

Subject SP4

CMP Upgrade 2022/23

CMP Upgrade

This CMP Upgrade lists the changes to the Syllabus, 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 2022 CMP to make it suitable for study for the 2023 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 *2023 Student Brochure* for more details.

We only accept the current version of assignments for marking, *ie* those published for the sessions leading to the 2023 exams. If you wish to submit your script for marking but only have an old version, then you can order the current assignments free of charge if you have purchased the same assignments in the same subject in a previous year, and have purchased marking for the 2023 session.

This CMP Upgrade contains:

- all significant changes to the Syllabus and Core Reading
- additional changes to the ActEd Course Notes and Assignments that will make them suitable for study for the 2023 exams.

0 Changes to the Syllabus

The following should be added after the objectives in Section 1.2 of the Study Guide:

Assessment

The assessment of this subject will consist of one examination. The candidate will be asked to apply core actuarial techniques and concepts, together with specific knowledge of pensions and other benefit arrangements, to practical situations. A number of questions will be set with varying marks, in line with the above syllabus topic weightings and skill levels.

The duration of the examination is three hours and twenty minutes and is timed and online.

Please read the latest version of the IFoA Examinations Handbook and IFoA Examination Regulations on the IFoA website before sitting any IFoA examination.

1 Changes to the Core Reading

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

Chapter 4

Section 1.2

In the second bullet point list on Page 7, the third bullet point is now Core Reading as follows:

- **The value of the scheme's liabilities**

and ninth bullet point is now Core Reading as follows:

- **The market value of the scheme's assets**

Chapter 6

Section 4

The material in this section has been rewritten and a new Section 5 on collective defined contribution schemes added. Replacement pages 13-14b are included at the end of this document.

Chapter 8

Section 1

The first bullet point list is now Core Reading rather than ActEd text. After this list, the following point should be added:

The alternative benefits can be determined by setting up an equation of value. The value of the different benefits is set equal on a given set of assumptions.

Section 2

On page 6, the second bullet point list on issues to consider when setting option terms is now Core Reading and has been amended somewhat. Replacement pages 5-6 are included at the end of this document.

Chapter 9

Section 1

In the first paragraph on Page 4, change '**Winter 2021**' to '**Spring 2022**' and in the second paragraph remove '**during 2021**' in the second sentence.

Chapter 11

Section 1.3

We have altered the way in which this material is presented, removing the separate bullet points. Replacement pages 7-8 are included at the end of this document.

Chapter 13

Section 0

In the second paragraph, change '**(Winter 2021)**' to '**(Spring 2022)**'.

Section 2.3

In the sub-section on Volatility remove the second and third paragraphs.

In the sub-section on Defaults, replace the existing Core Reading with:

Another risk is default risk, such as a bond issuer defaulting on bond payments (coupon and/or redemption).

Chapter 14

Sections 6.4 to 6.7

The material on the two methods of projecting future pensions expenditure has been removed together with the material on projecting future contribution income, affecting both Core Reading and ActEd text. Remove the last two paragraphs of Section 6.4 and all of Sections 6.5, 6.6 and 6.7.

Chapter 16

Section 4

Changes have been made to the key in the sub-section headed 'Standard Contribution Rate' but also the ActEd text in this section has been expanded to cover other types of scheme design, replacement pages 27 to 29b are included at the end of this document.

Section 7.1

On Page 45, replace the first two paragraphs of Core Reading text with:

In the long term, a scheme's membership may have a stable age profile. When this arises the SCR will be higher under a method that has a lower Actuarial Liability and *vice versa*.

Chapter 23

Section 2

In the second bullet point list, amend the first bullet point wording '**as only the**' to '**only as the**'.

Section 4.7

In the paragraph of Core Reading on Page 14, add 'discontinuance' after 'central'.

Glossary

There are two new Glossary definitions.

Environmental, Social and Governance (ESG) factors

An investment strategy taking into account ESG factors, such as climate change, may be driven by ethical principles.

Sponsor covenant

Sponsor Covenant can be defined as the combination of the ability and the willingness of the sponsor to pay (or the ability of the trustees to require the sponsor to pay) sufficient contributions to ensure that the scheme's benefits can be paid as they fall due.

2 Changes to the ActEd material

This section contains all the *non-trivial* changes to the ActEd text.

Study Guide

Section 1.2

The following should be added just before the detailed Syllabus objectives:

Skill levels

The use of a specific command verb within a syllabus objective does not indicate that this is the only form of question that can be asked on the topic covered by that objective. The Examiners may ask a question on any syllabus topic using any of the agreed command verbs, as are defined in the document 'Command verbs used in the Associate and Fellowship examinations'.

Questions may be set at any skill level: Knowledge (demonstration of a detailed knowledge and understanding of the topic), Application (demonstration of an ability to apply the principles underlying the topic within a given context) and Higher Order (demonstration of an ability to perform deeper analysis and assessment of situations, including forming judgements, taking into account different points of view, comparing and contrasting situations, suggesting possible solutions and actions and making recommendations).

In the SP subjects, the approximate split of assessment across these three skill types is 25% Knowledge, 50% Application and 25% Higher Order skills.

Section 1.4

Under the section titled 'Assessment', add the following sentence:

The online exams provide an additional 5 minutes (*ie* 3 hours 20 minutes in total) for students to download and print the question paper.

Chapter 6

Section 0

To the end of the last bullet point add ', including collective defined contribution schemes'.

Chapter summary

The chapter summary has been updated to reflect the changes to the material on hybrid schemes and collective defined contribution schemes. Replacement pages 15-16 are included at the end of this document.

Practice Question 6.1 solution

In the sixth point of the solution change 'hybrid' to 'risk-sharing'.

Practice Question 6.12 solution

The solution has been rewritten to reflect the changes to the Core Reading. A replacement solution is included at the end of this document.

Chapter 8**Section 0**

This section has been rewritten, replacement pages 1-2 are included at the end of this document.

Section 2.8

The heading should be amended to 'Impact of selection'.

Section 2.11

This section should be removed and subsequent sections renumbered.

Section 2.13

The current Section 2.13 should be renamed as 'Objectives of offering the option'.

Sections 2.14 and 2.15

The material in the current Sections 2.14 and 2.15 should remain but the numbering removed, so the material is included as subsections under the current Section 2.13. The subsequent section 'Take-up rate' should be renumbered.

Chapter summary

Amendments have been made to the second bullet list. Replacement pages 15-16 are included at the end of this document.

Chapter 11**Section 5.1**

Add the following at the end of the section:

As well as affecting the prudence of the funding basis, the strength of the covenant will also be considered when choosing the funding method and the method and period to be used for spreading any deficit or surplus.

Chapter summary

Replacement pages 19-20 are included at the end of this document, reflecting the restructuring of material in Section 1.3.

Chapter 14

Section 5.2

The section number and heading should be removed at the top of page 11 and instead replaced with:

Here is an example of a full cashflow projection formula:

The subsequent sections should be renumbered.

Chapter summary

In the first sentence of the second page of the summary, add the word 'Full' at the start.

Remove the last sentence in the section headed 'Projections of social security income and expenditure'.

Chapter 16

Section 7.2

On Page 49 the first title has been changed with a new opening sentence and a new sub-section has been added on schemes closed to any accrual. Replacement pages 49-50 are included at the end of this document.

Chapter 20

Section 1

On Page 4, the second example question, has been rewritten as follows:



Question

A defined benefit scheme's valuation basis assumes nil withdrawals. The trustees increase the level of benefit granted on future withdrawal.

Explain the impact of this change on:

- 1) the cost of the scheme
- 2) the results of valuations conducted at the point that the benefit is increased and subsequent dates.

Solution

Assuming some members withdraw, the increase in the level of benefits granted on withdrawal will increase the cost of the scheme in the long term.

However, the valuation basis assumes nil withdrawal, so the increase in the level of withdrawal benefits will have no impact on the results of a valuation conducted at the point of the change.

As time progresses, the scheme's finances are affected because, when a member leaves, the benefit awarded will be higher than if benefits had remained unchanged.

This higher level of benefits will be reflected in the liabilities at the next valuation, leading to a smaller surplus / larger deficit than would have otherwise have been recorded ...

... and consequently the contributions payable are likely to be higher than would otherwise have been the case.

Practice Question 20.3 solution

Add the following to the section on Defined contribution schemes:

If contribution rates are expressed as a percentage of salary and earnings inflation is low then the contributions in monetary terms will be low, leading to a smaller fund than would otherwise be expected. [½]

Chapter 23

Section 4.6

Add the following to the end of the section:

This may be a reflection of the less onerous reserving and regulatory requirements on the non-insurance consolidator.

The consolidator may pool together many similar schemes to achieve economies of scale in administration and investment. The consolidator may choose to provide benefits for only a certain period of time after which it buys out the remaining liabilities with an insurer.

3 Changes to the X Assignments

Assignment X2

Question 2.1(i)

Replace 'merits' with 'advantages'.

Question 2.4

This question has been replaced. The new question and solution are included at the end of this document.

Question 2.5(i)

The question has been changed and now reads:

Discuss how the contribution rates under an equalised PAYG financing approach and a pure PAYG approach are likely to vary over time for a maturing social security system.

4 Other tuition services

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

4.1 Study material

We also offer the following study material in Subject SP4:

- Flashcards
- Sound Revision
- Revision Notes
- ASET (ActEd Solutions with Exam Technique) and Mini-ASET
- Mock Exam and AMP (Additional Mock Pack).

For further details on ActEd's study materials, please refer to the 2023 *Student Brochure*, which is available from the ActEd website at www.ActEd.co.uk.

4.2 Tutorials

We offer the following (face-to-face and/or online) tutorials in Subject SP4:

- a set of Regular Tutorials (lasting a total of three days)
- a Block (or Split Block) Tutorial (lasting three full days).

For further details on ActEd's tutorials, please refer to our latest *Tuition Bulletin*, which is available from the ActEd website at www.ActEd.co.uk.

4.3 Marking

You can have your attempts at any of our assignments or mock exams marked by ActEd. When marking your scripts, we aim to provide specific advice to improve your chances of success in the exam and to return your scripts as quickly as possible.

For further details on ActEd's marking services, please refer to the 2023 *Student Brochure*, which is available from the ActEd website at www.ActEd.co.uk.

4.4 Feedback on the study material

ActEd is always pleased to receive feedback from students about any aspect of our study programmes. Please let us know if you have any specific comments (*eg* about certain sections of the notes or particular questions) or general suggestions about how we can improve the study material. We will incorporate as many of your suggestions as we can when we update the course material each year.

If you have any comments on this course, please send them by email to **SP4@bpp.com**.

4 Hybrid schemes

Hybrid schemes offer a mixture of Defined Benefit (DB) and Defined Contribution (DC) benefits or share the risks between various parties.

A key aim of hybrid schemes is to provide greater certainty for scheme members about the value of their pension benefits than in a DC arrangement, but also less cost volatility for employers than a DB arrangement.

The intention is that these aims are met by sharing the risks among a number of parties including scheme members, employers and insurance and investment businesses.

Possible approaches include:

- **cash balance schemes**
Here a defined lump sum is provided at retirement, and so the post-retirement risks are transferred from the employer to the member.
- **longevity adjustment factors: the retirement age is increased for future service in the light of increasing longevity, thus mitigating the financial cost to the employer of increasing life expectancy**
- **risk management options: including longevity swaps and bonds and insurance company investments**
- **simplified / core DB schemes: a basic, 'core' level of DB benefits is offered with other benefits such as indexation and spouse's benefits being discretionary and subject to less regulation**

This design may not be possible in countries where these other benefits such as indexation and spouse's benefits are a statutory requirement.

But if such a design can be implemented, it will transfer the cost and some of the risk associated with these other benefits from the employer to the member (eg inflation risk in respect of indexation, longevity risk of the dependant).
- **conversion of benefits: a defined level of benefit is promised to the member which is converted to a DC fund of equivalent value when the member leaves the scheme (through withdrawal, death or retirement)**

The operation of this scheme is similar to a cash balance scheme, but the benefits become defined contribution in nature at the earlier of withdrawal, death or retirement.
- **fluctuating pensions: the scheme provides a core non-increasing pension on retirement with an additional element which is entirely discretionary and subject to the financial status of the scheme**
- **links to changes in State Pension Age (SPA): the scheme's retirement age would be permitted to be adjusted in line with revisions to the SPA**

In this case, the variable retirement age means that some of the post-retirement longevity risk is transferred from the employer to the member.
- **the use of with-profit funds within DC**

In such funds, the risk is shared between the member and the provider of the fund (usually the investment business or insurance company).

- **guarantees and risk sharing provided by the insurance industry: guarantees on the return on the fund and the income at retirement whereby the member is not subject to the downside risk but takes a share in the upside risk, as opposed to a standard DC arrangement where the member shoulders all of the downside and upside risk.**

5 Collective DC (CDC) schemes

Collective DC schemes provide another example of risk sharing. The key features of such a scheme are as follows:

- **The employer pays a fixed rate of contributions into the fund.**
- **Benefits paid to members on retirement are dependent on the funding level of the scheme.**
- **Pensions may be subject to variation once in payment, depending on the funding level of the scheme, with a minimum level payable and the balance being discretionary.**

The minimum level of benefit will be set such that it is very likely the benefit can be provided even if there is adverse experience.

- **The risk is shared collectively by the members rather than individually. This means the scheme can follow a more risk-seeking investment strategy in the long term compared to individual funds where members traditionally opt to switch into low-risk, low-yielding assets in the years before retirement.**

The chapter summary starts on the next page so that you can keep all the chapter summaries together for revision purposes.

Chapter 6 Summary

Big picture decisions

- Which stakeholder(s) should take the risks, *eg* of investment return or longevity?
- What level of benefit should be provided or targeted?
- Should the benefits be defined in monetary or real terms?
- On what events should benefits be provided, *eg* on death, on retirement, on leaving employment, whilst unable to work, during employment, on divorce?
- How should benefits be provided, *eg* an annuity, a cash lump sum, goods, services?
- Should the approach differ between individuals in the group? If they should differ, in what way, *eg* form, level, real nature, events?
- Should the individuals be given options about events, forms or levels of benefits?

The Net Replacement Ratio (NRR) is a useful measure in assessing how well retirement benefits maintain an individual's standard of living. However, NRR is a crude indicator.

Sponsors may take into account State benefits and individual provision when designing the level and form of the scheme benefits.

Defined benefit schemes

The benefits are defined in advance.

They can be linked to service, final salary, average salary, revalued salary or fixed.

Costs will not be known until all benefits cease to be paid. Often contributions are paid in advance to meet the estimated cost of benefits, based on assumptions.

Typically, employees pay fixed contributions and the employer pays the balance of cost.

DC schemes

Contributions

The contribution rates may be:

- a fixed rate for all members
- matched (usually up to a limit)
- age related
- service related.

Investment choice

Members take on the investment risk but often have investment choice. A default fund may be available for members who don't want to make an investment choice.

Lifestyling may be carried out over a few years before retirement to switch the member into suitable matching assets by retirement.

Benefit provision

DC schemes are generally more flexible in delivery. Option choices may include:

- the amount to be taken as cash
- purchasing an annuity from an insurance company
- purchasing an annuity from within the scheme
- what, if any, pension increases are to be secured and
- what, if any, dependants' benefits will be provided
- drawing down an income stream.

Hybrid schemes

Share risks between employers, members, insurers and investment businesses.

Examples of hybrid schemes include:

- cash balance schemes
- longevity adjustment factors
- risk management options, *eg* longevity swaps
- a 'core' level of DB benefits, with other benefits being discretionary
- offering a defined benefit and converting it to a DC fund when the member leaves service
- fluctuating pensions, core non-increasing element with increasing element being discretionary and dependent upon the scheme's financial position
- adjusting the scheme's retirement age in line with the country's State pension age
- the use of with-profits funds within DC
- guarantees and risk sharing provided by the insurance industry, *eg* guaranteed return on the fund and income at retirement.

Collective DC schemes

A type of risk-sharing scheme where:

- the employer pays a fixed contribution rate
- the benefits paid to members are dependent on the funding level of the scheme
- once in payment, members may receive a minimum promised benefit and rest of benefit may be discretionary, dependent on the scheme's funding level
- there is collective risk sharing across members, enabling a more risk-seeking investment strategy that may lead to higher returns.

8

Scheme design – options

Syllabus objective

- 3.3 Discuss the main factors that should be taken into account in setting appropriate terms and consent requirements for member options, taking into account the risk and reward for all relevant parties.

0 Introduction

In this chapter we will look at how scheme design could be enhanced by offering options and guarantees. We will consider high-level principles for setting option terms and describe each of the options in turn.

Many benefit packages include options and guarantees.

Options may enable employees to tailor the benefits to their own requirements.

With options there is a risk of selection, which can be a significant problem. Selection can be guarded against by setting eligibility criteria for the option or by setting terms that favour one option over another.

It may be desirable to design the options to be actuarially cost-neutral, so that the cost is expected to be the same whichever option is taken up. However, this can be difficult to achieve in practice given the wide range of employees to whom they may apply.

Guarantees may help to protect members against certain risks, *eg* poor investment returns.

For both options and guarantees, it is important to be aware of the potential for higher costs and other risks. Sponsors can then decide whether the risks are too great.

Questions on this material often require knowledge and understanding of:

- the different options
- high-level factors to think about when setting option terms
- how to determine assumptions and calculate the option factors.

In Subject ST4, options and guarantees was the most frequently tested topic in the course – with many questions and long questions about options. In Subject SP4 there is less Core Reading on options and guarantees, as some of the Core Reading on the topic from Subject ST4 has been removed. Nevertheless we think it is important for you to have knowledge and understanding of the above three areas as they may be tested. The first two areas are covered in detail in this chapter, and the final one is covered in the chapter on assumption setting, coming later in the course. As a result, this chapter contains relatively little Core Reading and is mainly ActEd text.

So, Pension surrendered = $\frac{\text{Commutation lump sum}}{\text{Commutation factor}}$

and Residual pension = Pre-commutation pension – Pension surrendered

Many pension scheme members may elect to take a lump sum at retirement to pay off an outstanding mortgage, to finance a major purchase or if they are pessimistic about their own life expectancy. As a result, factors which are less generous than cost neutral may be adopted with little effect on the take-up rate.

The tax treatment of the lump sum will also have a major effect on the take-up rate.

Commutation introduces the risk that members mismanage or spend the funds which were intended to provide a regular income, and live in poverty or require social security benefits. So the State may legislate to limit the amount of pension that may be taken as a lump sum.



Question

State the problems that commutation poses for a member's partner and how to avoid them.

Solution

If the partner's pension is also reduced proportionately, this reduced pension may be inadequate. In addition, the partner may not have received a share of the lump sum in exchange for the pension surrendered.

These problems can be avoided by linking the partner's pension to the *pre*-commutation pension.

1.6 Augmentation

This is the reverse situation to commutation, where cash is used to provide extra pension benefit.

1.7 Additional dependant's pension

Some pension schemes allow members the option at retirement to surrender part of their own pension in exchange for an additional contingent pension for their partner or chosen dependant on death after retirement.

The contingent dependant's annual pension provided by £1 *pa* of member's pension surrendered is the *dependant's option factor*.



Question

State when the value of this option is lost.

Solution

The value of the option is lost when the partner or dependant dies before the member.

2 Factors to take into account when offering or taking up options

Here we will consider the high-level issues to consider when setting terms for member options. The technical detail of how the terms are set is discussed in the later chapter on assumptions. Many of the issues a member would consider before choosing to take up the option are similar.

The main factors to take into account when setting appropriate terms for member options are:

- **the relative value of the option compared to the expected cost of providing the ‘regular’ benefit**
ie fairness to the member taking up the option
- **fairness to other beneficiaries**
to achieve fairness between both groups may result in the terms being ‘cost-neutral’
- **the provisions in the benefit scheme’s documentation**
- **regulatory and legal requirements**
- **whether to evaluate the option on a market-related basis or some other basis**
- **the scheme’s investment strategy**
- **the security of remaining benefits once the option has been exercised and of remaining beneficiaries following the option being exercised.**

This may depend on the scheme’s funding level ...

... and the strength of the sponsor covenant.

However, the range of issues to consider when setting option terms is wide, and could also include:

- **whether the option requires consent**
- **treatment of discretionary benefits**
- **the possible impact of selection**
- **simplicity of administration and ease of understanding**
- **the cost of calculation and/or administering the option**
- **differing tax treatment of the benefits under the option**
- **the objectives of offering the option and any impact on actuarial cost-neutrality**
- **the expected take-up rate of the option.**

In the remaining parts of this section, we will look at some of these factors in more detail.

Chapter 8 Summary

Options

The main options are:

- a transfer to or from another scheme
- early receipt of the benefits
- late receipt of the benefits
- changing the level and/or form of pension increases
- conversion of the benefits from pension to cash (commutation)
- conversion of additional contributions to pension to cash (augmentation)
- transfer of benefits from one beneficiary to another.

High level factors to consider when designing options

- fairness to the member taking up the option
- fairness to other beneficiaries
- the provisions in the benefit scheme's documentation
- regulatory and legal requirements
- whether to evaluate the option on a market-related basis or some other basis
- the scheme's investment strategy
- the scheme's funding level
- the strength of the sponsor covenant
- whether consent is being sought
- treatment of discretionary benefits
- the possible impact of selection
- simplicity of administration and understanding
- the cost of calculation and administration
- tax
- the objectives of offering the option and impact on actuarial cost-neutrality
- the expected take-up rate

Consent

Consent may be sought by the following parties:

- Members – by definition (if exercising an option) are giving consent, and may wish to do so if the terms are fair or generous
- Custodians eg trustees – will want to ensure fairness between those taking up the option and those not taking up the option, before giving consent.
- Employers – may wish to control the flow of benefits whilst members are still in employment, for example, to better regulate their employees' behaviour.
- Regulators and government – unlikely to directly give consent for member options but may require certain parties to give consent.
- Actuaries – unlikely to be required to give explicit consent but they may be required to advise on the terms or certify that practice has been reasonable.

Guarantees

Guarantees may relate to minimum benefits from a defined contribution scheme or minimum benefits granted in respect of a transfer in or additional contributions.

Credit rating

Companies can pay a specialist agency to provide them with a credit rating.

The credit rating can apply to the company or to a specified issue of debt.

The rating will be supervised by a specialist from that industry as well as including the involvement of experts in the field of rating.

The rating agency will have access to information that is not publicly available.

The rating is deemed to be 'interactive', because there will be interaction between the sponsor and the agency when determining the rating.

An advantage of credit ratings over the implied market default risk method is that it is based purely on an analysis of the financial circumstances of the company, thus eliminating the difficulties associated with market forces that affect prices.

Credit ratings are the most commonly used method of assessing the financial strength of a company and are intended to be a guide to the probability of a company defaulting on its financial obligations and its subsequent insolvency.

Ratings are generally reflected through a letter grade, eg ranging from AAA (strongest), to C (weakest) and D (default).

By considering past experience of companies with different credit ratings, an assessment can be made of the likelihood of companies with different grades defaulting in the future.

Ratings can be translated into a quantifiable measure such as probability of default.

Usage of credit ratings for assessing sponsor covenant risk is low because only the larger companies tend to have full credit ratings.

However coverage is still wider than for the implied market default risk method.

Merton-type credit risk models

Where a sponsor has traded equities, a model can be used to determine the probability of default based on the behaviour of the equities.

This model is similar to the Merton model, which was introduced in the implied market default risk section above.

Again, the advantage of this approach is that a quantifiable measure can be obtained but the ratings under this method require the sponsor to have traded equity, are not widely available and are costly to produce.

Quantitatively derivation from accounting data

Quantitatively derived credit risk models determine a credit rating purely from available information, rather than from interaction with the company.

This is a model deriving a credit rating or probability of default from standard corporate accounting data, augmented by confidential credit information from credit bureaux and/or commercial banks.

This approach is most commonly used by institutions trying to gauge the creditworthiness of other unrated entities.

Credit rating grades exist in the same way, except they are denoted by small letters, *eg 'aaa'*.

The model can provide a quantifiable output and usage is wide, but it relies on accounting information, which is updated annually in arrears and therefore up-to-date information is not easily available.

The model used by Experian to calculate the PPF levy is a bespoke quantitatively derived credit risk model, based on the average month-end insolvency probabilities generated by the model.

Independent business review (IBR)

An independent business review (IBR) is a report by an external credit advisory specialist, typically an accounting firm, insolvency practitioner or other specialist.

A lender can write into the terms of lending a requirement that an IBR will be carried out if there are significant changes to the company's operations or financial conditions that might impact on the security of the loan.

This review would typically be paid for by the borrowing company.

The review is expensive and requires sponsor co-operation for access to confidential information to produce.

It tends to be most appropriate when there is some uncertainty about the sponsor's financial position, rather than as a regular monitoring tool.

However, it can:

- take explicit account of the interdependence of funding and the sponsor covenant
- help trustees to determine how much the sponsor can afford.

1.3 Non-analytical techniques

Alternatively, or in conjunction with these analytical techniques, the trustees may meet regularly with the board of the sponsor to discuss its financial position, business outlook and plans for the future; and may impose requirements 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.



Question

Set out examples of circumstances that could materially affect the security of member's benefits about which the trustees may wish to be notified.

Chapter 11 Summary

Sponsor covenant

Ability and willingness of the sponsor to pay (or the ability of the trustees to require the sponsor to pay) sufficient contributions to ensure that the scheme's benefits can be paid as they fall due.

Credit assessment techniques

- financial metrics
- implied market default risk
- credit rating
- Merton-type credit risk models
- quantitatively derived credit risk
- independent business review

Non-analytical techniques

Trustees:

- could consider meeting regularly with the board of the sponsor to discuss its financial position, the wider business outlook and the company's plans for the future
- may impose requirements on the sponsor to notify them of circumstances that could materially affect the security of members' benefits.

Considering sponsor covenant

Always consider it, unless:

- scheme is very well funded
- covenant is strong enough to be deemed certain
- covenant is so weak it is deemed to be nil
- sponsor has no further liability.

Categorising sponsor covenant

- strong
- tending to strong
- tending to weak
- weak
- insolvent

Actions for trustees if covenant is weak

- change investment strategy to reduce risk, *eg* invest more assets in bonds
- buy assets such as credit default swaps, which pay out if the sponsor defaults
- consider alternatives to cash payments, *eg* obtain a fixed charge on sponsor assets
- agree that contributions will be ratcheted up if the sponsor's position improves
- establish contingent contributions

Interaction of covenant with funding strategy

- *assumption advice* involves advising on the total value of the scheme members' benefits taking into account all risks
- *contribution advice* involves advising on the level of contributions the sponsor should pay and what other arrangements should be used to finance the benefits
- a weak covenant implies a need for short-term contributions but a weak sponsor may not be able to afford these contributions
- a strong sponsor may be able to afford higher contributions, but the pension scheme may not need those contributions immediately

Interaction of covenant with investment strategy

- a weak covenant generally requires a lower risk investment strategy to be followed
- a strong covenant may allow the scheme to take more investment risk, given the sponsor can support the scheme if needed in future

Integrated approach to risk measurement

- an integrated approach to risk measurement will consider funding risk, investment risk and covenant risk
- risk can be measured in terms of the benefits, the deficit or the funding level. Value-at-risk techniques can be used to quantify the overall level of risk ...
... *eg* 'we are $x\%$ certain that the funding level will not be less than FL over the next n years'

4 Formulae for a final salary scheme and other types of scheme

4.1 Model formulae for a final salary scheme

This section summarises what we have covered so far in relation to final salary schemes. The formulae below:

- assume that the only benefit is a pension payable at retirement (as assumed previously)
- make allowance for pre-retirement decrements such as mortality (unlike the formulae given previously).

The similarities and differences between the methods and their variants can be demonstrated by consideration of formulae for the Standard Contribution Rates and the Actuarial Liabilities under the different methods.

Consider a final salary pension payable on normal health retirement, at age 65, to an individual currently aged x .

where:

- f** = pension accrued per year of service as a percentage of final salary
- Y** = number of years' service to be included in the calculation
- n_P** = number of years of accrued service
- n_F** = number of years of future service from current age to 65, ie $65 - x$
- S** = current salary
- a_{65}^r** = retirement annuity at age 65 taking into account post-retirement pension increases
- e** = inflationary revaluation (due to salary growth) of the pension before payment starts

i, v, r_{65}, l_x, AL are the standard actuarial and pensions terms

$a_{\overline{Y}|}$ is an annuity payable for a limited period which is subject to all of the in-force decrements applicable for active members at the ages passed through

The formulae to determine the *SCR* and *AL* under each funding method are set out on the next page. These are the same formulae that we had before, where:

- again we assume that the only benefit is a pension payable at retirement (ie no benefit paid on death before retirement) but unlike previously, allow for pre-retirement mortality
- $R = 65$, E is the entry age, $n_F = R - x$, $n_P + n_F = R - E$ and $v = (1 + i)^{-1}$
- the second of the two definitions for the *AAAL* presented earlier has been used
- a Y year control period has been used for the *PUSCR*.

Attained Age

$$AASCR = \frac{f \times n_F \times S \times \frac{r_{65}}{I_x} \times (1+e)^{65-x} \times v^{65-x} \times a_{65}^r}{S \times a_{n_F}^{(i-e)}}$$

$$AAAL = f \times n_P \times S \times \frac{r_{65}}{I_x} \times (1+e)^{65-x} \times v^{65-x} \times a_{65}^r$$

Entry Age

$$EASCR = \frac{f \times (n_P + n_F) \times S \times \frac{r_{65}}{I_x} \times (1+e)^{65-x} \times v^{65-x} \times a_{65}^r}{S \times a_{n_P+n_F}^{(i-e)}}$$

calculated at assumed entry age

$$EAAL = f \times (n_P + n_F) \times S \times \frac{r_{65}}{I_x} \times (1+e)^{65-x} \times v^{65-x} \times a_{65}^r - SCR \times S \times a_{n_F}^{(i-e)}$$

calculated at the member's current age x , and allowing for the member's actual potential service from their own entry date, but with the SCR calculated at the assumed entry age.

Projected Unit

$$PUSCR = \frac{f \times Y \times S \times \frac{r_{65}}{I_x} \times (1+e)^{65-x} \times v^{65-x} \times a_{65}^r}{S \times a_Y^{(i-e)}}$$

where Y is the Control Period

$$PUAL = f \times n_P \times S \times \frac{r_{65}}{I_x} \times (1+e)^{65-x} \times v^{65-x} \times a_{65}^r$$

Current Unit (basic form, one-year Control Period)

$$CUSCR = \frac{f \times 1 \times S \times \frac{r_{65}}{I_x} \times (1+e)^1 \times v^{65-x} \times a_{65}^r + AL \times [(1+e)^1 - 1]}{S \times a_1^{(i-e)}}$$

where the second term in the numerator allows for the next year's salary increase that was not allowed for in the calculation of the AL .

$$CUAL = f \times n_P \times S \times \frac{r_{65}}{I_x} \times v^{65-x} \times a_{65}^r$$

These formulae for the Current Unit method can be adjusted to allow for inflationary growth if using the revaluation-adjusted form of the Current Unit Method, and can be adjusted to use a Control Period other than one year.



Question

Set out formulae for the *CUAL* and *CUSCR* allowing for statutory revaluation at $r\%$ *pa*, and a Y year control period, with the benefit payable at a retirement age of R .

Solution

$$CUSCR = \frac{f \times Y \times S \times \frac{r_R}{I_x} \times (1+e)^Y \times (1+r)^{R-x-Y} \times v^{R-x} \times a_R^f + AL \times \left[\left(\frac{1+e}{1+r} \right)^Y - 1 \right]}{S \times a_{\overline{Y}|}^{(i-e)}}$$

$$CUAL = f \times n_p \times S \times \frac{r_R}{I_x} \times (1+r)^{R-x} \times v^{R-x} \times a_R^f$$

The formulae given for the methods above are based on absolute final salary.

In practice the formulae would be modified to allow for the actual definition of final pensionable salary in the scheme rules.

Similar formulae apply for other forms of retirement pension, for non-pension retirement benefits and for benefits payable on events other than retirement.

Again, we cannot emphasise enough the importance of *understanding* funding methods, as well as knowing the above formulae.

For example, in the formulae above the SCRs are expressed as a percentage of active members' salaries. This is sensible because the amount of benefit accruing in a final salary scheme is also dependent on active members' salaries. Therefore if these salaries (and hence the benefits accruing) are higher or lower than expected, this is reflected automatically in the contributions paid. However, alternatively the contributions to be paid to a scheme could be expressed in monetary terms (eg in £s in the UK). This may be appropriate if the benefit accruing is fixed in monetary terms.



Question

As well as the value of benefits payable to current pensioners, deferred pensioners and active members, state what else should be allowed for in the calculation of the Actuarial Liability.

Solution

An allowance for any expenses which the scheme will incur in future should be considered when calculating the *AL* and also the *SCR*.

Some employers will make a separate payment for expenses.

4.2 Calculations for other types of scheme design

As already mentioned the definitions and formulae developed in this chapter primarily relate to final salary schemes. This material can however be extended to other types of defined benefit scheme design.

For example, let's consider a career average scheme financed using the Projected Unit method with a one-year control period.

We will assume:

- the only benefit will be a retirement pension payable from age R
- a member age x at the valuation date has an accrued pension at the valuation date of amount $AccPen$
- each year of accrued pension does not increase pre-retirement
- nil decrements pre-retirement.

The $PUAL$ for the member can be expressed as:

$$PUAL = AccPen \times \left(\frac{1}{1+i} \right)^{R-x} \times a_R^r$$

We will assume that the benefit that accrues over the next year is based on salary at the end of the year and salaries increase just before the year-end.

The $PUSCR$ for the member can be expressed as:

$$PUSCR = \frac{f \times 1 \times S \times (1+e) \times \left(\frac{1}{1+i} \right)^{R-x} \times a_R^r}{S \times a_{\overline{1}|}}$$

Scheme closed to new members

We will next consider a scheme that is closed to new members but has continuing accrual for existing members.

Closed scheme, increasing age / gender / salary / past service, entry age realistic before closure:

$$AASCR > PUSCR > EASCR$$

These relationships remain the same as for the mature ongoing scheme.

However, both the *AASCR* and the *PUSCR* will increase as the membership ages and will tend towards the same rate as the last active members approach retirement age.

The *EASCR*, of course, remains unaltered.

The *CUSCR* will be higher than the *PUSCR* but there are again too many uncertainties to determine its amount relative to the *AASCR*.

However, we saw earlier that the *CUSCR* increases rapidly towards retirement age as the 'revaluation bit' has a dominant effect.

Therefore, even if the *CUSCR* is below the *AASCR* in its stable state, it will overtake it at some point and end up much higher.

Scheme closed to any future accrual

For completeness, we will now consider a scheme closed to any future accrual.

No further retirement benefits accrue which suggests the cost of accrual will be zero. However, there may be insurance premiums to pay in relation to any death benefit provision and levies and expenses *etc* still accruing. These would result in a non-zero SCR, unless the actuarial liability already included a reserve for these ongoing costs.

Summary

From these relationships, it is possible to deduce the progress of the SCR over the lifetime of a pension scheme.

Given the experience of the scheme relative to the parameters used in the calculations and the way in which surplus and deficit are treated, it is also possible to deduce the progress with time of the Actuarial Liability and the Modified Contribution Rate.

8 Allowing for a surplus or deficit

8.1 Introduction

If a valuation shows that a scheme has a deficit, it is common for contributions in addition to the *SCR* to be paid to remove it. In this section we describe how these contributions may be set. We assume that the scheme is a *balance of cost scheme*, so it is the employer who will be responsible for paying these deficit recovery contributions.

If a valuation shows that a scheme is in surplus, one option is to reduce contributions below the level of the *SCR* to remove it. However, we shall see later in the course that the sponsor and / or trustees may wish to use the surplus for other purposes. Therefore, this section focuses on deficits.

8.2 Factors to consider when determining contributions to remove a deficit

A wide range of factors will influence the approach taken to removing a deficit.



Question

List factors that the trustees should consider when determining their desired approach to dealing with a deficit.

Solution

Factors include:

- the sponsor covenant
 - the funding position, *ie* size of the deficit and funding level
 - the investment strategy
 - the security of members' benefits now and in the future
 - affordability for the sponsor
 - the time period over which the deficit will be removed
 - other forms of security available during this period, *eg* charge over assets
 - the pattern of contributions during this period.
-

Pattern of contributions

The contributions to remove the deficit can be structured in different ways. One approach is to make equal monetary payments each year; this is sometimes known as the 'mortgage' method.

6.12 Examples of hybrid schemes include:

- cash balance schemes
- using longevity adjustment factors, so that the retirement age is increased for future service in the light of increasing longevity
- risk management options, including longevity swaps and bonds and insurance company investments
- giving a basic 'core' level of DB benefits, with other benefits such as indexation and spouse's benefits being discretionary
- offering a defined level of benefit and converting it to a DC fund when the member leaves the scheme (on withdrawal, death or retirement)
- fluctuating pensions, a core non-increasing pension is offered with an additional element which is purely discretionary and dependent upon the financial status of the scheme
- adjusting the scheme's retirement age in line with the country's State pension age
- collective DC schemes
- the use of with-profit funds within DC
- guarantees and risk-sharing provided by the insurance industry, *eg* minimum investment guarantees, and a retirement income guarantee.

[½ each, maximum 4]

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X2.4 In a particular country most occupational pension scheme provision is through traditional defined contribution arrangements where each member has an individual defined contribution account within the scheme.

An employer is setting up a scheme for the first time. The employer is considering offering a collective defined contribution scheme. The employer and employee contribution rates to the scheme would be fixed and expressed as a percentage of salary.

The scheme would provide:

- a basic final salary benefit with no pension increases in payment
 - discretionary pension increases dependent upon the scheme's funding level. A degree of smoothing of benefits will be incorporated over time.
- (i) Compare the relative merits of offering this scheme against offering a traditional defined contribution scheme from the perspective of the employer. [8]
- (ii) Outline the key factors to consider when determining the scheme's contribution rate. [3]
- (iii) Describe the risks that arise in relation to benefits with this scheme from the perspective of the employees. [3]

[Total 14]

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Solution X2.4**(i) *Relative merits of the two scheme designs****Similarities*

Under both schemes the employer's contribution rate would be fixed as a percentage of salary ... [½]

... this helps stabilise costs ... [½]

... although the absolute cost is unknown dependent upon the number of members and salary increases. [½]

*Differences*Attract and retain staff

The collective defined contribution (CDC) scheme may help attract and retain employees who prefer the predictable nature of the final salary benefit. [1]

However, the scheme's design is unusual in this country which may not be attractive to employees. [½]

Employees will likely find the operation of a traditional defined contribution (TDC) easier to understand and therefore attractive. [½]

Cost

The contribution rate for the CDC scheme may need to be higher than for a TDC scheme ... [½]

... so that it is likely be sufficient to provide discretionary increases as well as the basic benefit. [½]

Level of benefits

Discretionary benefits may need to be reduced in the CDC scheme if there is poor experience. [½]

There is a (small) risk that very poor experience means the CDC scheme is unable to provide the basic final salary benefit. [½]

If benefits are reduced this can have a negative impact on industrial relations. [½]

As benefits in the CDC scheme are smoothed over time, a riskier approach to investments can be taken ... [½]

... if this leads to higher returns being achieved then members should on average receive a higher pension than under the TDC scheme. [½]

Nature of benefits

The CDC scheme may better meet employee needs in offering a predictable basic benefit ... [½]

... although members may prefer the flexibility in the approach to retirement provision offered by a TDC scheme. [½]

Targeting of benefits

The employer may wish to target benefits towards certain employees ... [½]
 ... and the CDC scheme is better at rewarding employees with high salaries at the end of their career. [½]

Administration and communication

The administration of the CDC scheme is likely to be more complex ... [½]
 ... in particular monitoring the funding position ... [½]
 ... and determining the discretionary benefits to be offered ... [½]
 ... although it avoids managing individual member accounts required for TDC scheme. [½]
 It may be difficult to communicate to employees that discretionary benefits in the CDC scheme might be reduced / removed if there is poor experience. [½]

Legislative requirements

As the CDC scheme is less common, need to consider whether any legislative restrictions on its operation. [½]
 [Maximum 8]

(ii) **Factors to consider when setting the scheme's contribution rate**

The level of guaranteed benefit to be provided and therefore ... [½]
 ... the accrual rate ... [½]
 ... and pensionable salary definition. [½]
 The level of discretionary increases aim to provide ... [½]
 ... and degree to which wish to ensure such increases can be given. [½]
 A higher contribution rate will mean it is more likely that pension increases can be given. [½]
 The underlying assumptions ... [½]
 ... *eg* investment returns ... [½]
 ... and longevity. [½]
 The split of contributions between employer and employees. [½]
 Any legislative restrictions on level on contributions. [½]
 [Maximum 3]

(iii) ***Risks and uncertainties relating to benefits***

The basic benefit is relatively predictable ... [½]

... depending upon the employee's final salary ... [½]

... and number of years of service. [½]

There is a risk that discretionary increases are reduced / removed if the scheme is underfunded ... [½]

... eg due to poor investment performance ... [½]

... or increasing longevity. [½]

If this happens then employee benefits may be eroded by inflation. [½]

There is a risk that the award of discretionary benefits is unfair across generations impacting the benefits received by some employees. [½]

[Maximum 3]

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