

CMP Upgrade 2019/20

Subject SP4

CMP Upgrade

This CMP Upgrade lists the changes to the Syllabus objectives, Core Reading and the ActEd material since last year that might realistically affect your chance of success in the exam. It is produced so that you can manually amend your 2019 CMP to make it suitable for study for the 2020 exams. It includes replacement pages and additional pages where appropriate.

Alternatively, you can buy a full set of up-to-date Course Notes / CMP at a significantly reduced price if you have previously bought the full-price Course Notes / CMP in this subject. Please see our 2020 *Student Brochure* for more details.

1 Changes to the Syllabus objectives

There have been no changes to the Syllabus objectives.

2 Changes to the X Assignments

There have been no material changes.

3 Changes to the ActEd material

Any changes to ActEd text (other than those noted below or in replacement pages) were trivial.

4 Changes to the Core Reading

This section contains all the *non-trivial* changes to the Core Reading.

Chapter 5, Section 7.4

The paragraphs of Core Reading starting 'Beyond the simple form ...' and 'One approach that is often used ...' have been deleted as has the paragraph of ActEd text 'Any age discrimination ...';.

Chapters 18 and 19

Many changes were made to the Core Reading and ActEd text in Chapter 18 Sections 0-2 and Chapter 19 Section 1, with material moving between the chapters. Replacement pages attached.

Glossary

The definitions of 'curtailment' (on page 7) and 'settlement' (on page 13) have been removed.

Chapter 11

Section 1

The paragraph starting 'It is important for the trustees ...' has been deleted.

Section 1.1

The paragraph starting 'Typically, they may rank equally ...' has been deleted.

The word '**analytical**' has been added before '... credit quality assessment techniques can, therefore, be adapted' and then the following Core Reading and ActEd text has been added about non-analytical techniques:

Alternatively, or in conjunction with these analytical techniques, the trustees may consider:

- **meeting regularly with the board of the sponsor to discuss its financial position**
- **business outlook**
- **the company's plans for the future**
- **any requirements imposed on the sponsor to notify the trustees of circumstances that could materially affect the security of members' benefits.**

An advantage of many of these approaches is that they are cheap to carry out.

However, the 'results' are likely to be subjective and difficult to quantify.

Section 1.2

The section of Core Reading on 'Business outlook' has been deleted (as all the other techniques in this section are analytical). The term 'business outlook' should also be removed from the bullet point list at the top of page 5.

Section 1.3

Section 1.3 on monitoring the sponsor has been deleted.

Section 7

The second paragraph of Core Reading starting 'However, based on specialists' assessments ...' has been deleted and replaced with the following:

'An actuary could prepare measures of risk as outlined in the following sections:'

5 Other tuition services

In addition to the CMP you might find the following services helpful with your study.

5.1 Study material

We also offer the following study material in Subject SP4:

- Flashcards
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18

Valuation assumptions

Syllabus objectives

The following syllabus objectives are covered in part in this chapter:

- 4.2 Discuss the principles underlying the determination of the funding method, valuation method and assumptions for valuing benefits and contributions, including:
- the types of information that may be available to help determine the assumptions and methods
 - the requirements for prudence
 - the objectives of the various parties involved.
- 4.3 Discuss how to determine values for assets, past and future benefits and future contribution requirements, including:
- the data requirements
 - the reasons why the assumptions and methods used may differ in different circumstances
 - the extent to which values should reflect investment / risk management strategy
 - sensitivity analysis and reasonableness checking

and be able to perform calculations to demonstrate an understanding of the main methods used.

0 Introduction

The results and conclusions from a valuation depend on the choice of valuation method, specific funding method and the assumptions used.

This chapter discusses considerations in the choice of valuation method and assumptions to be used. Earlier material has discussed specific funding methods.

In this chapter we will look at the important financial and demographic assumptions.

We will look at the sources of data used to set assumptions and the relevance of past data, in particular in the context of the projection of mortality rates.

We will look at what affects the level of prudence in the assumptions.

Finally, we will discuss different ways in which the discount rate, a key assumption, may be set.

1 Assumptions required

Before deciding on the detailed assumptions to be adopted for the valuation of a pension scheme, it is helpful to consider the valuation method to be adopted. The key questions include:

- Whether to use an ongoing scheme or discontinuance approach. This affects whether in service members are treated as continuing in service (and receiving salary-linked increases on accrued benefits, if applicable) or whether they are treated as leavers at the valuation date who receive deferred pensioner benefits.
- Whether to adopt a method that tries to reflect the economic value of the liabilities or whether the approach is intended to assist in funding discussions and hence should take into account the actual current and future asset strategy of the scheme and other factors that may be relevant to achieve an appropriate view on future funding.

There are many factors that will affect future cashflows. However, the majority of these factors will be unknown at the time of the valuation, so the actuary needs to make assumptions, *ie* predict the future experience.

When considering the assumptions, it is useful to divide them into two broad categories:

- demographic assumptions
- financial assumptions.

Broadly speaking, the demographic assumptions affect the nature and timing of the future benefits, while the financial assumptions affect their size and the estimated cost of providing those future benefits.

1.1 Demographic assumptions

Demographic assumptions may include:

- mortality base tables
- mortality improvements
- proportion of members with partners and/or dependants eligible to receive survivors' benefits
- age differences between members and their partners / dependants
- proportion of members retiring at each age in normal health, for in service members and deferred pensioners
- proportion of members qualifying for ill-health benefits at each age
- leaving service assumptions at each age for in-service members
- commutation of pension for lump sum
- commutation of lump sum for pension
- promotional salary scales for in-service members and
- transfer assumptions (if members have an option to transfer their benefits rather than draw a pension from the scheme)
- new entrant rates.

Mortality assumptions may differ for example by gender, category of member, size of pension, postcode, pre-/post-retirement and between member and dependant.

1.2 Financial assumptions

Financial assumptions typically include:

- **investment return assumptions**
- **price inflation**
- **earnings inflation**
- **rate of pension increases**
- **rate of revaluation of deferred pensions.**

1.3 Basis strength

Different terms that may be used for describing the strength of the actuarial basis are:

- a *best estimate* basis, one where there is a 50:50 chance of the assumptions overestimating or underestimating future experience
- an *optimistic* or *weak* basis is one that produces a high funding level. This may be as a result of producing a high value of assets and/or a low value of liabilities
- conversely, a *cautious* or *conservative* or *strong* basis produces a low funding level. This may be as a result of producing a low value of assets and/or a high value of liabilities
- a *prudent* basis usually lies in the range between a cautious basis and a best estimate basis.

When setting individual assumptions, an actuary must be careful to consider the effect of the assumptions as a whole. If each assumption is slightly on the cautious side of its best estimate value, the cumulative effect might be a basis that is very cautious overall.

Both weak and over-cautious assumptions can lead the employer into financial difficulties, or even insolvency. Use of weak assumptions will eventually lead to deficits and increased contribution requirements, possibly at a time when the employer cannot afford to pay extra. Cautious assumptions result in higher contributions, which the employer might not be able to afford.

1.4 Pace of funding vs actual cost

The funding basis affects the pace of funding but it does not *directly* affect the actual cost of the benefits. (The actual cost of the benefits is affected by the level of the benefits and the experience of the scheme.)

However, there might be some *indirect* effects of the choice of assumptions on the cost of the scheme.

These include:

- If the employer could get a better return on the money by using it in other areas of the business, there will be an opportunity cost of having to pay higher contributions into the pension scheme due to cautious assumptions.
- Conversely, weak assumptions might lead to less money being invested in the scheme in circumstances where it could earn a higher return.
- The use of weak assumptions might lead the employer to choose a scheme design with higher benefits than if cautious assumptions were used, because the cost appears to be lower.
- If a surplus arises as a result of the use of cautious assumptions, there may be pressure to increase benefits, thereby increasing the cost of the scheme.

2 Information

2.1 Historical data

The starting point for considering most assumptions is historical data.

This is particularly relevant for the demographic assumptions, where appropriately chosen historical data can provide statistically meaningful information to apply in setting future experience.

Historic data may include:

- global sources of information
- country-wide population statistics and analysis
- historic data on all pension schemes in the country
ie industry data and/or tables compiled by actuaries
- scheme specific historical data.

Which is of most relevance will depend on the assumption under consideration:

Appropriate data for setting financial assumptions

Investment return

When considering likely returns on a global equity portfolio, global data will be most relevant.

There are numerous sources of analysis of historic information for financial assumptions, such as the Dimson and Marsh study of 23 global equity markets for the period since 1900.

Inflation

Information published by governments and central banks on historic price and earnings inflation can be useful.

Past data for price inflation can be very useful in determining other economic assumptions, as conversion of past economic data into real terms will often remove much of the fluctuations when looking at nominal amounts.

In the UK, for example, past data for real levels of dividends and salaries (*ie* levels relative to price inflation) fluctuates significantly less than the non-real data.

Salary growth

Past data on salary levels in a particular country, industry or company may be useful when making an assumption about future levels of salary growth.

This is particularly the case when past salary increases are compared with the history of an inflation index to give an assumption for real salary growth.

These can form a useful starting point for setting financial assumptions but the other factors to be considered are explored further in the rest of the chapter.

Appropriate data for setting demographic assumptions

Mortality

Examples of historic data include the levels of mortality in a country, industry or company. In many countries this data will have been analysed and used to produce a decrement table.

For example, in the United Kingdom the ONS produces tables based on population mortality and the IFoA's CMI committee produces tables based on the experience of UK pension schemes.

Commercial models of current and future mortality based on past experience may also be available.

As discussed further below, some care is needed, however, to ensure that any observed trends are projected into the future.

Family statistics

Population and other published statistics can also be helpful in assessing demographic assumptions such as proportions married and the typical age difference between partners.

Other demographic assumptions

Historic data for the relevant scheme and, if available, for similar schemes, is likely to be useful in choosing assumptions for individuals leaving employment, becoming ill and retiring.

For these assumptions, factors specific to the company and industry are more likely to be relevant than broad population statistics.

Retirement rates

For determining retirement rates from active service, data on the scheme itself would be rather more appropriate.

2.2 Current data and forecasts

Current data is also usually valuable in determining assumptions.

For demographic assumptions, this data includes:

- the details of the current membership (such as their age and status)
- useful additional information such as whether they currently have a partner or dependant
- geographic information, such as postcodes, that can be used to further refine mortality assumptions.

For financial assumptions, current data is likely to be highly relevant. This will include:

- current yields on fixed and index-linked bonds
- current yields on various grades of credit
- current dividend yields on equities and the like
- yield curves, such as those for the UK produced by the Bank of England.

If available, the relationship between current yields for fixed and index-linked bonds will be useful in providing some indication of future levels of the index to which the bonds are related. The difference between the two will also provide information on market implied levels of future inflation.

For assumptions based on the cost of securing benefits with an insurer, current information on insurer pricing of individual and bulk annuity contracts may be relevant.

2.3 Other types of information that may be relevant

Where the valuation is being conducted for a specific statutory purpose, relevant legislation may set out the approach to be adopted to setting specific assumptions, and this will need to be taken into account.

For some purposes (for example, Pension Protection Fund valuations in the UK) the assumptions to be set may be prescribed in relevant regulations or other publications.

Assumptions for valuations used for company accounting purposes will need to comply with the relevant accounting standards.

Policy statements by Governments or controlling banks may also provide useful information for an actuary when making assumptions about economic assumptions.

One such example could be price inflation, where a central bank may have specific inflation targets.

There are often many 'experts' who provide alternative estimates of future economic variables, most notably price inflation.

For a particular scheme, industry forecasts or the views of the company directors might be taken into account when estimating future experience relating to factors such as real earnings growth, early retirement rates and withdrawals.

However, an actuary will usually seek to use long-term assumptions rather than assumptions based on the directors' views on salary growth or withdrawal rates over the next few years.

In some cases, the sponsor may be able to provide information on likely future trends based on its own business forecasts, for example, planned future salary increases or likely future rates of withdrawal, redundancy and early retirement.

Academic research and relevant analysis on future trends in longevity and future financial conditions may also be of value in deciding how current data is likely to develop in future.

1 Valuation considerations for ongoing schemes

The most important factor to take into account in deciding on the approach will be the purpose of the valuation.

For example, a funding valuation whose primary purpose is to determine future contributions would typically use an ongoing scheme approach and assumptions which have regard to the current and future asset strategy of the scheme.

A valuation intended to estimate the cost of settling all the liabilities of the scheme with an insurer would typically follow a discontinuance approach and start from an assessment closer to the economic value of the liabilities, adjusted for information about insurer pricing of the liabilities as appropriate.

As well as the purpose, **other factors which may be relevant to this decision** (the method and assumptions to use) **include**:

- **specific scheme circumstances such as:**
 - the scheme's membership profile *eg* **the scheme's maturity and whether the scheme is, or is expected to, remain open to new accrual – for schemes closed to new entrants in particular, the long-term funding aspirations of the sponsor and trustees**
 - **the strength of the scheme sponsor's covenant and whether it is reasonable to assume that the scheme is ongoing**
 - the scheme's investment strategy
- **the views of the sponsor and trustees**
- the desire for consistency
- external factors *eg*:
 - **any relevant legislative requirements**
 - competitors' schemes
 - market conditions
- the financial significance of the assumptions

These issues are discussed in more detail below.

1.1 Purpose of the valuation

Method

The method by which the benefits are valued should reflect the purpose of the valuation:

- To determine the current funding position of the scheme or when preparing figures for a company's accounts, normally it would be appropriate to value the benefits on the assumption that the scheme continues to operate on its current basis. This is often referred to as valuing the scheme's 'ongoing liabilities'.
- A similar approach would usually be adopted to assess both the contribution requirements to meet any future benefits earned by scheme members in a funded scheme (or for budgeting / reserving purposes in an unfunded scheme), and any adjustment (up or down) to reflect the current funding position.

In this context, an accrued benefits funding method should be used and it is often helpful to frame the valuation around a funding objective agreed by the key parties.

The 'method' could also relate to the manner and period in which surpluses and deficits are cleared.



Question

Explain why a slow spreading of surplus but a quick spreading of deficit may be preferred.

Solution

Such an approach is prudent.

Surplus results in a reduction to the contribution rate to cover future service costs. A surplus removed over a shorter time period leads to a lower contribution rate over the spreading period.

If, for example, the surplus could be removed rapidly and entirely by a contribution holiday until the next valuation and experience is worse than expected over the intervaluation period, the scheme would then have a deficit. It is prudent to spread a surplus slowly, over a long period.

Deficit results in an increase in the contribution rate. A deficit removed over a shorter period leads to a higher contribution rate over the spreading period and a more rapid restoration of benefit security.

Choosing the right approach, and explaining this choice to the users of the valuation, is a fundamental part of the valuation.

The results of the valuation can differ materially depending on the approach adopted.

Assumptions

The actuary will need to consider the purpose for which the assumptions are to be used in order to judge the degree of accuracy that is required, and the extent to which any prudent margins are included.

When valuing pension liabilities, it is usual to achieve the desired level of prudence by using assumptions which include an appropriate level of prudence.

However, an alternative approach is to set each assumption at a level considered broadly a best estimate, but then include in the valuation explicit additional reserves to provide a buffer against adverse experience.

Many of the considerations below would be relevant in assessing the desirable size of such a buffer.

For example, for funding valuations, there is normally a desire (or, as is the case in the UK, a formal legal requirement) to ensure that the assumptions chosen overall are prudent.

This is because for the purpose of setting contributions, there must usually be more than 50% confidence that the assets and future contributions payable will meet the benefits as they fall due.

However, for accounting purposes, in line with general accounting principles, there is usually more emphasis on choosing assumptions which are an unbiased realistic assessment of future experience.

Therefore the actuary will need to consider the degree to which the assumptions should represent realistic views of future experience, against the degree to which prudence is desirable.

Any allowance for prudence could mean understating or overstating the assumption relative to the best estimate, as appropriate.

For example, lower investment return assumptions are typically more prudent, but for pension increases it is higher assumptions that lead to higher liabilities and are, therefore, more prudent.

Whatever the purpose of the valuation it is important to consider the assumptions are reasonable for the purpose, for example whether the valuation should include prudent margins, and the level of those margins.



Question

Explain why a prudent basis reduces the risk that insufficient assets are held.

Solution

A prudent basis means that contributions are paid into the scheme earlier and so more assets available to cover the cost of the benefits.

If benefit costs turn out to be higher than expected, the extra assets available mean there is a smaller chance that extra contributions are needed.

It is important that, when reporting, the actuary should ensure that the reader of the report understands the purpose of the valuation and any margins included in the assumptions, providing sensitivity analysis where appropriate.

Where the cashflows are a more important consideration than overall present values, (for example, when modelling possible investment strategies), it will be appropriate to consider realistic rather than prudent assumptions.

For example, where the results of a valuation are being used as a basis for cashflow forecasts to inform investment strategy, it is important that assumptions are realistic since the pattern of future benefits is important if the hedging strategy is to be effective.

Any margins for caution or simplifying assumptions made because a particular benefit feature is broadly actuarial equivalent should be identified and considered.

For example, early retirement benefits may have a broadly similar value to a pension paid at normal retirement age, but the pattern of payments could differ significantly, particularly where a member also commutes a part of their pension for cash at retirement.

It would be possible for the actuary to consider the information available and apply judgement to produce a set of assumptions that they feel to be their 'best estimate' of future experience.

This can be considered to be the set of assumptions that has equal probability of overstating or understating the values.

Different actuaries are likely to arrive at different best estimate assumptions, based on their views about future experience.



Question

Explain why it may be helpful to start discussions about assumptions from a best-estimate basis.

Solution

The best estimate basis provides a realistic assessment of the cost of the benefit provision.

Margins for prudence can be added in, depending on the desire for caution.

However, a 'best estimate' value is not necessarily the most suitable. The reason why a value needs to be determined, or the needs of the client, will usually dictate the strength of the basis on which values should be produced.

Cash transactions

In some circumstances it will be necessary to determine a one-off payment from one party to another, which cannot be corrected by adjustments to future payments. In such cases it is important that the actuary chooses assumptions that produce the actuary's best estimate of the future experience. Under- or over-statement will have a direct financial effect on the two parties.

If cautious assumptions are used for funding, future contributions can be reduced later, only the *pace* of funding is affected. If cautious (rather than best-estimate) assumptions are used to determine a transfer value, more cash is given away, this increases the *cost* of the scheme.

1.2 Scheme characteristics

These may include:

- **the strength of the scheme sponsor's covenant and whether it is reasonable to assume that the scheme is ongoing**
- **the level of investment risk being adopted, ie the current investment strategy (if funded), how that will evolve and how benefits are secured at retirement**
- **the profile of the membership (and how this will develop in the future) eg:**
 - **the maturity of the scheme**
 - **the size of the scheme**
 - **the nature of the business**
- **historic information on the extent of variation in the assumption relative to the best estimate**
- **any options available to members**
- **any views from the sponsor or trustees about the benefits.**

Membership profile

Maturity

The term of the liabilities will depend on the age profile of the membership.

If the scheme is closed (no new entrants) the term of the scheme may be much shorter than for a scheme open to new entrants (where new entrants are expected).

This may affect the choice of both the funding method and the key assumptions, for example:

- **where it is expected that the membership profile will remain consistent over time (which may be a reasonable assumption if the scheme is open to new entrants):**
 - **a projected unit funding method may provide a stable contribution rate from valuation to valuation**
 - **it may be appropriate to base the discount rate on the current investment strategy**
- **where the scheme is maturing (eg because it is closed to new entrants) it may be expected that the investments will move to lower returning / less risky assets over time suggesting a lower, or term-dependent discount rate**
- **the degree of accuracy in setting assumptions may be more of an issue for mature schemes where liabilities are of a shorter duration than for younger schemes where there may be more flexibility allowed.**

Other features of the membership relating to mortality (*eg* occupation, social class *etc*) and family statistics (*eg* marital status and age of spouse / dependants) will affect the assumptions chosen.

Size of scheme

Where data available about likely scheme-specific experience is not extensive or is of questionable accuracy, more prudence may be appropriate in the assumptions.

For example, for a very large scheme the mortality assumptions adopted may be very close to the experience of the scheme itself, whereas for a slightly smaller scheme, while the experience may be relevant, it may also be appropriate to take a bigger margin.

For small schemes, the mortality experience of the scheme itself is likely to be of limited relevance in any event. Broad assumptions or assumptions based on standard tables used for other similar schemes are often necessary because of the lack of reliable experience data.

Sometimes it may be appropriate to ignore some of the assumptions (eg assuming as a simplification that all members remain in service up to retirement).

Care should be taken to consider any options that are generous to members and any insurance arrangements in place.

Overall, the actuary should ensure that the valuation assumptions are appropriately prudent, noting that the contribution rate for a small scheme is likely to be more volatile than for a large scheme, and any profits arising (assuming the value of the benefit is less than the actuarial reserve) from these sources will emerge as valuation profits which will help to smooth the contribution rate.

Nature of the business

The nature of the business is also likely to affect the withdrawal and retirement rates, and possibly the mortality rates.

It may also affect pay rises, either at a general level (if the business is successful and operating in a growth area and wishing to retain key staff it may be anticipated that employees will receive inflationary pay rises that are higher than average) or reflecting the nature of the workforce (for example, the proportion of employees who progress to senior levels).

Variability of the assumption

The actuary will need to consider how the assumptions are likely to vary over time.

Investment returns on equities, for example, fluctuate markedly from year to year, and it is difficult to have any confidence in the accuracy of any one best estimate for the future. A greater margin for prudence may, therefore, be warranted.

Rates of retirement by age, for example, are often relatively stable for any given employer unless there has been a significant change in the sponsor, and as a result there may be more confidence in the assumption adopted.

Options and guarantees

The valuation of options and guarantees was covered in more detail in the previous chapter.

Investment policy

The current investment strategy and how it is expected to develop in the future will influence the expected investment return, and hence the choice of the discount rate.

A scheme may have an agreed 'journey plan' under which the investment strategy is expected to move over a period of time (or on hitting certain triggers) to a lower risk / better matched strategy.

Additionally, if the investments held are not a good match for the type and size of liabilities of the scheme, there will be a greater risk.

If the scheme invests primarily in very risky assets which are not a good match for the liabilities of the scheme, it may be appropriate to take a more prudent view of likely future returns.

This could be allowed for by adopting more cautious assumptions to create, in effect, a mismatching reserve.

Different investment strategies offer the prospect of different long-term investment returns. If investing in equities (with higher expected returns than bonds and cash), a higher discount rate may be justified (under the asset-based or bond yields plus risk premium methods).

However, assets such as equities have greater variability in the returns achieved than bonds or cash. As a result, it may be prudent to use a lower discount rate, placing a higher value on the liabilities, in effect creating a mismatching reserve.



Question

Explain why a scheme might invest the majority of its assets in equities.

Solution

Equities may provide a reasonable backing for the liabilities, especially for immature schemes with real liabilities.

Alternatively, schemes may invest in equities in pursuit of higher expected returns, especially schemes in surplus with a strong covenant.

Sponsor covenant

As explained elsewhere, a strong sponsor is more likely to be able to increase contributions if future experience is not as assumed, and this may justify lower prudence.

However, there is a balance to be struck between this and ensuring that, while a sponsor is in a healthy position and can afford to pay contributions, prudence is set at an appropriate level.

A scheme with a weak sponsor is likely to require more prudent assumptions, as there is less certainty that sponsor can be relied on in future if experience turns out worse than assumed.

Conversely, a scheme with a strong sponsor is likely to require less prudent assumptions, as the sponsor can cover any deficit that arises if experience turns out worse than assumed.

Views from the sponsor and trustees

This can include:

- **any views from the sponsor on future pay increases**
- **any views from the sponsor and trustees / scheme management committee on any cost of living increases to pensions not guaranteed in the rules.**

1.3 Needs of the parties

Employer

The key objectives for a sponsor providing a scheme is to receive value for money and to provide benefits at an acceptable and affordable level of cost and risk.

The sponsor will also be concerned about the opportunity cost of investing in the scheme rather than in projects.

Stability

Stability of values and, in particular, of the cash contributions required to maintain the fund may be an important objective for the funding strategy, particularly for a sponsoring employer who will often want to keep the contributions stable so that it can budget properly for this employment cost.

A pension contribution linked to payroll (for example, as a percentage of pensionable salaries) will often be convenient to meet the cost of benefits being earned in the future.

A similar approach, or alternatively fixed contributions, may be appropriate to meet any shortfall, or adjust the future service rate if the scheme is in surplus.

Opportunity cost

An employer will also want to keep the total contributions as low as is reasonable subject to meeting its risk management objectives and retaining some flexibility to reflect other capital requirements in their business.

The sponsor providing the contributions will perhaps prefer not to pay more than is strictly necessary and may, therefore, have a preference for more realistic assumptions.

However, to the extent that this would then risk an unexpected increase in the future level of contributions this may not be acceptable.

The preference would depend on the sponsor's attitude to financial obligations in the short, medium and long term.

It will also be affected by the ability of the sponsor to reclaim, or otherwise determine the use of, any overpayment.

If the risk of overpaying in the short term is viewed as being preferable to the risk of having to find extra resources in the future, there will be a preference for a slightly cautious approach to the setting of the assumptions.

If the risk of overpaying is viewed as less attractive, due to a temporary or permanent loss of use of capital, a best estimate or slightly optimistic approach may be required when setting the assumptions.

Flexibility

The sponsor may prefer more prudent assumptions to:

- give greater contribution flexibility in the future
- possibly achieve greater investment returns
- defer tax liabilities.

A 'best estimate' approach may reflect a possible compromise between the sponsor's aims.

Trustees

In contrast, the trustees or scheme managers will usually wish to ensure that the level of funding gives beneficiaries adequate security, so they may prefer higher contributions at an earlier date in response to any funding shortfall (and a higher funding target).

Trustees are interested in safeguarding the beneficiaries' rights and so avoiding the risk of insufficient funds. They will have a preference for prudent assumptions that are expected to overstate, rather than understate, the future contribution requirements.

The trustees are likely to want to use prudent assumptions rather than best-estimate assumptions as the 50% chance of underfunding using best-estimate assumptions is likely to be too great.

However, the trustees or scheme managers will often be able to agree some flexibility over the timing of payments and the choice of funding method, but subject to:

- an adequate level of security being maintained
- the trustees or scheme managers having confidence in the ability of the employer to stand behind the scheme in the future.

It is usually in all parties' interests that onerous pension contributions do not lead to an employer's failure.

In other words they will wish to be prudent to increase the likelihood of the liabilities being met.

Members

Active members will also be interested in the sponsoring employer remaining financially healthy and in keeping their jobs in addition to having secure pension benefits.

For individual provision, individuals need to consider the benefit they wish to target, and the amount of risk they can accept, taking into account their personal circumstances.

A best-estimate basis will help determine suitable contribution and investment strategies.



Question

An individual financing private retirement provision is both the beneficiary and the sponsor.

State how this conflict will affect the assumptions that will be used to assess the contributions required to provide the desired retirement benefits.

Solution

The individual will need to find a suitable compromise between:

- the risk of providing insufficient benefits (and possible financial difficulties in retirement)
- the risk of providing excessive benefits (and possible financial difficulties before retirement as too much money is diverted away from more immediate needs).

In these circumstances, a *best estimate* basis may often be the most appropriate.

The individual should also consider the sensitivity of the benefits to changes in the key assumptions, *eg* investment growth, salary inflation.

Shareholders

Shareholders may prefer best-estimate assumptions to be used when the pension scheme is valued in the accounts as they need realistic information about the company's profitability on which to base decisions to buy and sell shares.

Optimistic assumptions would mean benefit costs are understated and profits overstated.

Prudent assumptions would mean benefit costs are overstated and profits understated.

However, most accounting standards require a prudent approach to be adopted where there is uncertainty, so a slightly prudent approach may be considered acceptable.

Balancing needs

The issue of funding a final salary pension scheme demonstrates clients' conflicting needs:

- the members and trustees may be most concerned with the benefit security and require a cautious approach to funding
- the sponsor and shareholders may be most concerned with cost control and wish to minimise costs, preferring a best-estimate basis.

A balance is needed to satisfy all parties, as for example it would not be in members' interests if a cautious approach to funding led to reduced benefits, job losses or even employer insolvency.

1.4 Consistency

The employer and trustees may want the assumptions to be 'consistent', which could mean:

- consistency with previous assumptions – the same approach could be taken as before, with the assumptions updated for demographic trends or changes in market conditions
- consistency between the method and assumptions – the level of prudence in the funding approach comes from a *combination* of the funding method and assumptions
- consistency in the valuation of assets and liabilities – for example, if assets are taken at market value, for consistency the liabilities should be valued using a market-related approach, *ie* mark to market, bond yields plus risk premium or asset-based discount rate
- consistency with assumptions used by other schemes – although ultimately assumptions should be chosen that reflect the specific feature of the scheme
- consistency within the assumptions – it is the ‘gaps’ between the assumptions that are more important than the individual assumptions themselves.

The relationship *between* valuation assumptions is usually more important than the *absolute* value of individual assumptions (unless a scheme holds fixed assets or pays fixed benefits).

For example, the relationship between salary growth e and the discount rate i is often more important than the absolute values of i and e .

For the key assumptions of discount rate and inflation, the difference between the values of these assumptions typically has a more significant impact on the results of the valuation than the absolute values of these assumptions.

It is also important to consider the extent to which other assumptions are prudent, in order to achieve an appropriate overall prudence in the valuation basis.



Question

The valuation assumptions for a pension scheme are $i = 4\% pa$ and $e = 2\% pa$.

Calculate the percentage change in the value of the liabilities, calculated using the above formula with a mean term to retirement of 15 years, if:

- i and e are both reduced by $1\% pa$
- i and e are both increased by $3\% pa$
- i is unchanged but e is reduced by $1\% pa$.

Assume the annuity value is unaffected by the changes. Ignore the final salary averaging effect.

Solution

Under the current assumptions, $\left(\frac{1.02}{1.04}\right)^{15} = 0.7473$

- $\left(\frac{1.01}{1.03}\right)^{15} = 0.7452$, $ie - 0.3\%$

$$(ii) \quad \left(\frac{1.05}{1.07} \right)^{15} = 0.7535, ie + 0.8\%$$

$$(iii) \quad \left(\frac{1.01}{1.04} \right)^{15} = 0.6446, ie - 13.7\%$$

We can see from the solution above that there is little effect on the value of the liabilities if the absolute values of the parameters are changed but the relationship between them remains the same.

However, the value of the liabilities can change significantly as a result of a change in one of the assumptions by itself, ie a change in the relationship between the parameters.

Considering the assets:

- if assets are taken at market value, any change in the assumptions will not affect the value
- if a smoothed market value is used, any change in assumptions may affect this value depending on how the smoothing is achieved
- if a discounted cashflow value of assets is used for equities, a change in i and g (the rate of dividend growth) is likely to change the asset value, depending on the assets held ...
... again it is the change in the 'gap' between i and g rather than their absolute values that is important.



Question

State the approximate effect on the discounted cashflow value of a scheme's equities of a 1% *pa* decrease in the assumed rate of dividend growth, g , with no change in the other assumptions.

Assume that the discount rate $i = 4\%$ *pa* and that expected dividend growth, $g = 2\%$ *pa*.

Solution

If we assume that the dividend yield on a suitable index, D_{index} , is a prospective yield and that dividends are paid annually starting in a year's time, we can use the formula $\frac{D_{index}}{i-g}$. The $i-g$ gap moves from 2% to 3%. The value of the assets changes from $\frac{D_{index}}{0.02}$ to $\frac{D_{index}}{0.03}$, a fall of 33.33%



Question

Explain which funding method gives the highest value of liabilities on a given set of assumptions.

Solution

The Entry Age method gives the highest value of liabilities for a given set of assumptions (assuming the entry age assumption is less than the average age of the active membership of the scheme and $i > e$).

Using the Entry Age method with a prudent basis will give a *very* cautious valuation result.

1.5 External factors

These include requirements of legislation or regulation relating to the valuation, and market conditions.

Regulation

Any statutory requirements should also be considered.

Regulation may prescribe the assumptions to be used, the frequency at which the valuations are carried out, the information to be disclosed and the particular financial checks to be performed.



Question

Set out the advantages and disadvantages of prescribed assumptions.

Solution

Advantages:

- the results of different schemes should be more consistent and so easier to compare
- equal treatment of schemes, as the same action is required by any scheme failing the test
- easier and cheaper to carry out the valuation.

Disadvantages:

- the assumptions may not be appropriate for schemes with special features or benefits.

Several financial checks may be required, *eg* to test that funds held are sufficient, *ie* a minimum funding check but not excessive, *ie* a maximum funding check.



Question

Explain why a regulator may require a maximum funding check to be carried out.

Solution

The regulator may want to check the scheme does not hold excessive assets relative to the liabilities when valuable tax concessions are granted.

A very prudent basis may be used to carry out the test, as if the scheme is surplus on this basis, this is strong evidence of over-funding and such a basis still allows schemes to fund prudently.

A valuation for a sponsor's accounts would also be completed on an ongoing basis but must reflect the relevant accounting standards.

Market conditions

If the assets are valued at market value, the assumptions used for investment return and inflation when valuing the liabilities should reflect market conditions as at the same date.

1.6 Financial significance

The actuary should be aware of the potential financial significance of errors in the assumptions that are to be made, as this will also help in the judgment of the degree of accuracy required.

Sensitivity testing

Assumptions such as the investment return assumption and the longevity assumptions will have a much bigger financial impact on the liabilities than some of the demographic assumptions such as the extent of ill-health retirements from the scheme.

Overall prudence is influenced primarily by the financially significant assumptions.

In many cases, presentation of a range of values, or values for alternative scenarios may be more useful to the client in making any necessary decisions.

A key part of most valuations will be to ensure that the users of the report understand the uncertainty of the results and the effect of using other key plausible assumptions on those results, in particular the sensitivity to:

- **the assumed investment return underlying the discount rate either itself or relative to other key financial assumptions such as the assumption for pension increases and/or pay inflation**
- **the assumption for price inflation**
- **the base mortality rates and allowance for future improvements**
- **possibly other demographic assumptions, depending on their relevance and importance, for example, early retirement terms, or any assumption for the proportion of benefits commuted for cash at retirement.**

Illustrating the effect of a range of assumptions can show the client the risks involved and the potential impact on benefits or contributions if experience is not as expected. This will help the client choose assumptions that reflect their attitude to risk.

Impact of changes in assumptions

The *direction* in which the assumptions work can be summarised as follows:

- an *increase* in any economic assumption for projecting the liability outgo (eg pension increases) will *increase* the value of the liabilities
- an *increase* in any economic assumption for projecting the asset income (eg dividend growth) will *increase* the value of the assets
- a *decrease* in the discount rate of interest will *increase* the value of the liabilities and, if the discounted cashflow method of asset valuation is used, the value of the assets (the change in the funding level will depend on the relative values and mean terms of the assets and the liabilities)
- if the contribution income is calculated as a percentage of salaries, the future cashflows will be affected by any change in the value of e .

The *amount* by which the values change depends on the factors affecting those values.

Let's consider the change in the actuarial liability for an active member of a final salary pension scheme under the Projected Unit or Attained Age methods.

The generalised formula is:

$$AL = \frac{P \times S}{A} \times \left(\frac{1+e}{1+i} \right)^{R-x} \times a'_R$$

If the assumed rate of salary growth, e , were to change from 4% to 5%, the actuarial liability would increase by:

$$\left(\frac{1.05}{1.04} \right)^{R-x}, \text{ ie around 1\% for each year between now and retirement.}$$

If the normal retirement age is 65, then the increase in the actuarial liability will be around 54% for a 20 year old and 15% for a 50 year old.

The total increase in actuarial liability for the scheme as a whole will depend on the average age of the membership (strictly, weighted by gender, past service and salary).

2 Considerations when assessing the discontinuance position

When assessing the position should the scheme be discontinued, the benefits valued would usually be the guaranteed benefits under the scheme, assuming that members in pensionable service leave immediately, which may mean they become deferred pensioners, receive a refund of their contributions or no benefits depending on the terms of the scheme and relevant legislation.

Special consideration should be given to any options or guarantees available at a member's option. These can have a material impact on the cost of securing benefits, particularly where the benefits are being insured (see below).

The way these benefits are valued would then reflect the method of securing the benefits. For example, this could be through purchasing annuities from an insurance company (a 'buy-out'), or by continuing the scheme for a period (often referred to as a discontinuance valuation on a 'self-sufficiency' basis).

The method and assumptions to be used (or approach to setting the assumptions) will often be defined in legislation.

2.1 Considerations for a 'self-sufficiency' discontinuance valuation

A 'self-sufficiency' approach means that:

- The scheme has a very good chance of meeting its liabilities without further help from the employer.
- Prudent assumptions are used for funding. The basis may be similar to the assumptions used for a buyout valuation but without the insurance company profit margins.
- A cautious investment strategy is followed, *eg* investments such as government / corporate bonds, longevity swaps / bonds and annuities could be included.

If the scheme would be run on for a long period on a 'self-sufficiency' basis or to test out that scenario, the assumptions would typically be set in a similar manner to the ongoing basis.



Question

Outline when the trustees might prefer to fund the scheme on a self-sufficiency basis.

Solution

A self-sufficiency basis may be preferred when:

- the scheme is closed to accrual ...
... but the scheme does not intend to wind up
- the sponsor covenant is weak ...
... *ie* the sponsor is less able or willing to contribute to the scheme
- the trustees are risk averse and wish to invest in assets that best match the liabilities.