DAUDS ADVISORY

Pensions

Pensions in Brief

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Introduction

1. Occupational pension schemes are usually provided by employers and are commonly funded. Employers fund their pension liabilities in advance, i.e. they pre-fund these liabilities, by building up a pool of cash to meet future pension payments. The pool of cash may be made up of contributions from the employer only or contributions from both the employer and the employees who are members and beneficiaries of the pension scheme. The funds are typically held in a separate trust which is not under the employer's control, thereby ring-fencing the cash. This pre-funding of pension liabilities holds several advantages:
    - it ensures benefit security for members;
    - it allows the sponsoring employer to manage its cash flow better rather than facing a huge pensions bill when members retire; and
    - the sponsoring employer and members enjoy beneficial tax treatment.

2. The two main systems of occupational pension provision worldwide are defined benefit (DB) and defined contribution (DC) schemes. Under a DB scheme, the member's pension benefit depends on factors such as:

- final salary (for this reason, DB schemes are often referred to as final-salary schemes);
- length of pensionable service; and
- age of the member.

3. Under a DC scheme, the pension of a member depends entirely on the extent to which the assets of fund had grown at retirement, and nothing else.

4. A defined benefit scheme is so called because the pension benefit of the member is defined, i.e. it is set as an amount equal to a certain percentage of final salary for each year of pensionable service. The benefit formula would therefore be: (percent) x (final salary) x (years of service). The "percent" is usually defined by the scheme. In accordance with this formula, the maximum pension a DB scheme member may end up with is two-thirds of final salary. A member is promised this pension regardless of whether there is sufficient money in the fund to pay the pension. This bold promise – the promised pension – to every DB scheme member makes up the liabilities of the scheme. If the scheme has enough cash to pay the expected future pensions, i.e. if the fund assets match the fund liabilities, the scheme is said to be fully funded or 100% funded. If there are insufficient assets to cover the future pensions, the scheme is said to be in deficit. The scheme would have a surplus if the assets in the fund are more than enough to pay the expected future pensions. The fund may give discretionary benefit increases to retired members so that pension payments keep pace with increased inflation or the fund may choose to price-index the member's pension, i.e. link it to the consumer or retail price index to the protect the member against the impact of inflation. The UK has a statutory indexation regime, although it only prescribes limited indexation.

5. The promise under DB schemes to pay pensions whether or not the fund has sufficient funds to do so represents a guarantee that the member will receive his/her pension at retirement. Of course, a guarantee of this nature is often easier made than delivered. Delivery of the guarantee will ultimately depend on the adequacy of contribution levels and the fund's return on investments. It is the actuary's job to help the fund deliver on this guarantee by setting the contribution rate at an appropriate level.

6. A defined contribution scheme is so called because the contribution rate into the fund is

defined. This rate may be set at 8, 10 or 12 percent (or any other figure) of earnings. The member's pension benefit under a DC scheme depends entirely on the extent to which the contributions into the fund had grown at retirement. At retirement the member may, if he so chooses, take up to one-third of his DC fund as a tax-free lump sum (the maximum tax-free lump sum in the UK is 25%). The remaining two-thirds must be used to purchase a life annuity from a life insurance company from which the member will be paid a pension for the remainder of his life. Because DC members are obliged to annuitize most of their fund benefits at retirement, these schemes are often referred to as money-purchase schemes. While the purchase of an annuity at retirement is mandatory in South Africa and the UK, it is voluntary in the US.

7. Both DB and DC plans have their advantages as well as disadvantages as systems of pension provision. In this day and age, people rarely remain with one employer their entire working life. The DC plan preserves portability and allows an individual to change jobs without affecting his pension fund. The DC plan also confers a greater measure of control over investment policy on the scheme members and avoids unfair subsidy. By contrast, the DB plan is, for various reasons, a better system of wealth accumulation for scheme members in that it, among others, offers generous employer contribution rates and guarantees a maximum pension of two-thirds of final salary. Equities are known to outperform bonds in the long-term – by at least 3%. While most of the funds of DC plans tend to be invested in bonds since investment return risk is borne by scheme members, a larger proportion of DB scheme funds is usually invested in equities, allowing the investment to earn an equity risk premium which is crucial to:
    - the sustainability of the contribution levels of the fund, i.e. to avoid upward adjustment of future contribution rates;
    - the solvency of the DB scheme so that benefits are paid as promised.

8. A DB scheme is able to pursue a less conservative investment strategy by increasing its weighting in equities because the investment return risk is borne by the sponsoring employer who has a more aggressive investment outlook.

9. When a sponsoring employer closes a DB scheme to new members because of cost considerations and sets up a DC scheme, the employer contribution into the DC fund is usually so much lower than its contribution into a DB fund. In fact, the sponsoring employer's contribution rate often is substantially below the level required to provide a

pension approaching the two-thirds of final salary that DB scheme members are guaranteed. Since DC scheme members are subsidized in the way DB scheme members are, the DC fund is, in the circumstances, required to earn a relatively high return to make up for the loss of the subsidy. Only risky equity investments can expect to provide a high return. By contrast, a DC fund's weighting in bonds is higher than its weighting in equities, reflecting the fund's conservative investment strategy since investment return risk is borne by the members rather than the sponsoring employer as is the case with a DB scheme.

Pension scheme funding

10. Actuaries have a definite role in pension scheme funding. Their task is to value the liabilities of the scheme and to calculate and recommend an appropriate contribution rate. The role of the pensions actuary extends to advising trustees on benefit security. The board of trustees relies heavily on the actuary adviser for advice on the funding of the pension scheme. Benefit security depends on the adequacy of funds assets to meet fund liabilities. The actuary adviser's brief usually also includes advising the trustees on an appropriate investment strategy while bearing three factors in mind:
    - the recommended contribution rate;
    - benefit security; and
    - the attitude to risk of especially the sponsoring employer in the case of a DB scheme and the attitude to risk of the scheme members if it is a DC plan.

11. The calculation of an appropriate contribution rate depends on the actuarial valuation of the liabilities of the pension fund. The recommended contribution rate is an important decision for the following reasons:
    - setting the rate too low today runs the risks of having to increase it in the future to improve the solvency of the scheme;
    - setting a higher contribution rate today means the rate might have to be reduced in future.

12. However, with a higher contribution rate the fund is less likely to face insolvency in the future and the chances of future benefit improvements are also greater under DB schemes.

13. It is usually unrealistic to expect that a contribution rate, once set, should be maintained

indefinitely. The uncertainties in the life of a pension scheme do not allow for such an expectation. An alert actuary adviser will recommend a contribution rate today, but include a method to change the future contribution rate should it later become necessary. The contribution rate change will be driven by a change in the assumptions on which the actuary based the calculation of the recommended contribution rate. The method to change the future contribution rate is incorporated by recommending a normal contribution rate which is subject to adjustment. The normal contribution rate is the rate which would apply if the scheme had no deficit or surplus, i.e. if it were fully funded. The adjustment would be the addition to the normal contribution rate to reduce the deficit which the fund had generated. It is the trustees' responsibility to ensure that a deficit is redressed within a definite time-frame. The adjustment might also be the subtraction to reduce the surplus the fund had acquired. A funding surplus may entitle a sponsoring employer to a contribution holiday, i.e. suspension of contribution payments for a certain period of time. A surplus may also entitle the sponsoring employer to a reduction in contribution rates. The adjustment – upward or downward - may be made over some fixed time horizon. The board of trustees, with the assistance of the actuary adviser, may choose a 5-year, 7-year or any other period. What the normal contribution rate plus the adjustment does is divide the total contribution rate into a fixed part and a variable part. If things stay on course, which is unlikely, the normal contribution rate will apply. If things change, which is more realistic, the total rate will be varied. Deficits and surpluses are really features of DB plans.

14. The contributions required to meet the future liabilities of the pension fund, i.e. the cost of the promised benefits, depend on two factors:
    - the amount and regularity of the future benefit payments; and
    - the future investment returns on the assets of the fund.

15. Both these variables are uncertain because:
    - DB plans are final salary schemes and there is no telling what a member's final salary will be at retirement – even if an estimation were attempted by linking an annual increase in the member's salary to an increase in inflation. Future inflation remains an uncertain variable.
    - even when mortality tables are used to estimate a member's life expectancy after retirement, it is never certain precisely how long a member will live after retirement – mortality, or longevity, risk remains ever-present.

- a pension fund's investments are subject to market fluctuations and returns are therefore exposed to the same risk, making them uncertain.

16. The precise funding, i.e. the exact amount of money required in the fund, depends on the liabilities of the fund. These liabilities are the pension benefits expected to be paid in the future. It is only once these liabilities are known, through a valuation process, that the scheme's funding level can be set. It is common practice in the actuarial profession to value pension fund liabilities by using a discount rate that is in excess of the risk-free government bond rate. Pension accounting rules may require the use of a high discount rate to value fund liabilities for financial statement reporting purposes.

17. The second aspect, apart from the discount rate, necessary for the actuarial valuation of scheme liabilities is the mortality, or longevity, of the group of scheme members. Based on mortality tables, the advising actuary may assume that, on average, scheme members will live for 15 years after retiring at 65. This means that the fund will have pension liabilities lasting 15 years. Based on all this information, the actuary will set the appropriate contribution level. Both the discount rate and the life expectancy of the members after retirement are influenced by actuarial assumptions, i.e. the actuary makes an assumption about the expected return on the pension scheme's assets which is then used as the discount rate. The actuary also makes an assumption, based on mortality tables, on the life expectancy of the fund members after retirement.

18. Actuarial liability is the funds that would be required, i.e. the amount of money that has to be set aside, to meet pension benefit payments under a specified contribution rate determined under the scheme's funding method.

Actuarial Valuations

19. Actuarial valuation of pension fund liabilities is necessary for:
    - funding purposes, in particular, to set the contribution rate and to determine the extent to which the liabilities are covered by the assets of the fund; and
    - accounting purposes, since sponsoring employers are required to disclose pension costs on their financial statements, even though fund assets and liabilities are off-balance sheet.

20. A typical actuarial valuation report for a DB scheme will include the following:

- recommendation of a contribution rate;
- the valuation method, which is commonly the projected unit method. This method values the liabilities of the fund, i.e. the pensions earned, as at the date of the valuation, but incorporates projected (estimated) future salary increases in the valuation;
- the assumptions on which the actuary bases his valuation. The actuary adviser may, for instance, assume that the equities the scheme has invested in will, in the long-run, earn a return of say, 6% or so above inflation. This assumption will be based on historic returns on the various asset classes in the pension fund. The size of the assumed return is designed to ensure that the fund assets are enough to cover fund liabilities. It is for this reason that actuaries are accused of taking advance credit for equity out-performance without incorporating the risks that equities may be exposed to over the duration of the investment. Risk and return are inextricably linked. However, while pensions actuaries are quite keen to take credit for an investment return which has not actually been earned yet, they appear to conveniently ignore investment risk. In fact, they treat equity investment as riskless even though they expect a high return from it, the type of return that is usually expected from risky investments;
- a comment about the suitability of the scheme's investment strategy, i.e. the allocation of the scheme's funds into various asset classes such as equities, bonds, real estate, money market instruments.

21. In his valuation of pension fund liabilities, the actuary adviser may make the following assumptions:
    - members' contributions: 6% of pensionable pay;
    - employer's contributions: 14% of pensionable pay;
    - earning's growth: 3.4%;
    - deferred pension increases before retirement: 3.5% per annum;
    - pension increases in retirement: 3.5%;
    - discount rate for liabilities: 10%;
    - mortality rate: in line with the published mortality tables for men and for women;
    - scheme size: no change over time in the total number of active members of the scheme.

22. The most controversial of the above assumptions are usually the discount rate used in the

valuation of fund liabilities and the mortality, or longevity, rate.

23. The trouble with standard valuation reports is the fact that they are not required to disclose the cost of the pension benefits. These costs are a key item of information for the sponsoring employer. Secondly, valuation reports are not required to disclose to what degree members' benefits would have been secure if the scheme were wound up at the date of valuation. This information is particularly important for trustees and members. Thirdly, valuation reports are not required to disclose how the scheme's funding position will change in future if the actuary's recommended contribution rate turns out to be too low or the actuary's assumption of the rate of return on the scheme's investments missed the mark. Both these scenarios will cause the scheme to generate a deficit which will have to be redressed by way of increased contributions, a one-off payment or incremental payments, over and above the usual contributions by the sponsoring employer who bears the risk under a DB plan. Under a DC scheme the members bear the deficit risk. Fourthly, valuation reports are not required to provide comments on how other financial risks may affect the fund. The omission of these important items of information has elicited accusations that actuarial valuation reports are not transparent.

24. Actuarial valuation of scheme liabilities centres on the use of a discount rate to compute the present value of the liabilities, i.e. the costs of the pension benefits to be provided. The choice of the discount rate is apparent from the more than one valuation method in use in the actuarial profession, some more commonly used than others. These methods range from the traditional method, the market-value adjustment approach, the asset-based discount rate method, the economic valuation approach to the bond yields plus risk premium approach.

The traditional actuarial funding approach

25. Under this approach, allowances are made for the expected long-term equity outperformance when setting the scheme's level of funding. In deciding how much outperformance should be allowed for, the actuary makes the assumption that equity returns will be higher when financial markets appear historically low, and returns will be lower when markets are historically high. Assets are taken into account at a value other than market value, i.e. they are given an off-market value. The discount rate used for valuation purposes is based on the dividend yield on a basket of stocks. The dividend yield is calculated on any particular day as dividends paid over the previous year, divided

by market value on that date. The traditional funding approach thus values liabilities by using a discount rate that is more equity orientated. Alternatively, liabilities may be valued through the rule-of-thumb approach which involves applying a fixed percentage as the discount rate in the valuation of fund liabilities – the fixed percentage could be anything.

26. Two of the difficulties of the traditional approach are:
    - risk is ignored in the assumption of long-term equity outperformance and, therefore, the valuation of liabilities in these circumstances has the potential to be misleading;
    - the fixed percentage used to discount liabilities under the rule-of-thumb approach is arbitrary – the valuation of liabilities in these circumstances also has the potential to be misleading;
    - because assets are valued off-market, such valuation have no relation to financial markets and can also be misleading.

27. The aforesaid difficulties mean that the valuation of a scheme's assets and liabilities may be unrealistic. The traditional valuation method is still used by many actuaries.

The market-value adjustment approach

The asset-based discount rate method

28. This funding method is market-based. It involves using the market discount rate for each asset class in the fund's investment portfolio. For bonds it involves the gross redemption yield. For equities it is the discount rate implied by current market price of the equities and expected dividend income. The overall valuation discount rate is then determined as the weighted average of the individual discount rates, taking into account the proportions invested in each asset class.

The economic valuation approach

29. This funding method is also market-based. It does not involve making any assumptions or estimates about return on assets, in particular, return on equities. To that extent, it removes a lot of the subjectivity in the making of assumptions. Under this approach, the discount rate is derived directly from market information and is the risk-free rate on a government-issued bond. However, actuaries who use the economic valuation method appear to prefer the discount rate linked to investment grade, i.e. AA-corporate bonds as

opposed to risk-free government bonds. The economic valuation approach values liabilities by using a more bond-orientated discount rate.

The bond yields plus risk premium method

30. This funding method is a combination of the traditional actuarial funding approach and the market-based method. It is simply an adjustment of the economic valuation approach. The discount rate is market-based in that it is derived from the gross redemption yield on a risk-free government-issued bond, but is then adjusted upward to reflect the estimated return on the pension fund's equity investment on which a premium is expected – the formula is thus, risk-free rate + equity risk premium. The risk premium may be kept constant or it may vary with changes in market conditions. In some jurisdictions, it is acceptable to use investment grade bonds such as AA-corporate bonds rather than the usual risk-free government bonds. The use of AA-corporate bonds is simply an indication of the riskiness of the market. Actuary advisers tend to advise pension fund trustees to opt for a high weighting in equities in order to benefit from the equity risk premium. This has the consequence of lowering funding costs for the sponsoring employer in the form of reduced contributions to the fund which, in turn, has the consequence of reducing benefit security for scheme members. The bond yields plus risk premium method values scheme liabilities by using the combination of a bond-orientated and an equity-orientated discount rate.

Pensions Fund Risks

31. Risk is all about uncertainties. The phenomenon may be classified into market risk, credit risk, liquidity risk and operational risk. Operational risk is the risk of loss arising from inadequate or failure of internal processes, people and system or from external events. A wide range of risks fall into this category, one of which is legal risk. Market risk is the risk that investments will perform adversely. For example, equities face the prospect of a fall in value while bonds face the prospect of a drop in interest rates. Credit risk is the risk that an entity will suffer loss because of defaults or significant declines in the creditworthiness of its counterparties, including issuers of instruments in which it has invested. For example, bonds face the prospect of default. Liquidity risk is the risk that a firm will not have sufficient liquidity to meet liabilities as they become due, or can only secure liquidity at an excessive cost. An entity might have plenty of assets, but they might be impossible to sell at the time the entity needs to in order to meet actual cash flows which it has committed to paying.

Solvency risk

32. Under a DB scheme, the most responsibility of the board of trustees is to ensure that the benefits promised by the scheme are paid. That can only happen if the fund is solvent enough so that the costs of the promised benefits, i.e. the liabilities, are more than covered by the assets in the fund. For this reason, it becomes necessary to measure the solvency of the scheme from time to time. A fund will be solvent if the present value of the contributions is in excess of the present value of the benefits to be paid. The soonest such a solvency measurement can take place is upon a wind-up of the scheme. The trustees should thus choose a notional wind-up date at which a solvency measurement exercise is undertaken. Where the sponsoring employer's financial situation appears precarious, the solvency measurement exercise should be undertaken at the next valuation date. Where the employer appears financially strong, the solvency measurement may be undertaken at a date further into the future. Solvency problems may cause serious underfunding and may be controlled in two ways:
    - by investing in index-linked bonds which provide a hedge for indexed pension liabilities;
    - by maintaining a surplus position, i.e. a funding ratio above 100%, to absorb a decline in asset prices.

33. However, there are difficulties with the above alternatives. World financial markets do not have an adequate supply of indexed bonds. Maintaining a surplus position might require high additional contributions which may not always be attainable.

Contribution risk

34. Contribution risk is the uncertainty of the contribution rate during the life of the scheme. Although it is uncertain when it will occur, the possibility of an increase in the required contribution rate is ever-present. Under a DB scheme the sponsoring employer bears this risk. Under a DC plan the members assume the risk. This risk is attributable to a number of factors – among others, poor investment performance, a too low contribution rate set by the actuary adviser, a deficit that requires redress. One way of controlling this risk is to accept a higher than normal contribution rate so that a future increase in the contribution rate will become less likely. This requires the use of pessimistic actuarial assumptions in the calculation of the contribution rate. If the desire is to maintain a low average contribute rate, then more of the scheme's funds should be invested in equities which are expected to deliver a higher return. However, if the equity market is in decline, the scheme will end

up in deficit. If the equity market experiences a boom, the scheme will have a surplus. The trustees of a scheme might themselves in a catch-22 situation – avoiding risky investments by investing in bonds and cash instruments will provide a lower expected return and thus require higher contribution rates. Investing in risky asset classes might deliver a higher expected return with the concomitant potential of reduced contribution rates, but also expose the scheme to investment return risk. Trustees are therefore faced with a complex trade-off between contribution risk and the expected level of contributions into the pension fund.

Mismatch risk

35. Pension funds and annuity providers cannot avoid mismatch risks. While the pension fund liabilities may be indexed, i.e. the pension benefits to be paid are inflation-linked, the pension fund assets are often not inflation-linked, because the fund is mostly invested in equities. This causes a mismatch in the assets and liabilities of a scheme. Because of the long duration of pension schemes, there is the ever-present risk that there will be an insufficient supply of long-maturing assets, particularly bonds, to match corresponding liabilities. Pension schemes and annuity providers are both exposed to this risk.

Longevity risk

36. Also referred to as mortality risk, it is the risk attached to the survival probabilities of retired fund members. There has been great improvement in the longevity over the last 25 or so in many countries. The underestimation of the longevity of scheme members has serious financial consequences for DB plans and annuity providers who sell life annuities to DC scheme members. An underestimation of how long a member will live after retiring from active employment can increase the cost of providing a pension.

Inflation risk

37. Inflation reduces the real value of a pension and the higher the level of inflation, the more rapidly the real value of the pension will be reduced. Inflation risk may be minimized by index-linked bonds.

Interest rate risk

38. A pension fund's bond portfolio is always exposed to falls in interest rates which means a drop in bond yields. A fall in interest rates causes a drop in the discount rate to be used to

value fund liabilities. The smaller the figure by which liabilities must be discounted, the higher the value of the liabilities. This increase in the value of the liabilities is usually not immediately matched by an increase in the value of the fund's assets. This causes a mismatch in the assets and liabilities of the fund.

Equity risk

39. A fund equity portfolio is always exposed to falls in equity values. Pension schemes invest in equities and therefore take equity risk in the expectation that a risk premium will be earned on such investments. Equities are always exposed to fluctuations in their value. Since the traditional valuation method and the bond yields plus risk premium method both rely a risk premium for scheme funding, a decline in equity values will have a significant impact on the funding of the scheme.

Credit risk

40. The purchasers of debt instruments and lenders such as banks are exposed to the possibility that the issuers of the instruments might default and in the case of a bank loan, the bank's client might default. It is common for these creditors to take out credit protection against the possibility of default. The deficit of a DB pension plan is tantamount to an unsecured loan granted by the scheme to the sponsoring employer. The scheme thus has an exposure to the creditworthiness of the sponsoring employer. Prudent trustees should therefore treat this exposure as any other and mitigate it. One way of doing so is by using credit derivatives.

Pensions Risk Management

41. Risk management is about anticipating exposure problems. Risk can be mitigated by diversification or by hedging it away.

42. The way to combat inflation risk – invest in index-linked bonds
Maintaining a high solvency margin/level through high contribution levels to absorb a fall/decline in asset prices.

43. Equity risk exposure may be managed by:
    - purchasing equity put options;
    - pursuing a policy that reduces the fund's equity weighting which in turn reduces

equity exposure as solvency decreases;

- using equity put options together with a swap strategy. This strategy reduces expected return;
- by switching all investments to a risk-free index-linked bond portfolio, without holding any derivatives. This strategy reduces expected return because of the removal of the equity weighting. If assets are all invested in 8-year bonds, while liabilities have a 20-year duration, there will still be downside risk because of the mismatch in the asset and the liabilities. The yields from the bond investment cannot be reinvested to match the 20-year liabilities;
- by switching all assets to a risk-free index-linked bond portfolio with a 20-year duration which neatly matches the 20-year liabilities. In practice, this is achievable through the use of (real) interest rate swaps. The only risk that remains under this strategy is mortality risk.

Risk Measurement

44. A risk measurement model such as value-at-Risk (VaR) requires a specification of a confidence level, say 95% or 99%, and a time period, say one day, five days or one months. If a fund has a 5-day 95% confidence VaR of X (X being a monetary amount or a percentage of the fund), it means that there is a only a 5% chance of the losing more than X over the next 5 days, if the same position is held for this 5-day time frame. While VaR originally referred to losses on an absolute numerical basis, it may now be used to refer to percentage losses.

Pension Fund Investment Strategies

45. Defined benefit pension schemes have, over the last decades, shown a strong bias in favour of equity investing. This was justified on the basis that the liabilities of final salary pension plans are very long-term and inflation-linked in nature and that therefore, DB schemes should have a heavy weighting in equities since they display similar economic characteristics, i.e. they also are long-term in nature and are inflation-linked and are expected to outperform other major asset classes including index-linked bonds and property over the long-term. Equities were seen to fulfil two investment functions – they served as a good defence against inflationary pressures in the same way that inflation-linked bonds did, but were better than bonds in that they commanded a premium over the long-term which bond investments did not. However, a recent practice is to first value the

liabilities of a scheme and then choose an investment strategy that has the objective of matching the assets with the liabilities. This is often referred to as liability-driven investment, asset-liability investing or liability-led investing. As a result, the weightings in fixed-income securities such as bonds have gradually started to increase. The reassessment of whether an equity-driven investment strategy is appropriate for DB schemes appears to have been driven by, among others, a decline in worldwide equity markets.