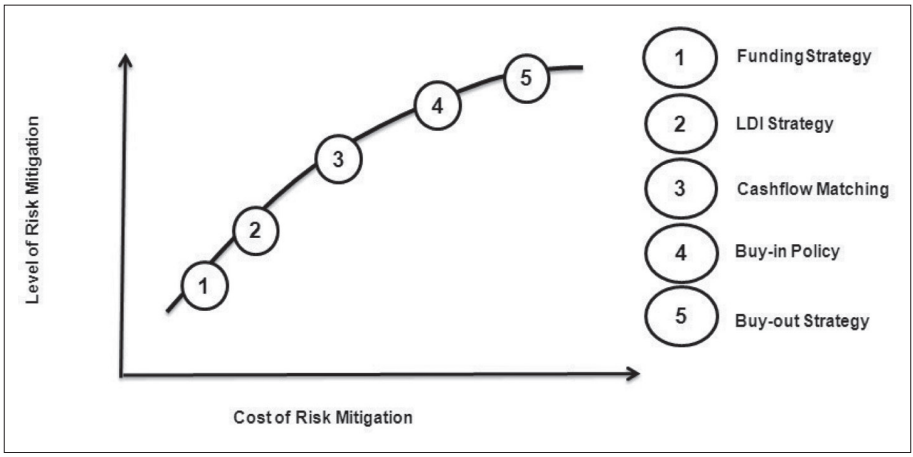

Figure 1 Matching investment strategies

4.3 Mismatching Assets And Liabilities

Moloney (2006) stated that a sponsor is exposed to financial volatility from two sources:

— Fluctuation in the asset value backing a defined benefit obligation due to movements in investment markets; and
— Changes in the value of liabilities driven by movements in yield curves.

These two sources of volatility expose the sponsoring employer to the following risks:

a) **Investment risk** This refers to the possibility that the assets are at any point less than what is required to cover the expected costs of the benefit obligation. Under a defined benefit obligation, the employer carries all of the investment risk.
b) I**nterest rate risk** The possibility that the present value of the defined benefit obligation can change due to interest rate movements. Any decrease in interest rates will cause the present value of the obligation to increase and vice versa. If the assets do not move in a similar manner, a mismatch will occur and the funding position will be affected. This in turn introduces additional volatility to the employer's financial accounts.
c) **Liquidity risk** This arises when the assets backing the defined benefit obligation are not liquid enough to make the necessary payments as they become due. It also refers to the potential need to realise assets at an inopportune time which may lead to financial losses for the fund and/or employer. On the other hand, the long-term nature of a defined benefit obligation does allow the investment strategy to invest in illiquid assets which offer enhanced return due to the associated liquidity risk premium.
d) **Inflation risk** The risk that inflation decreases the real value of the assets backing the defined benefit obligation. For example, if benefit increases are linked to inflation but the underlying assets do not grow in real terms. This is less of a concern when the benefit payments are nominal in nature.
e) **Longevity risk** The risk that employees live for longer and hence receive more benefit payments that initially anticipated. Unlike the liquidity risk, there is no expected premium for this risk exposure.
f) **Actuarial risk** The risk that the economic and demographic assumptions made in setting the investment and/or funding strategy are inaccurate or do not cater for unforeseen events. Ultimately, this might cause the overall modelling to be inaccurate and hence lead to financial loss.

4.4 Rewarded vs. Unrewarded Risks

"Pension funds need to manage risk, not throw it away. The only real asset pension funds have is risk. They should put that to work." (Van Nunen, 2011). For the purpose of this paper, we share the risk classification approach of Layton and Wagner (2009). They stated that the risk for an employer can be divided into unrewarded risk and rewarded risk. Unrewarded risks focus on value protection, whilst rewarded risks

focus on value creation. Stated in a different way, by being exposed to rewarded risk the employer is expected to benefit from it, but not from being exposed to unrewarded risk.

Let us consider a practical example. If a sponsor invests in equities, then it would expect its equity holdings to provide a superior return compared to the other less risky investments. In other words, it expects to be rewarded for the additional risk it is taking on. Investing in equities can therefore be seen as a rewarded risk.

With other types of risk, the employer can only react on them when they occur, for example, legislation changes and mortality experiences (i.e. longevity risk). Another example is a change in interest rates which is probably the most important unrewarded risk a defined benefit obligation is exposed to. Senoski (2008) stated that over the short term, interest rate risk is the most significant risk embedded in a pension plan's liability structure. It is of particular importance in setting the discount rate for valuing a defined benefit obligation.

Liability volatility is often poorly understood, largely unmonitored (with the exception of triennial actuarial reviews or perhaps consideration of annual accounting disclosures), and has rarely been actively managed (Moloney, 2006). This statement supports our concern that not enough attention is given to the funding strategy of a defined benefit obligation (i.e. calculating the liability value), especially the chosen discount rate. In addition to the potential liability volatility this might imply, there is the additional risk that the chosen investment strategy also does not take into account the discount rate used in calculating the liability value.

4.5 Liability Driven Investments

A concept worth exploring in trying to mitigate unrewarded risk is that of a liability driven investment ('LDI'). The CME Group (2008) hit the nail on the head with the following statement: "… even though the plan (asset) may consistently outperform standard return on asset benchmarks, it might still fail to meet its goal of funding its liabilities." An LDI solution can be designed to mitigate (hedge) the impact of interest rate movements on the costs associated with a defined benefit obligation, in other words a fund's exposure to interest rate sensitivities. This means that the associated impact of an interest rate movement on the funding strategy of a defined benefit is matched by a corresponding movement in the investment strategy.

The effectiveness of this interest rate hedge is however affected by how closely a defined benefit obligation's funding strategy is aligned with its investment strategy, in other words its LDI solution. More specifically, the investment return assumptions used in the funding strategy must be consistent with the financial instruments underlying the LDI solution.

For example, if the LDI solution mainly uses interest rate swaps to provide the desired interest rate hedge, a strong argument exists for the funding strategy to use an interest rate swap curve as being representative of investment return expectations. In such a case, the interest rate swap curve can be viewed as a risk-free curve due to

the collateralisation of the underlying swap agreements which in effect removes any default risk of the counterparties in question.

Further adjustments can be made to the assumed swap curve to represent the long-term nature of assets underlying any swap investment strategy. For example, an expected illiquidity premium can be added to the swap curve to illustrate the long-term nature of the assets backing the defined benefit obligation. There is no market-wide consistent approach to determine the illiquidity premium. A possible approach involves estimating the illiquidity premium using the funding spreads published by banks. This is discussed in more detail in Section 6.1.2.

By applying this focused approach, consistency will be achieved between the funding strategy and investment strategy for a defined benefit obligation. It will also reduce the investment return volatility measured by the obligation's deviation away from the defined liability benchmark. This is due to the fact that in the case of a fund or company that is invested in an LDI arrangement, the benchmark is the tracking of the liability and not some explicit performance targeting.

An LDI solution can be expanded to allow for other objectives in addition to reduced interest rate volatility exposure. For example, a leveraged (i.e. unfunded) LDI solution can be used to free up assets for investing in more risky assets in order to generate higher expected returns. This is due to the fact that under a leveraged LDI approach, fewer assets are required to hedge the full obligation against interest rate movements than the value of the obligation itself. For example, an LDI solution with a gearing ratio of 3 only requires a third of the assets to provide an interest rate hedge for the full liability. These assets are mainly to manage the margin calls underlying the swap agreements. However, if the hedge is not constructed in a correct and appropriate manner, any losses may also be exacerbated by the gearing effect. The excess available assets (i.e. remaining two thirds) can be invested with the objective to either reduce an existing funding gap or to increase the amount of excess assets backing the obligation. Such a strategy can only be constructed by using interest rate swaps as the underlying financial instruments. Various other LDI strategies exist which can be discussed as a future expansion of this paper.

5. DISCOUNT RATE AND LEGISLATION

This section summarises the current legislation that provides guidance on the setting of a discount rate.

5.1 Pension Fund Circular 117 (PF117 for Pension Funds only)

This circular forms part of the Pension Funds Act ('PFA'). It requires the discount rate to be set on a best-estimate basis. This means that the assumption must be realistic, consider the nature of the business and is guided by past experience. Motivation for the chosen basis should be done with reference to the experience of the fund, statistical evidence and yields on classes of Government or corporate bonds. No deliberate margins of conservatism should be allowed for under the best estimate basis.

It also mentions the requirement to value the Minimum Benefit for each fund member which has a strict set of assumptions guidelines that must be followed. Consideration should also be given with regard to any solvency reserves that should be set up, e.g. investment solvency reserve (i.e. assuming that the investment return will be less than expected).

5.2 Standard of Actuarial Practice (SAP) 201 (applicable for pension funds only)

This practice note encourages a valuator (or actuary) to discuss the assumptions to be used with the target audience before the valuation commences. The note clearly states the valuation objectives that should be achieved by the valuation. Within the context of the discount rate to be used, it refers to the financial position of the fund, analysis of the impact of the assumption choices and commentary on the investment strategy currently in place.

It states that the long-term best estimate valuation basis and explicit solvency reserve setting approach, as per PF117, must be used to determine the financial position and recommended contribution rate of the fund. Valuations can be done for other purposes as long as the appropriateness of the chosen assumptions is justified and fully explained. Specific mention should be made of the chosen post-retirement discount rate and the consistency thereof with the fund's pension increase policy. The impact of each assumption and combination of assumptions on the valuation results should be disclosed. Also, the appropriateness and consistency between the investment strategy and funding strategy must be discussed.

The financial soundness of a fund is determined by the best estimate liability. Consideration should be given to the risks a fund faces that could affect its financial position in the future. Examples of such risks include the inadequacy of the real discount rate (difference between fund returns and benefit and salary increases) and the risk that asset movements and liability movements are not matched. Lastly, the characteristics of the fund should be compared against the appropriateness of the investment strategy.

5.3 International Accounting Standard 19 (applicable for all employee benefits, e.g. pension funds and PRMA obligations)

This accounting standard prescribes the accounting and disclosure by employers for employee benefits. To quote from IAS 19:

> The rate used to discount benefit obligations (both funded and unfunded) shall be determined by reference to market yields at the end of the reporting period on high quality corporate bonds. In countries where there is no deep market in such bonds, the market yields (at the end of the reporting period) on Government bonds shall be used. The currency and term of the corporate bonds or Government bonds shall be consistent with the currency and estimated term of the post-employment benefit obligations.

Some important comments made in IAS19:

— It states that the measurement of the defined benefit obligation should be independent of the measurement of any asset backing the obligation. This is why the use of the expected rate of return of the assets as the discount rate was rejected by this accounting standard.
— The discount rate should reflect the time value of money, but should not attempt to capture the risks underlying the defined benefit obligation.
— It should also be determined by reference to market yields as at the balance sheet date.

5.4 Board Notice 37 of 2007 (applicable for pension funds)

This Board Notice is also called the Notice on Assumptions for the Determination of Minimum Individual Reserves of Members of Defined Benefit Categories of Pension Funds. It essentially stipulates the real discount rate to be used when valuing the benefits for active members under a defined benefit pension fund. In other words, the difference between the nominal discount rate (expected risk-free return on assets) and the salary increase assumption. An implication of the notice's stipulations is that the nominal discount rate is defined as a risk-free rate of return (e.g. Government yields) plus a 1.35% equity risk premium less a 1% salary increase assumption in excess of inflation less an estimated 0.3% for investment fees.

5.5 Other Notes relevant to the bigger Valuation Context

Other relevant notes include Advisory Practice Notes 207 and 301. The former note provides guidance to actuaries on the interpretation and reporting of valuations performed under IAS19 for defined benefit pension funds. The latter note refers to the valuations performed under IAS19 for post-retirement medical aid subsidies.

5.6 Summary of Important Points to note from Available Legislation and Guidance

1) **No "one size fits all"** As can be seen from the legislation summaries in the preceding sections, differences exist between the Pension Funds Act and IAS19 on how a discount rate must be set for valuing a defined benefit pension fund. IAS19 is much more specific compared to the Pension Funds Act. As a result, IAS19 implies that different employers must use the same discount rate assumption, regardless of the differences in the characteristics underlying their respective defined benefit obligations or the assets backing the obligations
2) **Implications for a sponsoring employer** The differences between IAS19 and the Pension Funds Act on how the discount rate assumption must be set, means that the sponsoring employer is potentially exposed to two different values for the same defined benefit obligation. This, of course, acknowledges that the purpose of the two valuations differs.

   However, which valuation results should the employer focus on in trying to manage the cost of the defined benefit obligation? Stated in a different manner, which expected cost level should the employer target when trying to manage

the risks and uncertainties underlying the defined benefit obligation and the environment it is operating in?

An aspect to keep in mind when asking these questions is the fact that a pension fund is a separate legal entity with ringfenced assets backing the benefit obligation. The assets of the fund are creditor remote, meaning that the pension fund assets cannot be used by the employer to service its other liabilities. Any reference to the liability calculated under the Pension Funds Act will therefore be accompanied by some reference to the funds' assets which should imply a certain level of consistency in interpreting the results.

But, seeing that the sponsoring employer carries the majority of the risks underlying a defined benefit pension fund, any mismanagement and miscalculation of the assets and liabilities will impact the employer directly as any deficit remains its responsibility. The employer needs to be fully aware of the risks it is exposed to and make sure that its preferences and risk tolerance levels are taken into account when the investment strategy is set for the defined benefit obligation. It also needs to be aware of the risks and uncertainty underlying the funding strategy of the obligation.

3) **Setting the discount rate based on the characteristics of the liabilities or assets**
The difference between current legislations also leads to the previous comment made around the two main approaches for setting a discount rate, i.e. whether the actuary should consider the characteristics of the underlying assets or those of the liabilities when setting the discount rate assumption.

5.7 Survey Feedback

This section summarises the findings of the sections of the ASSA survey that relate to the legislative environment in which discount rates are set. Of the 105 participants that completed the survey, about 40% indicated that they are involved in IAS19 valuations and/or statutory pension fund valuations. Some statistics that came from the survey:

a) Approximately 60% of those expressing an opinion felt that there needs to be greater consistency between IAS19 and the valuations performed under the Pension Funds Act (as guided by the relevant guidance notes).
b) Approximately 65% of those expressing an opinion felt that the valuations performed under the Pension Funds Act are a more realistic estimate of the expected costs underlying a sponsor's defined benefit obligation. 26% felt that the Pension Funds Act allows for too much subjectivity. 9% were indifferent.
c) Approximately 50% of those expressing an opinion felt that the IAS19 guidelines should be extended to allow actuaries to use interest rate swaps as the discount rate assumption.

The survey allowed participants to provide further comments on the above questions. The central points highlighted in these comments are summarised below:

d) The solvency reserves under a Pension Funds Act valuation act as a buffer against adverse fund experience. When a deficit arises under the statutory valuation,

action is required to restore the financial position of the fund. This is not required under IAS19. Our view on this comment is that although no explicit action plan is required under IAS19, we need to keep in mind that an employer is required to make provision in its balance sheet to fund any shortfall that might arise when valuing a defined benefit obligation. In other words, the resulting deficit needs to be reflected on its balance sheet.

e) IAS19 should take account of the assets backing the defined benefit obligation. For example, to allow for an equity risk premium in the setting of the discount rate if the fund is invested in equities.
f) The prescribed IAS19 valuation basis is too strong under the current interest rate environment.
g) IAS19 assumes that bond yields are determined by an efficient market. Recent market experience has taught us that markets are anything but efficient.

The above summary of the survey seems to indicate that participants view the IAS19 guidelines as too restrictive and perhaps not suited for current market conditions. The strong opinion also exists that the statutory pension fund valuation guidelines allow a valuator to more accurately calculate the expected cost associated with a defined benefit, mainly because it allows the valuator to take into account the assets backing the defined benefit obligation.

We need to emphasise that the purpose of the feedback provided above (and this paper) is not to dismiss the use of any one valuation guideline over the other, but merely to give the reader a sense of the views that exist around this topic within the actuarial community that participated in the survey. A further expansion of this discussion might involve performing a more detailed and focused investigation into these perceptions and to then approach and liaise with the accounting profession around the findings.

6. FACTORS TO CONSIDER WHEN CHOOSING A DISCOUNT RATE

6.1 The Risk-free Rate: Bonds vs. Swaps

The risk-free rate is a theoretical concept in financial economics. While there have been attempts in recent years to define exactly what a risk-free rate is, no real practical definition exists.

6.1.1 Bonds vs. Swaps

There are two observable market rates that can be considered, legislation permitting, when setting the discount rate assumption, i.e. swap and bonds. While bonds are a traditional investment in the market, interest rate swaps are a fairly new investment structure in the pension fund environment. However, the use of swaps has become quite extensive internationally in recent years. For this reason we provide some background into how these derivatives work. A typical swap agreement would be structured as follows:

Two parties enter into an agreement to exchange a set of interest cashflows at specified intervals over a set period of time. Usually one party would pay cashflows that are based on a fixed interest rate and the counterparty would pay cashflows based on a floating interest rate. These interest payments will be based on a notional principal amount that is set at the beginning of the transaction. No principal is exchanged upfront making this an unfunded strategy, i.e. one can obtain the interest rate hedge required for the fund without having to pay the funds upfront. This reduces the counterparty credit risk that one would typically be exposed to when utilising a funded approach. The only credit risk that the client is exposed to is the loss of the net future interest rate payments should default occur. These instruments are over-the-counter (OTC) agreements, with the counterparty being an investment bank, and for this reason the hedge is completely customisable and can be designed to match the expected liability profile of the client exactly.

In the survey conducted, approximately half the respondents who expressed an opinion believed that IAS19 should be expanded to allow for the use of swap rates in the discount rate assumption. Roughly 50% believed that a bond-based funding strategy better represented the expected costs under a sponsor's defined benefit obligation whereas 25% believed that the swap-based strategy gave a better reflection. However, surprisingly, despite the Pension Funds Act allowing the use of swap rates as a discount rate for statutory valuations, none of the valuators used this rate in practice. Some reasoned that the rate used should be dependent on the underlying assets which does raise an important point: when determining which market rate is appropriate to value a pension fund liability an important consideration would be the asset strategy. Should the interest rate hedge incorporated in the fund use one of these market instruments and the discount rate that is used to determine the liability be based on another, then that introduces basis risk which refers to the risk that these two market rates could potentially move out of line.

6.1.2 Funded Basis vs. Un-funded Basis

A bond rate reflects the market rate that can be earned if assets are invested upfront, i.e. a funded basis. Swap rates on the other hand reflect an unfunded basis in the sense that the swap rate can be earned without the strategy being funded upfront. The only commitment required from the client is to pay the interest cashflows at regular intervals over the period of the swap.

In the South African market, CPI-linked swaps traditionally pay CPI-linked cashflows in exchange for the Johannesburg Interbank Agreed Rate (JIBAR) which is the average money-market interest rate at which banks buy and sell money. The swap arrangement effectively converts the fund's CPI-linked obligation to its members into a JIBAR-linked obligation to the bank that acts as the counterparty. This arrangement affords the fund the flexibility to invest the underlying assets as they prefer in order to produce the JIBAR cashflow payments required in the swap agreement and any additional desired return above this. Should the fund choose to invest these assets with

the bank, the bank is usually willing to pay more for the assets in the form of a funding spread due to the long-term nature (i.e. illiquidity) of the investment. Therefore, when one considers a swap curve relative to the bond curve, the funding spread that can be earned (net of credit risk) should be taken into account.

Current markets indicate that the funding spread for a 10-year duration swap would be roughly 100bps. Since the interest rate risk of the fund is hedged at no cost upfront this structure would allow the fund to invest in assets that the manager believes can provide the necessary performance to meet the fund's JIBAR-linked obligations. Depending on the risk appetite of the fund, these assets can range from cash which would exactly match the obligations under the swap agreements to more aggressive assets such as equities in order to achieve additional return. The fund should however be aware that strategies that offer higher return also introduce additional risk which means that the extent to which the additional return achieved from these strategies can be taken into account in the discount rate is diminished.

6.1.3 Challenges in determining a Risk-free Rate

Determining an appropriate risk-free yield curve is not as simple as identifying an appropriate instrument and matching the currency, timing and amount of underlying cash flows. There are a few challenges that exist with defining the appropriate yield curve viz.:

a) Government bonds and interest rate swaps are financial instruments that are often used as a reference for deriving risk-free rates. However, recent history has shown that these instruments are not risk-free under all circumstances. Issuers of these instruments may not be able to fulfil all of their contractual obligations under extreme conditions. In addition, the value of government bonds can be affected by deteriorating market liquidity.
b) In many markets the term structure of interest rates is quite difficult to construct from government or other bonds even if the markets are deep and liquid. This is due to the fact that there may only be a limited number of bond maturities and long maturity bonds may be completely absent.
c) Where insufficient instruments exist in the long end of the curve, valuators will need to select the most appropriate instrument to use as a basis for a risk-free rate, adjust that rate for differences in maturity or other factors and in some cases even combine two or more instruments.
d) Alternatively they may also need to extrapolate yield curves beyond the contractual duration of the reference instrument's cash flows for those periods long into the future.
e) Some bonds also have significant technical bias affecting their yields. Reasons for this may include their use as benchmarks or reference rates in particular circumstances or because of excess demand by financial institutions such as pension funds and insurance companies, to match particular liability patterns.
f) Some geographical areas may not have sufficiently deep and liquid government

bond and swap markets in the same currencies as the pension fund liabilities being measured.

6.1.4 Risk-free Rate Characteristics

The Technical Provisions task group for Solvency and Assessment Management: Pillar I, with consultation with the investment banks, created the following desired characteristics of a risk-free curve in the South African market:

a) **Observable** The rates used to construct the yield curve should be observable in the open market. This increases transparency and allows for ease of validation of data.
b) **Objective** There should be no bias in the curve used or the data that the curve is based on. In a market where there are many price makers, the issue of bias can be addressed by calculating the average of these prices in order to get a reasonable indication of where the market rates lie.
c) **No/low credit risk** This requirement is in accordance with the definition of a risk-free rate. The discount rate used should reflect the certainty of the occurrence of the cashflow liability, i.e. no risk of default.
d) **Liquidity across term structure** Liquidity in a market implies that transactions of large volumes can be executed quickly without impacting prices in that market. Liquidity is an important consideration as it indicates the reliability of the observed rates. If an asset of a particular term, e.g. 30 years, is not traded often or is illiquid then the observed prices in the market may not be a true representation of what the current achievable price or rate will be as these prices are likely to be stale and not relevant in current market conditions.
e) **Arm's length transaction** This refers to a market where buyers and sellers are assumed to act independently in order for a fair value of an asset to be determined. In the context of interest rates, the rate used in the valuation of cashflows should reflect the same price or value at which the exact same cashflows could be traded in the financial market. By implication, one would expect that these rates would be achievable in that it should be possible to buy or sell these cashflows at these rates in the market.
f) **Reliability/liquidity in stressed market conditions** In stressed market conditions the number of liquid market data points for certain instruments may be reduced. It is desirable that the risk-free rate remain reliable under these conditions in order to promote the stability of the financial sector.

Additional considerations are given below.

g) **Level of extrapolation required** A lower level of extrapolation is desirable when constructing a risk-free curve. This is achieved by having more market observable rates at the long-dated end of the curve. This feature results in more accurate modelling of the curve in the long-term which is important when discounting the defined obligation liability cashflows that can extend beyond 30 years.
h) **Level of interpolation required** A lower level of interpolation is desirable when

constructing a risk-free curve. This is achieved by having a high level of granularity, i.e. a higher number of market observable rates on a curve will result in a more accurate term structure to use when discounting the defined obligation liability cashflows.

6.1.5 Comparison of Bonds and Swaps to Ideal Characteristics

Inflation-linked government bonds and interest rate swaps measure against these criteria as follows:

a) **Observable** The instruments used to derive the bond and swap curve are observable and quoted by various financial institutions in the market.
b) **No or low credit risk** It is generally accepted that government bonds can be treated as risk-free. However the exposure on default is higher than that for swaps due to the funded nature of the investment. Credit risks on swaps are very small as swap agreements are collateralised and the credit risk on the cash required to earn JIBAR to meet the interest rate payments under the swap agreement is immaterial.
c) **Objective** Government bond issues are based on the government borrowing needs rather than investor demand. Swaps are synthetic instruments which do not suffer from systematic distortions due to insufficient supply or regulatory factors since supply and demand are more strongly linked. In addition, the bid-offer spreads on government bonds are very low. Since the swap market is an OTC market, prices will vary based on the financial situation of both the bank and the client. However, the best bid/offer spreads are still close indicating that this market is highly objective.
d) **Liquidity across term structure** For bonds, market makers are required to provide liquidity making this market liquid. Theoretically rates can be made available at a greater number of points along the curve for the swap market than the bond market. However, in the current South African market the supply of inflation-linked swaps is limited.
e) **Arm's length transaction** It is not possible to trade the exact expected cashflows under a defined benefit obligation using bonds as these instruments are not available at all durations and are standardised. In the swap market, the OTC nature of the market allows funds to trade on customised solutions for their obligations. Therefore fair prices would be available and the cashflows would be tradable.
f) **Reliability or liquidity in stressed market conditions** In stressed market conditions the liquidity of the inflation-linked swap market becomes a major issue, this is less of a concern for the inflation-linked bond market.

Additional considerations are given below.

g) **Level of extrapolation required** While in the current market the longest dated inflation-linked government bond is 37 years, the furthest observable point on the bond curve is dependent on the government issue of long-dated bonds. As time progresses, should government choose to not issue another long-dated instrument

beyond this term, the extent to which there will be observable data at the long end of the bond curve will reduce resulting in extrapolation of the bond curve becoming increasingly difficult. As mentioned previously, the supply of bonds are dependent on government and can be driven by factors unrelated to the market. On the other hand, because swaps are customisable it is possible to obtain rates from various counterparties such that the rate reflects the term and nature of the liability. Banks generally quote at the long-dated maturities which means that obtaining a rate at the maximum point should not be an issue.

h) **Level of interpolation required** In terms of the level of interpolation, bond rates are available at a smaller number of points along the curve as the existence of bond issues at each duration are dependent on government. This makes interpolation more difficult than the swap market where rates are available at more points along the curve since market makers should be able to quote at any duration required.

The table below summarises this comparison of inflation-linked Government bonds and swaps in current South African market conditions.

Table 1 Criteria for assessing the suitability of a discount rate

Criterion	Government inflation-linked bonds	Inflation-linked interest rate swaps
1. Observable	High	Medium
2. Objective	High	Medium
3. No/low credit risk	High	High
4. Liquidity across term structure	Medium	Medium
5. Arm's length transaction	Medium	High
6. Reliability/liquidity in stressed market conditions	Medium	Low
7. Level of extrapolation required	Medium	Medium
8. Level of interpolation required	Medium	High

It is important to note that this comparison will differ at any point in time and, while in current market conditions Government inflation-linked bonds meet the criteria of a risk-free rate marginally better than inflation-linked swaps, this will not always be the case. Additionally, based on the measurement against the ideal characteristics both rates may be considered appropriate for use as the risk-free rate.

6.2 Top-down vs. Bottom-up Approach

Determination of the discount rate can be done using either a bottom-up or top-down approach (Ernst & Young, 2011; American Academy of Actuaries, December 2011).

Under the bottom-up approach, the discount rate is set based on the fund's liabilities. The starting point is the observed risk-free yield curve in the appropriate currency for instruments that expose the holder to no or negligible credit risk. A

premium adjustment is then added to reflect the illiquidity of pension fund liabilities. Additional adjustments can be made to this curve to reflect the relevant characteristics of the pension fund liability. Therefore to use this approach, the risk-free rate, illiquidity premium and potentially other risk premiums in the financial markets must be identified and measured.

Under the top-down approach the discount rate is determined based on the fund's assets. The starting point is the observed yield curve for a market basket of securities representing the fund's investment portfolio. This allows valuators to determine discount rates from a familiar starting point and then adjust to reach an appropriate discount rate for pension fund liabilities. Adjustments are made for the timing of the cash flows and risks inherent in the assets, but not in the liabilities. Examples of such adjustments include expected default and default risk premiums. A characteristic of the top-down method is that spreads for expected defaults and for retained investment risk could be held stable for valuation purposes, thus allowing liability discount rates to move in parallel with asset discount rates, thereby reducing volatility of the funding level.

In the South African market, most valuators indicated that under IAS19 they use the risk-free government bond rate as the discount rate since there is no deep market in corporate bonds in South Africa. A few valuators indicated that in their opinion risk premium adjustments are warranted given the fund's underlying asset mix and current factors impacting the bond market that will not have an impact in the long term and this adjustment is made using the bottom-up approach (i.e. risk-free rate + risk premium adjustments). For valuations under the Pension Funds Act, there is also a strong preference in South Africa to follow the bottom-up approach. The only adjustment that is applied according to the survey is the equity risk premium, which is discussed later.

In both the top-down and bottom-up approaches the discount rate is essentially derived by seeking an observed market yield curve for investments with one set of risk and liquidity characteristics adjusted upwards or downwards, as appropriate, to reflect the risk and liquidity characteristics of the pension fund liability. Therefore, theoretically, one would expect both approaches to result in approximately the same discount rate. However, in practice, significant judgement needs to be exercised by pension fund valuators in order to estimate components of a discount rate. The reasoning for this will be touched on in the next section.

The likely result is discount rates that differ between funds, markets and geographical areas. This means that discount rates may depend heavily on the approach chosen by the valuator. A great amount of emphasis will need to be placed on understanding the impact of the choice of estimates made on the pension fund valuation.

6.3 Components of the Discount Rate

We focus our discussion in this section on the components of the bottom-up approach as the results from our survey indicate that this approach is popular with valuators in the South African market.

The main components that adjustments to the risk-free rate can be made for are (Ernst & Young, 2011; American Academy of Actuaries, December 2011):

a) **Credit risk premium** The credit risk premium can be sub-divided into two components viz. the expected default risk premium and the unexpected default risk premium. The expected default risk premium reflects the expected loss on contractual cash flows of a financial instrument (or portfolio of financial instruments) and is expressed in an annual percentage of its fair value. The unexpected default risk premium reflects compensation for the uncertainty in expected future defaults, i.e. in estimating the timing and amount of future cash flows. When uncertainty and/or the market price of risk increase, the default risk premium will rise. Unexpected default risk premium typically is not directly observable, and a method used in the market to measure this is subtracting the compensation for the expected default from the total credit spread. The latter may be derived from market prices of credit default swaps or from financial instruments like corporate bonds, but, in many cases, no reliable market observation can be found.
b) **Liquidity risk premium** This refers to the additional yield that an investor requires as compensation for holding an illiquid asset. Pension fund liabilities are illiquid in nature so arguably an illiquid premium should be allowed for when determining the discount rate. Currently, there is no single widely-accepted method of calculating an explicit liquidity premium, or discount in price, that the purchaser of an instrument would require due to an illiquid market. As mentioned earlier, a possible approach involves estimating the illiquidity premium using the funding spreads published by banks.
c) **Equity risk premium** This refers to the additional yield that can be earned on a risk-free basis from investing in equities as opposed to government bonds. This premium will also include a component to compensate for the illiquid nature of equities. One way to determine the equity risk premium is by using the Capital Asset Pricing Model (CAPM). The CAPM formula is as follows:

$$\text{Expected Equity Return} = \text{Risk-free Rate} + \text{Equity beta} \times (\text{Expected Market Return} - \text{Risk-free rate})$$

In this formula the equity risk premium is equal to the difference between the expected market return and risk-free rate. By using the observable data and projections for the unobservable information in the market one could then determine an estimate for this premium.
d) **Diversification premium** Where a portfolio of investments consists of assets that are not perfectly correlated to each other, one would expect the portfolio's risk-adjusted return to be higher than the sum of the individual constituent risk-adjusted returns. The additional yield is derived from investing in a diversified portfolio of assets other than government bonds, and not just equities.

Some of the fundamental components of discount rates have been identified and estimated from market information to a certain extent in recent years. However, in many cases, full observable market information does not exist for components of the pension liability discount rates, meaning that estimates by valuators are often necessary. Such estimates will inevitably require judgement resulting in varying estimates of the discount rate required for the exact same purpose. These variances will however be negligible.

6.4 Curve vs. Point Estimate

When determining the discount rate to use to value a pension fund liability, one can either choose a single discount rate or a full yield curve. The results of our survey indicate that most valuators in South Africa use the point estimate approach for both the discount rate and the expected inflation assumptions with there being a gradual shift towards use of the yield curve. Some valuators are of the opinion that using the yield curve provides unnecessary refinement.

The main advantage of using a single discount rate is the simplicity but the main disadvantage is that it often fails to reflect all of the information in the market. With modern computing power, incorporating the full term structure of the yield curve into the valuation of liabilities is not really an issue.

However, should one decide to use a single point estimate this should be set to a single discount rate that accurately reflects the duration of the liabilities, i.e. a single discount rate that gives the same present value of the liabilities as using the full term structure. This is particularly important in conditions where the yield curve is inverted and using a single discount rate based on the duration of liabilities can significantly understate the value of long-dated liabilities.

7. NUMERICAL EXAMPLES

This section values a generic pensioner obligation of a defined benefit pension fund excluding future retirees. The absolute values of the results are not the focus point of this section, but rather the differences between the two valuation results as described below. We also want to use this section to make the aspects discussed in this paper more tangible and practical. We start by giving some information around the pensioner obligation that was modelled. We then look at how a discount curve can be constructed, specifically a Government bond and interest rate swap curve. We finally use these curves to discount the projected nominal cashflows underlying the liability in question.

7.1 General Information and Data Summary

The statistics underlying the pensioner membership that was used in the numerical example is given below.

In addition to the information provided below, the pensioner liability in question has an expected duration of approximately 10 years.

Table 2 Summary of membership statistics

Membership statistic	Males	Females	Total Fund
Number of pensioners	158	210	368
Annual pension	R28 million	R14 million	R42 million
Average age	74 years	74 years 10 months	74 years 6 months

7.2 Constructing the Nominal Discount Curves

Two discount curves were constructed where one was based on the nominal Government bond market and the other on the nominal interest rate swap market as at 30 June 2013.

The nominal Government bond curve was constructed by observing closing day prices (implied yields to maturity) for each traded nominal Government bond in the market. The implied monthly forward rates between the different maturity dates were then calculated using the bootstrapping technique. For the period after the longest dated maturity, the curve was extrapolated to a long-term expectation. This curve is representative of a discount curve that would be used under IAS19.

The same methodology was followed for the interest rate swap curve. As short-term interest rate swaps are not widely available, the quoted interest rates under forward rate agreements up to two years were used. Thereafter, quoted nominal swap interest rates were used together with the underlying duration. The monthly forward swap rates were then calculated using the bootstrap technique. As with the Government bond curve, the swap curve was then extrapolated to a long-term expectation for the period after the longest dated swap.

We view this curve as representative of a risk-free curve that would be used in calculating the solvency liability under Board Notice 37 of the Pension Funds Act based on current market conditions. To allow for the long-term nature of the underlying pensioner liability, a funding spread of 1.25% p.a. was then added to each point on the nominal interest rate swap curve as a proxy for the illiquidity premium discussed earlier. This funding spread was taken as the highest quoted spread in the market by three prominent banks and takes into account the duration of the pensioner liability in question, namely 10 years. This way of setting the final discount curve mirrors the approach that would be followed by an insurer to place an insurance liability value on the pensioner obligation, ignoring additional profit, expense and capital requirement loadings.

The two nominal discount curves are illustrated in Figure 2.

7.3 Nominal Projected Cashflows

Figure 3 illustrates the profile of the nominal projected cashflows for the pensioners. It represents the expected pension payments taking into account assumed future mortality experience and future pension increases equal to 100% of inflation granted on 1 January each year. Two inflation assumptions were used: the black curve in Figure 2

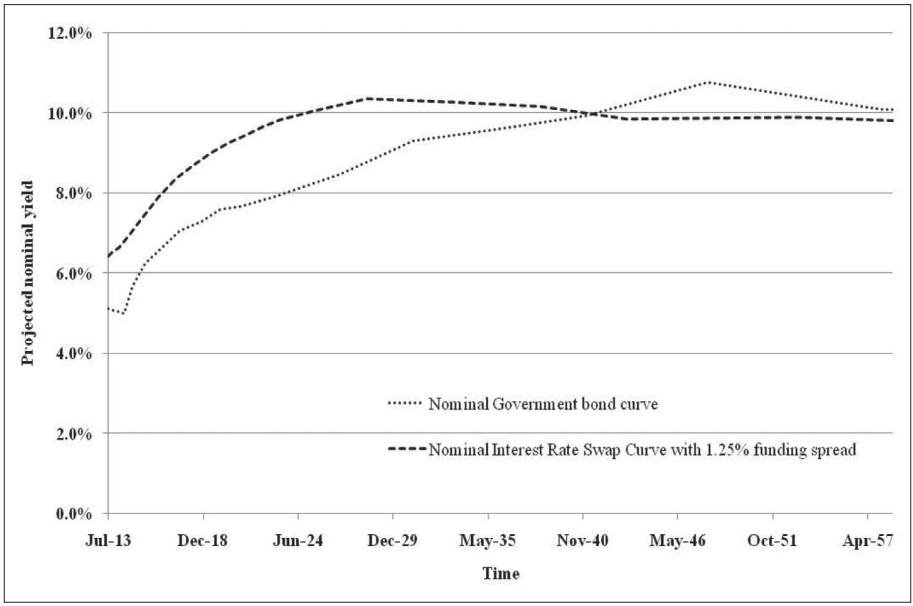

FIGURE 2 Comparison of nominal discount curves

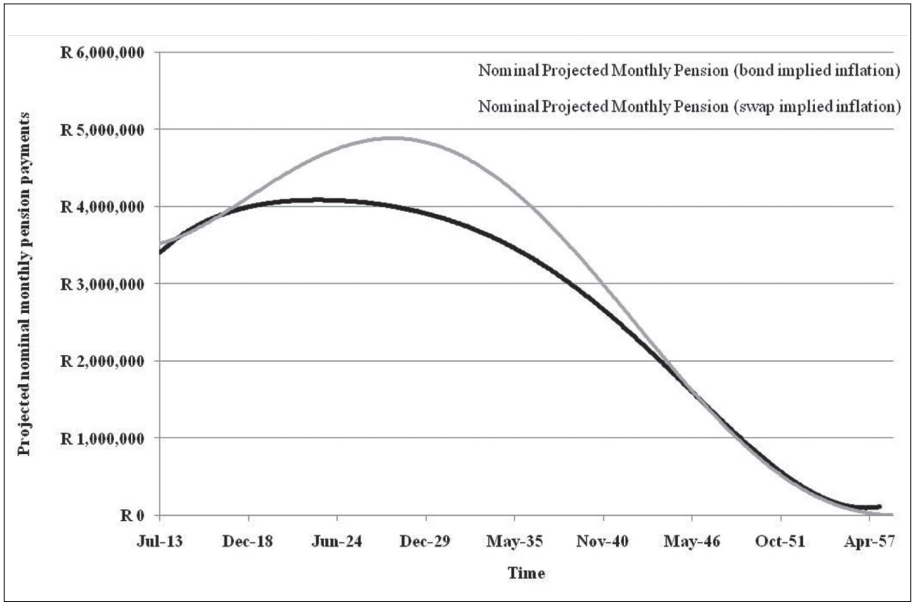

FIGURE 3 Comparison of nominal projected cashflows

assumed inflation increases implied by the Government bond market and the grey curve in Figure 2 assumed inflation increases implied by the interest rate swap market (without any allowance for a funding spread). The starting date of the projection period is 1 July 2013. Comparing the two curves in Figure 2, we see that the inflation expectation implied by the interest rate swap markets is higher than the inflation expectation in the Government bond markets.

7.4 The Importance of the Real Discount Curves

As mentioned under Section 7.3, annual pension increases were assumed to be 100% of inflation as implied by the Government bond market and interest rate swap market respectively. Practically, this was calculated as the difference between the nominal and real yield curves in the two respective markets. The real discount curves were calculated in the same manner as discussed in Section 7.2, but using observed quoted market data for traded instruments in the inflation-linked Government bond market and inflation-linked interest rate swap market. For example, the inflation assumption under the interest rate swap funding strategy was calculated as the difference between the nominal interest rate swap curve and the inflation-linked interest rate swap curve.

The ultimate liability value (i.e. funding strategy) for an inflation linked liability is determined by the real discount rate, i.e. the difference between the nominal discount curve discussed in Section 6.3 and the inflation curve assumption. The respective real discount curves (i.e. inflation linked yield curves) used in Section 6 are illustrated below (Figure 4).

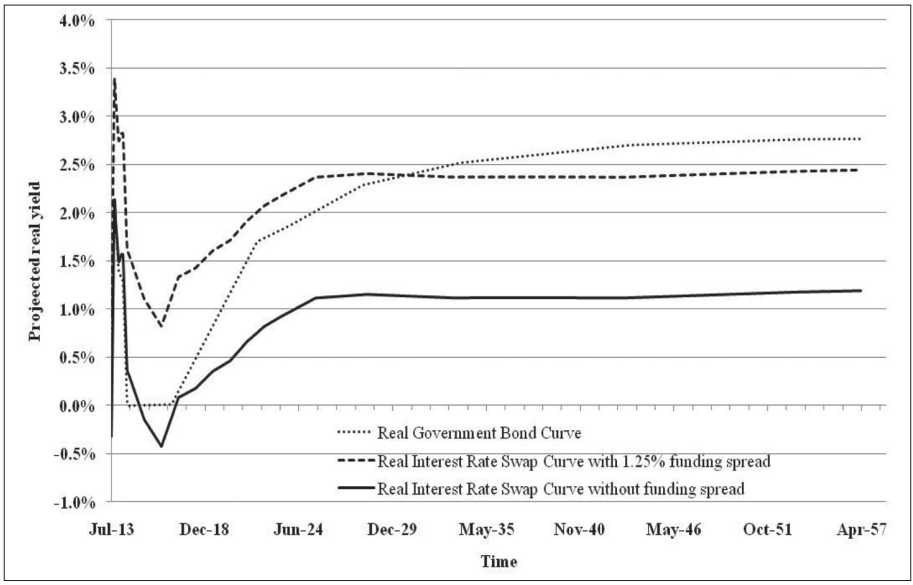

FIGURE 4 Comparison of real discount curves

As can be seen from the graph, the long-term real Government bond curve and interest rate swap curve are very close to each other after an appropriate funding spread is added to the base real interest rate swap curve. As discussed in Section 6.1.2, this addition of the funding spread makes the "funded" Government bond yield curve more comparable with the "unfunded" interest rate swap curve. The gap between the two curves is the largest over the short to medium term. This leads to the expectation that the liability value under the IAS19 funding strategy to be marginally higher than under the funding strategy as per the Pension Funds Act. This is discussed in more detail under the next section.

7.5 Calculating the Liability Values

The two funding strategies (applied to the same pensioner obligation) are summarised below.

Table 3 Comparison of funding strategies

Funding strategy	Government bond	Interest rate swap
Relevant legislation or accounting disclosure reference	IAS 19	Board notice 37 of the Pension Funds Act
Inflation assumption	Expected difference between nominal and inflation-linked Government bonds	Expected difference between nominal and inflation-linked interest rate swaps
Discount rate assumption	Expected nominal Government bond yield curve	Expected nominal interest rate swap curve plus a funding spread of 1.25% p.a. as an illiquidity premium allowance for the given liability duration
Implied real discount rate assumption	Inflation-linked Government bond yield curve	Inflation-linked interest rate swap curve plus a funding spread of 1.25% p.a. as an illiquidity premium allowance for the given liability duration
Present value of pensioner obligation as at 1 July 2013	R513 million	R503 million
Increase in liability with a 1% p.a. reduction in the discount rate assumption	9.6%	9.5%
Decrease in the liability with a 1% p.a. increase in the discount rate assumption	–8.0%	–8.2%

Some comments are made below on the summary provided above.

a) **Valuation assumption consistency** It is worth noting the consistency between the inflation assumption and discount rate under both scenarios. For example, using

inflation expectations implied by the Government bond market together with a nominal Government bond curve as the discount rate. This promotes a market consistent view and avoids any liability value distortions and volatilities from having disjointed economic assumptions.

b) **Best estimate assumption** As mentioned above, the interest rate swap approach is representative of the solvency liability as per the guidance under the Pension Funds Act. What was not valued under this example is a best estimate liability, which may have been constructed by using the risk-free nominal Government bond curve together with appropriate risk premium adjustments, i.e. a bottom-up approach which might have been somewhere in between these two discount curves.

c) **Comparing an IAS19 liability with a solvency liability** One important application example which involves comparing these two funding strategies refers to when a defined benefit pension fund is looking to outsource its pensioner obligation. The ultimate liability (reserve) held in the fund for the pensioner membership is represented by the solvency liability. As per Board Notice 37, a solvency liability can be calculated on an outsourcing basis, i.e. the estimated cost of transferring the pensioner obligation to an insurer.

   Should the solvency liability be lower than the actual cost of outsourcing, the employer might be approached to make good the shortfall. In order to assess its willingness to make good the required shortfall, an employer might refer to its financial accounts and reporting to compare the expected cost it is reflecting for this pensioner obligation. This is calculated as per IAS 19.

   By way of an example, the above scenario indicates that the pension fund in question is funding for R503 million in total for its pensioner obligation. Upon asking for an outsourcing annuity quote from an insurer, the associated costs might be R520 million, assuming a total loading of 3.4% for expenses and expected return on capital loadings and assuming that the valuation basis is exactly aligned with that of the fund's solvency liability.

   Comparing this R520 million cost against the R513 million discussed above, we find that the employer is short of R7 million to fund additional cost requirements. Other sources of funding can be explored, e.g. surplus accounts within the fund. Alternatively, the employer and trustees might feel that now is not the opportune time to undertake an outsourcing exercise.

d) It is worth noting that in this particular numerical example, the two liability values are very close to each other. It is not to say that this will always be the case. The results of the two funding strategies will differ when:
   — The cashflow profile of the underlying liability changes, e.g. when younger pensioners join the pensioner membership the duration and hence the term structure of the pensioner liability will change. This will affect the liability's exposure to the discount curve (Figure 5).
   — The term structures of the discount curves change. Both discount curves will be impacted as economic conditions and outlook expectations change. This

change in economic condition will alter the shape of the discount curves. This will impact the funding strategies as well.

e) **Term structure of the discount curves vs. the term structure of the cashflows** Figure 5 compares the term structure of the two nominal cashflow sets with that of the respective discount curves under the pensioner liability example. As can be seen from the below comparison, the higher cashflows under the Government bond funding strategy is valued off the lower portion of the bond curve.

In contrast to this, the higher cashflows under the interest rate swap strategy is valued off the swap curve during the period when the swap curve is consistently higher than the bond curve. This is a contributing factor as to why the two liability values are so close to each other, despite the fact that the nominal cashflows differ quite a bit.

f) **Investment strategies** As mentioned earlier, there is a great need for consistency between a defined benefit obligation's funding and investment strategies. The analysis above indicates that the two funding strategies in question place different liability values on the same defined benefit obligation. This implies that different investment strategies are required to back the associated funding strategy if it is the intention to put in place perfect or partially matching assets. A mismatch between assets and liabilities will occur if the two strategies are not aligned.

However, some funds may choose to purposefully target an unmatched funding position, e.g. when trying to generate excess investment returns to increase the asset surplus level of a defined benefit obligation. In such an example, an approach might be to invest in more risky assets than being used to value the liability. This will lead to a higher real discount rate and consequently a lower liability value. This decrease in the liability value will then increase the associated mismatch risk underlying the chosen investment strategy.

g) **Liability Driven Investment solutions** As mentioned earlier, an LDI solution aims to hedge a defined benefit obligation against interest rate movements, thus reducing the overall interest rate volatility. In this example, a 1% decrease (increase) in interest rates is expected to increase (decrease) the liability values with approximately 9.5% (8.0%). If an LDI solution was put in place, such a 1% decrease (increase) in interest rates would have been hedged by a corresponding increase (decrease) of approximately 9.5% (8.0%) in the underlying assets of the LDI solution.

Furthermore, the abovementioned hedge would have required a third of the underlying assets to hedge the full liability against interest rate movements if interest swaps were to underlie the LDI solution and if the LDI solution had a gearing ratio of 3. This hedge would have been more accurate under the interest rate swap funding strategy compared to the Government bond strategy seeing that the discount rate assumption would have been more accurately aligned with the financial instruments underlying the LDI, i.e. interest rate swaps.

8. THE WIDER DISCUSSION

This section continues the conversation around what constitutes an appropriate discount rate by considering current international practices for setting the discount rate assumption when valuing defined benefit obligations. Further consideration is also given to the discount rate discussions taking place under Solvency Assessment and Management (SAM) and Solvency II. We have included these sections as we believe they add additional tangible and practical elements to the topics discussed in this paper. The two sections that follow are summaries of the relevant discussions and must not be seen as a comprehensive representation of the actual discussions taking place. Specific focus has been placed on the discount rate assumption under each of the wider considerations.

8.1 Proposed Solvency Regimes: Solvency Assessment and Management and Solvency II

Solvency Assessment and Management (SAM) is the new solvency regime being developed for insurance companies in South Africa. In the initial QIS technical specifications (FSB, SA QIS3) the swap rate was used as the risk-free curve. The following concerns regarding the use of the swap rate were raised:

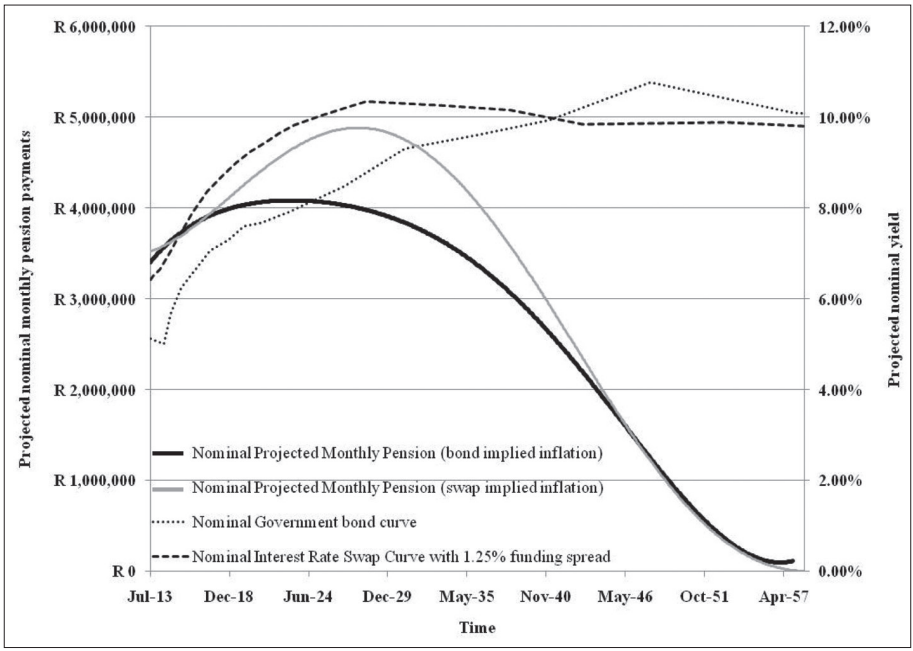

FIGURE 5 Comparison of term structures

— Whether the rate can actually be earned in the market
— Whether the rate is actually free from credit risk
— Liquidity relative to the bond market
— Possible impact the move to swap rates may have on insurers' matching strategies and the impact this may have on the Government bond market (both from potential selling on transition and future demand point of view).

It was also noted that due to Basel 3 changes, banks were less inclined to issue long term swaps, so the higher liquidity argument in favour of using swaps is weakened. In order to mitigate all of these concerns, the approach followed in the latest Quantitative Impact Study (QIS3) is that the Government bond curve be used as the risk free rate, with no allowance for the illiquidity premium or matching adjustment. In addition, no default risk associated with Government bonds is allowed for. There is however an allowance to use the swap curve to value embedded derivatives due to practical difficulties of using the Government bond curve for valuing this component of the technical provisions.

In contrast, Solvency II (KPMG, 2012), Europe's equivalent of the SAM framework, proposes a swap rate based on a six month deposit period as the risk-free rate. In the early stages of Solvency II it was assumed that Government bond yields gave the best indication of risk-free rates (QIS3 and QIS4 in 2007 and 2008 respectively). A contentious issue became which curve to use in the absence of a consistent Government bond market that can be applied throughout Europe. It was then determined that a better view of risk free would come from the rate at which banks lend to each other – i.e. the interbank swap rate.

This rate meets the requirements for a risk-free rate under the Solvency II regime in that there is an active, deep, liquid and transparent market for them. However, given the deposit period there is credit risk and this needs to be allowed for. Currently, the Solvency II regulations determined that reduction of 10 basis points would be sufficient to allow for this credit risk – at all durations due to lack of appropriate term dependent data. This analysis compared unsecured inter-bank lending with secured repurchase agreement (repos) rates – a method commonly used to measure the impact of credit risk in swap rates.

For certain insurance obligations (typically annuities) an adjustment above the basic risk-free rate is allowed should certain conditions regarding the assets held be met. The matching adjustment is determined as follows:

Higher of (Gross Redemption Yield of Assets – Single Risk Free Rate weighted by Liability Cashflows – Fundamental Spread;
75% Long Term Average Spread)

where:
— Fundamental Spread = Allowance for Downgrade + Allowance for Default

The formula for determining the matching adjustment makes intuitive sense in that as spreads widen a greater proportion of this widening is attributed to liquidity. There is still ongoing debate around both proposals for SAM and Solvency II and these are still some way from finalisation.

8.2 International Environment

In this section we provide a high-level overview of the funding strategy standards applied in other countries, with specific focus on the discount rates used for defined benefit pension funds. Further investigation into international practice should be done on how post-retirement medical aid obligations are valued.

8.2.1 United States

Andonov, Bauer and Cremers (2012) stated the following: "Whether a pension fund is public or corporate has a very strong effect on the liability discount rate in the United States (U.S.). U.S. public funds are typically using discount rates that are 64 basis points higher than U.S. corporate funds. U.S. public funds that allocate a greater percentage of their assets to risky investments tend to use higher liability discount rates." In the US, the Government Accounting Standards Board (GASB) determines the standards of accounting and financial reporting for state and local Governments. GASB 25 states that the discount rate "should be based on an estimated long-term investment yield for the plan, with consideration given to the nature and mix of current and expected plan investments…" This suggests a strong link between discount rates and the assets backing the obligation.

8.2.2 United Kingdom (UK)

Great emphasis is placed on the sponsor covenant in the UK (Vittas, 2010). Pension liabilities can be valued at discount rates that are linked to expected returns of pension plan assets. However, the UK Pensions Regulator requires financially weak companies to use least-risk discount rates for their valuations. This differs from the approach that is applied by sponsors who apply a higher discount rate when they face financial difficulty and a low rate when they are financially strong. The Regulator furthermore requires a sponsoring employer to first make good any financial shortfall in a defined benefit fund before the liabilities are transferred to an insurer.

Vittas (2010) performed a study into the four distinct valuation types that exist in the UK as published by The 2009 Purple Book. A short summary is given below to illustrate the impact of using a different discount rate (relevant to the valuation context and objective) to value the same defined benefit obligation.

Table 4 clearly illustrates that the choice of a discount rate, as well as the purpose of a valuation, can lead to differing financial results.

Table 4 Comparison of UK valuations

Valuation type	Definition of the discount rate used	Funding ratio 2008	Funding ratio 2009
Statutory valuation	Must use Government bond rates; considers the obligation guaranteed by the PPF(1)	101.5%	79.5%
Accounting valuation	Must use corporate bond rates	100.9%	93.5%
Full buy-out valuation	Must use Government bond rates; considers the full scheme benefits	62.9%	57.7%
Technical provision valuation	Discount rate determined by individual scheme (assumed to be expected return on assets); considers full scheme benefits	89.7%	70.3%
(1) Pension Protection Fund: this is a statutory fund that compensates members of an unfunded defined benefit pension fund when the sponsor becomes insolvent.			

8.2.3 Specific European Countries

In the Netherlands, it is required that pension funds use the interbank swap yield curve to discount their liabilities. Van Nunen (2011) stated that this forces the funds to de-risk as it does not accurately reflect the amount of risk pension funds take to ensure higher returns. He went on to say that 40% of the decline in funding levels from mid-2008 to the end of the financial crisis was due to lower inter-bank swap rates used to discount liabilities.

This requirement to use swap discount rates forces pension funds to sell their equity holdings and buy bonds and swaps. This means that equity prices went down lower during the crisis and by buying bonds and swaps, interest rates also went down further. This created a hostile environment for other funds wanting to do the same.

Vittas (2010) reported that the Danish authorities started revamping the solvency monitoring and regulation of life insurance companies and pension funds in the mid-1990s. The various new methods and approaches included the adoption of fair value accounting for assets and liabilities. This has proven specifically difficult for the valuation of liabilities, because no active market exists for pension liabilities. It was decided that the chosen discount rate should not be based on the assets backing an individual defined benefit pension fund, but should rather reflect conditions in the financial markets for the term and currency of each type of liability.

This implies one discount yield curve for all pension funds in the market. It was further stipulated that the yield curve would be based on interest rates in the euro swap market with an allowance for a spread to reflect the difference between Danish and euro swap rates. This approach became compulsory in 2009.

8.2.4 The European Union

Vittas (2010) mentioned that increasing emphasis is being placed on using market values that emerge from the trading of pension and insurance liabilities to value the

defined benefit obligations, in other words, the payments that insurers are willing to make for transferring their liabilities to another insurer. This approach has the risk that assets and liabilities are affected in different values during financial turmoil and economic uncertainty. It is acknowledged that more work needs to be done for setting the regulatory framework for pension plans. Proposals are being made to apply the same solvency approach to pension funds as is the case for insurance companies. This has the risk of having adverse effects on sponsoring employers as the cost underlying the obligation is likely to increase.

9. SUMMARY

Defined benefit obligations are exposed to various uncertainties pertaining to the structure and features of the obligations themselves, as well as the sponsor covenant. These uncertainties make it difficult for the company and the appointed valuator to determine the expected costs (i.e. funding strategy) that need to be provided for (i.e. investment strategy). Therefore, certain assumptions are required in setting the funding strategy to reflect this degree of uncertainty.

A high degree of basis risk will exist if the investment strategy is not consistent with the funding strategy of the obligation. In order to mitigate this basis risk, various investment strategies exist that differ with regard to the degree of liability matching that is allowed for, i.e. the higher the degree of liability matching allowed, the higher the associated costs.

One of the most important assumptions to consider in determining a fund strategy is the discount rate, which is the crux of this paper. In setting the discount rate, consideration should be given to the purpose and context of the valuation, the current legislation, the characteristics of the assets and liabilities, as well as the future life expectancy of the defined benefit obligation. Within these considerations, the appropriateness of the chosen discount rate can be determined by how observable it is in the market, its objectivity, underlying credit risk, liquidity risk under current and stressed market conditions and the required levels of extrapolation and interpolation required in constructing the full discount curve. The process for setting the discount rate can either follow the top-down or bottom-up approach. Additionally, a discount curve or point estimate can be used.

Against this framework, this paper assessed the suitability of Government bond yields and interest rate swaps. The numerical example illustrates that, for the given pensioner liability, the valuation results were very similar. However, it must be noted that this might not always be the case as the shape of the discount curve can change, as well as the expected cashflow profile underlying the defined benefit obligation.

We concluded our discussions by giving a summary of current international practices for determining the discount rate. Consideration was also given to the current discussions around the proposed Solvency Regimes (SAM and Solvency II).

As mentioned throughout this paper, our intention is not to motivate the use of any one particular funding strategy. We wanted to highlight the bigger and complex

considerations an actuary should take into account in determining an appropriate discount rate for a company's defined benefit obligation funding strategy. The proposed framework will enable the actuary to assist the company to better manage the associated financial risks, thus enabling the company's financial freedom.

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APPENDIX

1. EMPLOYEE SERVICE PERIOD

It is impossible to know how long an employee will stay with an employer. This impacts both the value of the employee's defined benefit obligation, as well as the timing of the benefit payment. This in turn influences the liquidity requirement of the assets backing the defined benefit obligation. If an employee's defined benefit is dependent on the number of years of service, the benefit entitlement will increase as more years of service are accrued. It might be pragmatic to make some form of withdrawal rate assumption to allow for the fact that employees can resign before retirement and hence the expected cost of the benefit provision at retirement will be less for the employer. However, should fewer employees resign than expected, the associated defined benefit obligation will be higher.

2. SALARY INCREASES

Future salary increases cannot be planned for with certainty. Therefore, salary increases will impact the expected costs of a defined benefit obligation to the extent that the future salary of an employee determines his/her defined benefit value. In some instances, salary increases are linked to other economic indicators, e.g. inflation. Such correlations must be taken into consideration when setting the salary increase assumptions. Higher salary increases will imply a higher final fund salary and hence a higher starting pension for an employee. This leads to a higher expected cost for the employer as it needs to put more assets aside to meet the defined benefit obligation. Also, if an employee's salary determines his/her starting post-retirement medical aid subsidy, the same result will follow for the expected cost of the employer.

3. DURATION OF BENEFIT PAYMENTS

It is impossible to know how long an employee will live after his/her retirement date. The longer the employee's future life expectancy, the more benefit payments he/she will receive and the higher the associated defined benefit obligation for the employer.

4. BENEFIT OPTIONALITY

The more benefit options an employee has to choose from, the greater the level of uncertainty as it is unknown what options or combination of options the employee will choose at retirement. For example, a single or divorced employee can get married just before his/her retirement date and hence choose a joint life pension or medical aid subsidy into retirement. This will increase the employer's defined benefit obligation as the employee's liability was probably calculated on a single life assumption or some proportion married factor.

5. BENEFIT INCREASES

Once in payment, most benefits are expected to increase into the future. The type of increases to be granted is usually known upfront, but the actual level of increases might only be known at a future date. For example, it is known upfront that a defined benefit pension fund endeavours to pay inflation linked increases on an annual basis. The actual inflation percentage will however only be known at a future date. The same holds true for a post-retirement medical aid subsidy linked to medical aid inflation.

6. CHANGES IN LEGISLATION AND ACCOUNTING GUIDELINES

Although changes in the benefit formula are unlikely from an equitability and employee expectation point of view, revised legislation might require certain changes to be made. Legislation might also dictate certain minimum benefits payable to employees, e.g. the Second Amendment to the Pension Funds Act that introduced the concept of Minimum Benefits payable to an employee on withdrawal from a defined benefit pension fund. Also, once finality has been reached around the planned National Health Reform, employer's post-retirement medical aid subsidies might be required to change.

Legislation can therefore dictate the actual value of a defined benefit, as hence the expected cost (funding requirements) thereof. Legislation and accounting guidelines can also dictate how the expected cost must be accounted for. For example, the current IAS19 only requires accrued service to be considered when calculating a defined benefit obligation. If this should be expanded to allow for future service, the associated expected cost provision will increase dramatically.

7. DISCOUNT RATE ASSUMPTION

The uncertainty factors mentioned above influence the starting and future values of the benefit amounts to be paid to employees. To calculate the (present) value of an employer's defined benefit obligation, a further assumption is required around the discount rate to be used. In other words, what best estimate assumption to make around the investment return of the assets that will back the defined benefit obligation. A discount rate assumption is required for the period leading to the start of a benefit payment, as well as for the period during which the benefits are paid. The higher the assumed discount rate, the lower the present value of the defined benefit obligation and vice versa.

Financial disclosure requirements like IAS19 are quite strict regarding the discount rate to be used to calculate the defined benefit obligation. Other pieces of legislation like the Pension Funds Act are more subjective and allow the appointed actuary or valuator to apply his/her professional judgement. This leads us to the logical question: given that more than one "appropriate" discount rate exists, what the expected cost that an employer should be concerned about?