# Subject CP1

## CMP Upgrade 2023/24

### 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 2023 CMP to make it suitable for study for the 2024 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 2024 *Student Brochure* for more details.

We only accept the current version of assignments for marking, *ie* those published for the sessions leading to the 2024 exams. If you wish to submit your scripts 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 2024 session.

This CMP Upgrade contains information on:

- 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 2024 exams.

# 1 Changes to the Syllabus

There have been a significant number of changes to how the Syllabus objectives are expressed.

In addition, a number of Syllabus objectives have been removed or reduced in scope. The main deletions are:

1.6 – responsibility for giving advice and taking decisions

5.2 – risks in projects

6.4 – risk reporting

9.1.6 – climate policy developments

9.3.1 – cashflows of simple financial arrangements

11.7.2 final bullet point – performing valuation calculations

11.7.5 – equalisation reserves

12.4 – insolvency and closure.

Syllabus objective 14 (principal terms) has also been removed, but equivalent wording has instead been included within the wider Syllabus.

A copy of the new Syllabus can be found within the CP1 Study Guide, which is available to download from the **ActEd.co.uk** website: see Products, Study Guides (under 'Core Study Materials').

 

# 2 Changes to the Core Reading

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

## Chapter 0

**Section 2**

Delete the phrase '**at all times or in all circumstances**' from the end of the second sentence in the first paragraph.

**Section 2.2**

Replace the ninth and tenth bullet points with:

- **monitoring the emerging experience and modifying models and strategies in light of this**

**Section 2.3**

In the first paragraph under the 'Feedback loops' heading, delete the phrase '**that it now appears exists**' from the end of the second sentence.

In the second paragraph under that heading, amend the first sentence to:

**More usually, the monitoring process indicates that the solution should be refined, either by bringing it up to date or by reflecting current experience.**

**Section 3.1**

Delete the final two points from the bullet point list.

**Section 10**

In the final paragraph under the sub-heading 'Monitoring the experience', put a full stop after '**inappropriate**' (second sentence) and replace the remaining text in that paragraph with:

**If the market is not competitive, larger profits can be made.**

In the next Core Reading paragraph (under the 'General economic and commercial environment' sub-heading), delete the second incidence of the word '**resultant**'.

## Chapter 1

**Sections 0, 1 and 2**

Core Reading and ActEd text in these sections have both been materially changed. Replacement pages 1 to 6 are included at the end of this document.

 

**Section 3.7**

Add the following bullet point at the start of the list:

- **declaring additional bonuses as expected for with-profit policies**

**Section 3.16**

Change the second bullet point to:

- **monitoring compliance with the legislation**

**Section 4**

This section has been materially changed. Replacement pages 11 and 12 are included at the end of this document.

**Section 6**

Delete this section.

**Section 7 (now 6)**

There are a number of changes in this section. Replacement pages 17 and 18 are included at the end of this document.

**Section 7.3 (now 6.3)**

In the third bullet point, insert a comma after '**skills**' and delete the phrase '**of actuaries and**'.

## Chapter 2

**Section 1**

In the paragraph starting 'The regulation of the sales process ...', delete the phrase '**for different types of product**'.

In the final Core Reading paragraph, replace the final phrase '**however suitable they might be for consumers' needs**' with '**directly to the consumer and are only sold through financial advisers**'.

**Section 2**

Delete the penultimate paragraph and the bullet point list that follows it.

**Section 6.1**

Add '**, regulators**' after '**suppliers**' in the first paragraph.

**Section 9.1**

In the last bullet point, amend the second sentence to:

**This provides insurers with additional information on some risk factors which would not normally be readily measurable.**

 

Insert the following new bullet point at the end of the list:

- **Social inflation is another shift in the insurance industry. It measures the increase in insurers' claims costs above the general economic inflation rate. Social inflation is most often driven by the increasing number of legal proceedings, as well as rising jury awards for legal settlements paid for disputed claims.**

**Section 9.6**

Delete the final sentence of the first bullet point ('**Clients can …**').

In the second bullet point, amend the text in brackets to '**(such as motor insurance and/or household insurance)**'.

## Chapter 3

**Section 4**

Replace the third and fourth bullet points with:

- **supervising the prudential management and conduct of financial organisations**

**Section 5.2**

Under the heading 'Treating the customer fairly', remove the full stop from the end of the first sentence and replace the second sentence with '**and treat them fairly**'.

**Section 6.2**

In this section (the heading for which is now just 'Competence'), delete the first Core Reading paragraph.

**Section 6.6**

This new section has been added: 'Regulation of other major strategic risks', with the following Core Reading content:

**Regulators may put in place requirements for companies in respect of major strategic risks, such as climate change, to limit the impact of these risks on the financial system.**

**Regulators could require companies to take a number of possible actions, such as assessing the impact of these risks, disclosing the impact of these risks to stakeholders, or considering these risks within the company's overall corporate strategy.**

**Section 7.1**

Replace '**involve**' with '**be principles based involving**' in the first sentence under the 'Freedom of action' heading.

**Section 7.5**

In the third Core Reading paragraph ('**Also, the regulatory body …**'), amend '**may be able to be run**' to '**may be run more**'.

 

**Section 8.1**

Delete the final sentence of the first paragraph (‘**The possible regulatory …**’) and all of the second paragraph (‘**This section …**’).

The second, third and fourth bullet points have been combined into one:

- **determine or influence interest rates, inflation rates or exchange rates**

**Section 9**

Delete this section.

## Chapter 4

**Section 1**

Amend the final sentence of the first paragraph, including the bullet points, to:

**The main types of social security, financial products and other financial arrangements are described in the following sections.**

Simplify the ‘Exam Tip’ Core Reading paragraph to:

**Detailed product knowledge is not required for Subject CP1 examinations, but candidates should be able to apply their understanding of the underlying principles for these basic contract types.**

**Section 5.3**

Delete the last sentence of the second paragraph under the ‘Retirement communities’ heading (about CCRCs) and delete the ‘Microinsurance’ sub-section.

**Section 8.1**

In the final sentence of the first bullet point of the Solution, delete the word ‘**very**’.

## Chapter 8

**Section 6.2**

Replace ‘**future time**’ with ‘**maturity date**’ in the first sentence.

**Section 7.2**

Delete the second paragraph of this section (‘**In practice the operation of an index-linked security …**’).

## Chapter 9

**Section 1.2**

Replace '**will**' with '**may**' at the end of the first sentence of the existing last paragraph of Core Reading.

Add the following new Core Reading paragraph at the end of this section:

**Equities are considered real investments that provide protection against inflation.**

**Section 4**

There have been material changes in this section. Replacement pages 11 to 14 are included at the end of this document.

## Chapter 10

**Section 4.5**

Delete the second paragraph of Core Reading.

**Section 9**

Replace the final bullet point with:

- **financial and investment markets – property liquidity risk, refinancing risk.**

## Chapter 11

**Section 3.4**

Add the following two paragraphs to the end of this section:

**Quantitative easing is a tool that a central bank can also use to meet an inflation target, by influencing interest rates.**

**Central banks can reverse QE by selling the assets they have bought. This process is sometimes called 'quantitative tightening', and this can raise interest rates and lower inflation.**

**Section 5.2**

Delete '**general level of the**' from the first sentence following the first Solution in this section.

## Chapter 12

**Section 5.2**

This section has been materially changed. Replacement pages 11 to 14 are included at the end of this document.

 

## Chapter 14

**Section 1**

Delete the word '**generally**' from near the start of the second Core Reading paragraph.

**Section 2.2**

Add '**investment management**' between '**of**' and '**risk**' in the boxed Core Reading text.

**Section 3.4**

Add the following to the end of this section:

**The complexity in analysing ESG factors exposes investors to the risk that companies may try to convey a more positive impression of their ESG credentials to investors than is actually the case. This is sometimes referred to as greenwashing.**

## Chapter 15

**Section 1**

This section has been materially rewritten. Replacement pages 3 and 4 are included at the end of this document.

**Section 2**

Delete this section.

## Chapter 16

**Section 6**

Delete this section.

## Chapter 17

**Section 2.3**

Insert the following after the first two paragraphs:

**A stochastic model is a model where one or more of the inputs are random variables.**

Replace the last sentence of the first paragraph under the heading 'Merits of a stochastic model' with:

**It should be borne in mind, however, that each time the model is run, the value of the random variables could differ. This means that each iteration of the model has the potential to yield different results.**

 

**Section 5**

In the third Core Reading paragraph, replace '**know what equity market fall**' with '**know the extent / magnitude of the equity market fall**'.

**Section 7.1**

Replace the first two paragraphs with:

**In most cases the options and guarantees that are dependent on future investment returns, or a future investment value (yield or capital value), give providers a cause for concern.**

**Because the benefits are dependent on future financial events (and hence are uncertain), a stochastic investment model should be used to assess the provisions necessary for such guarantees.**

## Chapter 18

**Section 1.3**

The penultimate bullet point has been amended to '**sexual orientation**'.

**Section 2.2**

In the penultimate Core Reading paragraph, add the phrase '**, and to have strict data governance processes in place**' to the end of the sentence.

Delete the final Core Reading paragraph in this section.

**Section 3.3**

In the final Core Reading paragraph in this section, delete the phrase in brackets, *ie* '**(staff, …)**'.

**Section 3.4**

In the second Core Reading paragraph, insert '**fully**' before the final word '**achieved**'.

**Sections 4.1, 4.2 and 5.1**

There have been a number of amendments in these sections, so replacement pages 9 to 12 are included at the end of this document.

**Section 5.2**

Amend the title of this section to 'Data quantity and quality', delete the two sub-headings ('Publicly available data' and 'Internal data') and the first Core Reading paragraph.

 

**Section 6.1**

The first line of Core Reading content and its associated bullet points are now part of Section 5.2.

Replace the remaining Core Reading content in Section 6.1 with the following:

**Even when a company has improved its data systems, it may take many years for enough data to be collected for analysis purposes.**

This updated Core Reading should now be the last paragraph of Section 5.2.

**Section 6.2 (now 6.1)**

Remove the phrase '**, adding any coding that is necessary**' from the end of the second paragraph.

**Section 7.2**

Delete the last two Core Reading paragraphs in this section ('**For example, …**' and '**However, if a …**').

**Section 8.1**

In the first paragraph, replace the phrase '**that help to indicate the validity of**' with '**when validating**'.

**Section 8.2**

In the second paragraph, delete the final sentence ('**This information will …**').

**Section 8.4**

Delete this section.

**Section 8.5 (now 8.4)**

Replace the first paragraph with:

**Whatever the source of the data provided, an actuary will need to perform checks on the data before using it.**

**A decision will then have to be made as to how the data will be checked and the level of detail of the checks that will be appropriate.**

Delete the ninth and tenth bullet points (including the related ActEd content).

**Section 9.1**

Delete the final sentence of the final paragraph ('**Similarly if …**').

**Section 9.2**

Shorten the fourth Core Reading paragraph to:

**It is also unlikely that summarised data could be used to value options or guarantees.**

**Section 10**

This Section is now titled 'External data', with Sections 10.1 to 10.4 having been combined to form new Section 10.1 'Industry data'.

Delete everything in the second Core Reading paragraph (currently in Section 10.2) after '**whole**'.

Amend the second sentence in the third Core Reading paragraph (currently in Section 10.3) to finish '… **precisely comparable for a number of reasons. For example:**'.

**Section 11**

Delete this section.

## Chapter 20

**Section 1**

There have been material changes to this section, so replacement pages 3 to 5a & 6 (also covering Section 2) are included at the end of this document.

## Chapter 22

**Section 6.2**

In the third sentence of the last paragraph of Core Reading in this section, replace '**discriminate**' with '**differentiate**' and insert '**lower**' before '**mixed**'.

**Section 7.2**

Delete the last paragraph of Core Reading (*ie* the paragraph starting: '**While not charging …**').

## Chapter 24

**Section 1.1**

In the second sentence, delete '**of this course**' and in the third sentence amend '**It will be seen that these steps …**' to '**The steps …**'.

**Section 1.4**

Delete '**with or without controls**' from the end of the fourth bullet point.

**Section 1.5**

Replace the last sentence of the Core Reading paragraph starting '**Frequently risk mitigation …**' with:

**Another example would be a bank taking action when one or two loan repayments are missed, rather than waiting for the borrower to completely default on the loan.**

 

**Section 2**

Add '**financial**' before '**stability**' in the third bullet point.

**Section 3**

Delete this section.

**Section 4.1 (now 3.1)**

In the first sentence, delete '**is risk that**'.

## Chapter 25

**Section 1.1**

Replace the point '**Identifying all the risks …**', including the subsequent bullet points, with the following:

**Identifying all the risks in an organisation is a difficult task and requires good knowledge of the circumstances, as well as the business and regulatory environment in which it operates.**

**Section 1.2**

Delete the second bullet point.

Replace the fourth bullet point with:

- hold brainstorming sessions that involve staff from across the organisation, together with external experts.

  **This should make use of the experience of staff who have joined from similar organisations, and of consultants with broad experience of the industry concerned.**

**Section 1.3**

The Core Reading in this section has been deleted, with the remaining text being rewritten and included at the end of Section 1.2 under a new 'Risk matrices' heading. Replacement pages 5 and 6 are included at the end of this document.

**Section 3.2**

In the second sentence of the first bullet point, delete the phrase '**under consideration**'.

**Section 3.4**

Replace the first two bullet points with:

- **there may not be sufficient available assets (*eg* in terms of their nature or duration) to match the liabilities**

Change '**additional**' to '**surplus**' at the start of the final paragraph of Core Reading.

**Section 4.1**

The bullet point '**general debtors …**' is no longer Core Reading, but has been broadly retained as the following ActEd text:

> Another example would be where the purchaser of goods and services fails to pay for them.

**Section 4.3**

Replace the final paragraph with:

**A company may act to improve its credit rating and these actions may affect the value of that company's shares.**

**Section 5.1**

Delete the first sentence.

In the boxed text, delete the phrase '**enable it to**'.

**Section 5.2**

Delete the second sentence in the first paragraph.

In the first paragraph below the heading 'Banks', amend '**(loans, including mortgages)**' to '(**loans and mortgages)**'.

**Section 6.1**

Delete the last three bullet points and the indented paragraph immediately below the final bullet point.

## Chapter 26

**Section 2.1**

Amend the second sentence under the 'Risk of illiquid assets' heading to:

**This illiquidity may arise when illiquid assets have been set aside to fund the benefits.**

**Section 3.2**

Remove '**, or the real level,**' from the fourth bullet point.

 

Amend the first two paragraphs under the 'Risk of insufficient assets' heading to:

**Other uncertainties arise from the shortfall between the funds set aside and those required to cover the future benefit payments.**

**In such a case, additional funds would be required. In theory, these additional contributions could be provided at any time before the benefits need to be paid. However, in practice there may be either legislative or self-imposed constraints on the timing of these contributions or the sponsor may become insolvent before the additional funds are provided.**

Delete the following from the end of the first sentence under the 'Cost of guarantees' heading:

**, which will arise if those guarantees ever apply**

**Section 5.2**

Change the first paragraph of Core Reading to:

**These are the risks that assumptions made about the future mortality of lives are different from the actual experience.**

## Chapter 27

**Section 1.2**

Insert '**under Basel regulations**' after '**requirements**' in the last sentence of the Core Reading in this section.

**Section 2.4**

Replace the first two paragraphs with:

**When designing a product, there can often be a desire to add more options or product features to make a product more marketable. However, each additional option or product feature introduces new risks, which will increase the cost of the product.**

## Chapter 28

**Section 1.3**

Delete '**occurrence isn't an on/off event, but to quantify the risk simply**' from the second Core Reading paragraph.

Amend the start of the last sentence in this section to '**Aside from COVID-19, one has to go back more than 100 years …**'.

**Section 1.4**

Replace the final bullet point list with:

**Examples of possible categories might include:**

- **fraud**
- **computer error**
- **loss of key personnel**
- **mis-selling.**

**Section 2**

In the second sentence in the Core Reading paragraph at the start of this section, amend '**whether a company is vulnerable**' to '**how vulnerable a company is**'.

**Section 2.1**

Delete the second sentence (starting '**Again, this is likely …**') in the third bullet point.

**Section 2.2**

Delete '**extreme**' from the first sentence.

**Section 2.3**

Delete the fifth bullet point ('**the value of the …**').

**Section 2.4**

Delete the penultimate paragraph ('**It might also occur …**').

**Section 2.5**

Insert '**and the data**' before the final word of Core Reading ('**used**') in this section.

**Section 3.1**

Delete the phrase '**for financial product providers**' from the second Core Reading paragraph.

**Section 3.2**

Delete the fourth bullet point ('**Operational risk …**').

**Section 5**

Delete this section.

**Section 6 (now 5)**

This section has been materially changed, as has the related content in the Summary. Therefore replacement pages 17 to 22 are included at the end of this document (existing pages 23 and 24 can also be removed).

 

## Chapter 29

**Section 6.7**

This has been materially changed. Replacement pages 25 and 26 are included at the end of this document.

## Chapter 30

**Section 1**

Insert the following at the start of this section:

**A financial product provider can diversify their risks in a number of different ways.**

Amend the boxed text to the following:

**For example, an insurer could diversify by:**

- **selling different lines of business**
- **selling to different target policyholders**
- **selling in different geographical areas**
- **using different reinsurers**
- **investing in different asset classes**
- **investing in different assets within an asset class.**

**Section 6**

Replace the first sentence of Core Reading with:

**The first step of the risk management process (as described in earlier chapters) will have identified a range of high impact but low probability risks.**

## Chapter 32

**Section 5.4**

Delete this section on equalisation reserves.

## Chapter 33

**Section 2.5**

Delete the final Core Reading bullet point list, including the introductory line ('**Possible disclosure requirements** …').

## Chapter 34

There is now very little Core Reading remaining in this chapter, but most of the content has been rewritten as ActEd text. We would recommend that you continue to familiarise yourself with the contents of this chapter, to assist with questions that could arise on closed benefit schemes and/or companies that are (or are close to being) insolvent.

## Chapter 35

Section 3.1

In the last sentence of the first Core Reading paragraph, amend '**an overseas state**' to '**a different country**'.

## Chapter 37

**Section 5.1**

Delete the first two Core Reading sentences under the 'Provision of capital and margins for future adverse experience' heading ('**There are several reasons …**').

Replace the first sentence of the first Core Reading paragraph under the 'Business objectives of the company and retention of margins' heading with:

**One of the business objectives of a with-profit life insurance company is to maximise the profit distribution to policyholders. This is to improve its competitive position by demonstrating good returns for the premiums invested.**

**Section 5.2**

Amend the start of the second paragraph under the heading 'Source of surplus' to '**For a final salary pension scheme, surplus may arise …**'.

## Chapter 38

**Section 1**

Replace '**level of profit**' at the end of the second paragraph with '**objectives**'.

## Chapter 39

**Section 2**

Add the sentence '**This was previously covered in Subject CM1.**' at the end of the definition for the Discounted income model.

 

Include the following new glossary term:

## Dividend discount model

**The general model can be expressed as:**

$$V = \sum_{t=1}^{\infty} D_t v(t)$$

**where:**

- $V$ **is the value of the share**
- $D_t$ **is the gross amount of the** $t^{th}$ **dividend payment**
- $v(t)$ **is the discount factor applied between time 0 and the time of the** $t^{th}$ **dividend payment.**

**Please also refer to Subject CM1.**

# 3 Changes to the ActEd material

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

## Chapter 1

**Summary**

On the second page, delete the 'Advice and decisions' section.

**Practice Question 1.9**

Delete this question (and its solution).

## Chapter 3

**Section 0**

Delete the fourth paragraph and the last bullet point.

**Section 6.2**

Replace the first ActEd paragraph with:

It is important that individuals who are employed in a particular role have the appropriate level of competence for that role.

**Section 6.6**

Insert the following after the Core Reading in this new section:

Many countries have put regulation and other policies in place in order to meet the requirements of the Paris Agreement (2015) on climate change, and to support the United Nations' Sustainable Development Goals.

As discussed in the chapter on the External environment, climate change could have a significant impact on the financial system – and regulators have a key role in managing this.

**Summary**

On the second page, add the following sub-bullet at the end of the sub-section 'Maintaining confidence':

– requiring consideration of climate and other major strategic risks

Delete the 'Climate risk related policy and regulatory developments' section from the third page.

**Practice Question 3.6**

This question (and its solution) has been moved to Chapter 25 (now Practice Question 25.8).

## Chapter 4

**Section 5.3**

Insert the following two new paragraphs after the second sentence of the first paragraph (which has now been split into two Core Reading paragraphs at that point):

Pooling a large number of individual events or risks reduces the volatility or uncertainty of the outcome. This idea is explored further, from the providers' perspective, in the chapter on Accepting risk.

Pooling can also have operational advantages.

**Summary**

On the second page, replace the sentence at the end of the section on 'Insurance principles' with:

Retirement communities are an example of pooling of risk.

## Chapter 6

**Section 0**

In the second paragraph, delete all but the first sentence.

**Section 14.2**

Amend the ActEd paragraph to:

Retirement communities, which were mentioned in an earlier chapter, are another example of a group version of long-term care provision.

## Chapter 7

**Section 0**

In the second paragraph, delete all but the first sentence.

**Section 1.5**

In the first sentence of the final paragraph, amend 'insurance cycle' to 'underwriting cycle'.

## Chapter 8

**Section 6.4**

In the Solution, under the sub-heading 'Yield – expected return relative to other assets', insert 'relatively' after 'as' in the first sentence.

 

**Section 7.2**

Replace the first paragraph of ActEd text in this section with the following:

In practice, the cashflows of an index-linked security are not based on the relevant inflation index at the time of payment, due to delays in calculating the index. Also, the borrower (or perhaps the investors) may need to know the amounts of the payments in advance. This usually leads to the index from an earlier period being used. The difference between the time of the index used and the time of payment is referred to as the 'lag' in the indexation.

**Summary**

In the last sub-section ('Comparison of …'), insert 'government' before 'bond' in the first line of the equation, and similarly before 'bonds' (two places) in the final paragraph.

## Chapter 9

**Section 1.2**

Add the following at the end of this section (after the new Core Reading paragraph):

Over the long term, equities would be expected to provide a return that matches or exceeds inflation, but this is not a perfect hedge and there can be significant short-term variation.

**Summary**

In the second column of the table on the second page:

- delete 'susceptible to political risk' from the first row
- add '; uncertainties relating to government intervention and expenses also contribute to volatility' in the third row
- add ', valuation issues' in the sixth row.

Simplify the text below the table (above the sub-heading 'Freehold and leasehold') to:

There is also the possibility for investment characteristics to be changed by the investor, *eg* redevelopment.

## Chapter 10

**Section 4.5**

Expand the first paragraph of ActEd text to the following:

Investors trading in futures rarely want to actually receive delivery of the underlying asset and so will normally aim to trade out of a long position before the agreed delivery date.

For example, a financial institution trading in sugar futures won't have any use for several tonnes of sugar, should it take a long position.

 

Amend the start of the next paragraph from 'For example, consider …' to 'This position may be taken by …'.

**Section 9**

Add the following paragraph to the end of this section:

Refinancing risk includes the risk of the borrower being unable to obtain a further affordable loan at maturity in order to repay the capital due, *eg* due to high interest rates or a low credit rating.

## Chapter 11

**Section 1.3**

Replace 'protects' with 'should protect' in the second paragraph.

**Section 3.4**

Add the following paragraph to the end of this section (after the new Core Reading content):

If the central bank sells assets back into the market, this takes money out of the financial system. The greater scarcity of money supply increases its 'price', *ie* can lead to higher interest rates.

**Summary**

In the section 'Interest rates', delete the first sentence of the first paragraph below the bullet points ('The level of …') and insert the following at the end of that section:

This process could be reversed (quantitative tightening: selling assets back into the market) with the aim of increasing interest rates.

## Chapter 12

**Summary**

In the 'Equity valuation' section, delete everything except the first two sentences and the final bullet point list ('Other equity valuation methods include …').

**Practice Question 12.2**

Delete the question (and solution) for part (i).

**Practice Question 12.3 solution**

Change '\$5.9*m*' to \$5.1*m*' at the end of the third bullet point from the end.

## Chapter 13

**Section 2.6**

Delete the final paragraph ('The assumption …').

## Chapter 15

**Section 3 (now 2)**

This section is now titled 'Nature of liabilities'. The introductory text now forms Section 2.1 ('Liability cashflows'), with previous Sections 3.1 *etc* becoming Sections 2.2 *etc*.

In new Section 2.1, replace the first paragraph with the following three paragraphs:

Consider a benefit scheme or a portfolio of insurance policies. Contributions or premiums are received, which might be partly used to cover immediate costs associated with the scheme / policy, with the remainder being invested. Investment returns will be earned on this amount, until benefits / claims and any further expenses are paid out.

The liability cashflows of a financial product provider are therefore the future expected benefit / claim payments and expenses, net of any expected future premiums / contributions.

We can start to categorise these liability cashflows, with a view to then choosing the most appropriate asset class to match each category.

**Section 3.4 (now 2.5)**

Insert the following new Question and Solution at the end of this section:

**Question**

State the liability cashflows arising from a portfolio of immediate annuities and how each would likely be categorised.

**Solution**

Annuity benefits – guaranteed in money terms if the annuities are level or have fixed increases, or guaranteed in terms of an index if they are index-linked.

Expenses – the closest category is likely to be 'guaranteed' in terms of an index.

(There are no future premiums to deduct since immediate annuity business is single premium.)

**New Section 3**

This section is titled 'Matching assets' and comprises previous Sections 3.5 and 3.6 (now 3.1 and 3.2 respectively).

**Section 3.6 (now 3.2)**

Insert the following new Question and Solution at the end of this section:

**Question**

Suggest appropriate matching assets for a portfolio of immediate annuities.

 

**Solution**

Appropriate assets would be:

- fixed-interest bonds of appropriate term to match annuity benefits that are level (or with fixed increases)
- index-linked bonds of appropriate term to match index-linked annuity benefits and expenses
- denominated in the same currency as the annuity benefits / expenses, likely domestic.

(The portfolio of bonds would be chosen so that the expected coupons and redemption amounts matched the expected liability cashflows as closely as possible.)

**Summary**

Insert a new section 'Matching assets' above the section 'Mismatching', containing the following text:

Different types of asset are suitable for each of the four categories of liability by nature.

Asset selection should also take into consideration matching by term and currency.

**Practice Questions 15.1 and 15.2**

Delete these questions (and their solutions).

## Chapter 16

**Section 0**

In the final paragraph, delete the phrase ', the different ways of measuring key investment risks'.

**Section 7 (now 6)**

At the start of this section, insert the following:

In this section we explore how investment performance might be assessed, including measurement of the risk taken.

**Section 6.4**

This new section has been added at the end of previous Section 7. Replacement pages 17 and 18 are included at the end of this document.

**Summary**

Delete the section on 'Measuring investment risks'.

## Chapter 18

**Section 0**

Amend the sixth paragraph to:

In Section 5 we look at the main uses of data within actuarial work and identify the two main operational considerations: data quality and quantity.

Amend the ninth paragraph to:

In Section 8 we consider how data may be checked.

Add the phrase 'and mention some other possible external sources' to the end of the eleventh paragraph.

Delete the final paragraph of this section.

**Section 1.3**

Add ', or could create significant risk to their fundamental rights and freedoms' at the end of the first paragraph.

Insert the following after the bullet point list:

Such data is sometimes referred to as 'special category data'.

**Section 3.3**

Insert the following at the end of this section:

This would include both internal stakeholders (*eg* managers) and external stakeholders (*eg* customers / members, shareholders, regulators, credit rating agencies, *etc*).

**Section 5.2**

The Question and Solution have been moved to Section 10.1 (and the paragraph below them can be deleted).

**Section 8.5**

Delete the Question and Solution from this section.

**Section 10**

Add the following at the very start of this section:

Although internal data would often be of most relevance to an investigation, there may not be a sufficient available quantity of such data. External data might therefore be required, for example from industry-wide data collection schemes.

Insert the following after the second Core Reading paragraph (currently Section 10.2):

Industry-wide data is also likely to be more credible than an organisation's own internal data.

 

Insert the following after the second bullet point list (currently Section 10.4):

Industry data might also be available from publicly available financial reports.

**Summary**

Under the heading 'Checks on data', delete the ninth and tenth bullet points.

Amend the heading 'Industry-wide data collection schemes' to 'External data'.

Delete the section 'Risk classification and reduction of heterogeneity'.

**Practice Question 18.12**

Within the brackets, insert 'and medical care' after 'housing'.

## Chapter 20

**Summary**

The first page of the Summary has been materially changed and so replacement pages 21 and 22 are included at the end of this document.

## Chapter 22

**Section 0 & Summary**

Amend the sixth bullet point to 'target market for the product' (and similarly in the Section 5 title).

**Section 7.2**

In the second Solution, insert the following additional point under part (ii) on household property insurance:

- guarantee that premiums will not increase at a rate greater than x% *pa* over the next three years if remain a customer

**Section 11.1**

Amend the second paragraph to:

New business strain arises because the premium received in the first year may be less than the sum of the initial expenses, the initial commission paid and the initial increase in provisions (or reserves). It may also include the need to cover initial solvency capital requirements.

## Chapter 23

**Section 3.3**

In the second sentence of the first ActEd paragraph, insert 'upfront' after 'is made'.

## Chapter 24

**Section 0**

Add the following two paragraphs at the beginning:

Risk arises as the consequence of uncertain outcomes. This uncertainty may relate to the probability associated with a particular outcome, the severity of the impact of that outcome, or a combination of the two.

It is worth bearing in mind that risk does not only relate to adverse outcomes, and organisations might aim to take on greater levels of risk in order to gain from the potential upside.

Delete the second bullet point.

**Summary**

On the first page, insert 'financial' before 'stability' in the third bullet point under the sub-heading 'Benefits'.

Change the 'Risk terminology' sub-heading at the top of the second page to 'Systematic *vs* diversifiable risk' and delete the 'Risk *vs* uncertainty' sub-section immediately below it.

## Chapter 25

**Section 0**

In the first sentence, delete the phrase 'including specifically within project management'.

**Section 1.1**

Insert the following at the end of this section:

Once risks have been identified, they should be recorded in the organisation's risk register.

**Section 1.2**

In the third bullet point, insert ', and risk matrices' after 'purposes'.

**Summary**

Insert ', and matrices' at the end of the second bullet point under the heading 'Risk identification'.

Replace the third bullet point with:

- brainstorming sessions, including using the experience of staff joining from similar organisations, external consultants and experts.

Delete the fourth bullet point and the sub-bullet points following it.

Delete the third bullet point under the heading 'Credit risk'.

**Practice Question 25.2**

Delete part (i) of this question (and its solution).

## Chapter 26

**Section 0**

In the Solution, under the sub-heading 'Defined contribution scheme', add the phrase ', less any charges that apply' to the end of the first paragraph.

**Section 1.1**

In the Solution, under the sub-heading 'Defined benefit scheme', amend the first bullet point to:

- a reduction in benefits, *eg* if it is a State-operated scheme and the government reduces the benefits offered

## Chapter 27

**Section 2.5**

Replace the last sentence before the Question with:

These ideas were discussed in the earlier chapters on Data and Mortality and morbidity.

In part (ii) of the Solution, insert the following at the end of the first bullet point (before the full stop):

(although legislation may require that the premium charged does not differentiate by gender)

## Chapter 28

**Section 0**

Replace the final sentence with:

Section 5 focuses on risk reporting, including reporting at enterprise level and issues arising.

**Section 2.3**

Delete the fifth bullet point in the Solution.

 

**Section 4.1**

Replace the ActEd paragraph in this section with the following:

As a reminder, the main risk measures mentioned in the earlier chapter were:

- tracking error: the standard deviation of portfolio returns relative to the benchmark, to measure active risk
- Value at Risk (see below).

**Practice Question 28.5**

Delete this question (and its solution).

**Practice Question 28.7 (now 28.6)**

Delete 'risk portfolio or' from the question and all references to 'portfolio' within the solution.

## Chapter 29

**Summary**

In the final section (ART), replace 'Reasons why providers …' and the final bullet point list with 'ART can be used to manage risk, stabilise results and manage capital.'

## Chapter 30

**Section 6**

Replace part (i) of the Solution with:

(i) Government collapse – diversify by investing in more than one South American country, monitor governments over time in order to make appropriate strategic decisions if there is an increased risk of government collapse.

**Summary**

Add the following after the first bullet point:

- target market

**Practice Question 30.10**

Delete part (ii) of this question (and its solution).

**Practice Solution 30.12**

Under 'Risk identification', amend the list of techniques to:

- use of risk checklists / matrices [½]
- brainstorming sessions involving consultants, experts in banking and wider aspects of finance [1]
- use of experience of staff joining from other banks. [½]

In the fifth point under 'Risk measurement', remove the references to tracking errors and conditional expected shortfall / Tail VaR.

In the first point under 'Risk monitoring', remove the reference to the risk portfolio.

## Chapter 31

**Section 3.1**

In the Solution, add the following bullet point:

- expected benefit amounts (unless is a fixed benefit scheme)

## Chapter 32

**Summary**

Delete the final bullet point regarding equalisation reserves.

## Chapter 33

**Section 2.5**

Delete the final Question and Solution in this section.

**Summary**

Delete the final bullet point list, including the introductory line ('Possible disclosures …').

## Chapter 35

**Section 1.3**

Under the heading 'Statutory or solvency requirements':

- amend 'statutory reserves' to 'provisions' in the seventh paragraph (starting 'As previously described …)
- insert '(plus any prudential margins in the provisions)' after 'solvency capital' in the eighth paragraph
- insert '(and any prudential margins)' after 'release of capital' in the ninth paragraph.

**Practice Solution 35.2**

Change 'catastrophe equalisation reserve' to 'support dividend payments when earnings are low' in the penultimate bullet point.

## Chapter 37

**Section 3**

Amend the title of this section to 'Sources of surplus / profit and management actions to control'.

**Section 3.2**

Change the heading of this section to:

Management actions to control surplus / profit

**Section 5.1**

Amend the start of the question under the heading 'Stakeholder expectations' to 'List the factors that …' and insert the following at the end of the solution:

The performance of the investment markets would also likely have an influence on these expectations.

 

# 4 Changes to the X Assignments

There have been minor changes throughout the assignments, including changes to mark allocations, and more material changes to the following questions and solutions:

- Assignment X2: Questions X2.3 and X2.8, with corresponding adjustments to X2.9 and part of the background to the Scenario.
- Assignment X5: Question 5.3.

If you would like the new assignments *without* marking, then retakers can purchase an updated CMP or standalone X Assignments at a significantly reduced price. Further information on retaker discounts can be found on the **ActEd.co.uk** website (Prices, Retaker Discounts).

If you wish to submit your scripts 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 2024 session. We only accept the current version of assignments for marking, *ie* those published for the sessions leading to the 2024 exams.

 

# 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 CP1:

- 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 2024 *Student Brochure*, which is available from the ActEd website at **ActEd.co.uk**.

## 5.2 Tutorials

We offer the following (face-to-face and/or online) tutorials in Subject CP1:

- a set of Regular Tutorials (lasting a total of five days)
- a Block (or Split Block) Tutorial (lasting five full days)
- an Online Classroom.

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

## 5.3 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 2024 *Student Brochure*, which is available from the ActEd website at **ActEd.co.uk**.

## 5.4 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 **CP1@bpp.com**.

# 1

# Actuarial advice

## Syllabus objectives

1.1 Understand the clients that actuaries advise and the considerations to ensure that this advice meets the needs of stakeholders.

- 1.1.1 How stakeholders other than the client may be affected by any actuarial advice given.
- 1.1.2 The business roles that actuaries advise and the types of advice that actuaries may give to their clients.
- 1.1.3 Why and how certain factual information about the client should be sought in order to be able to give advice.
- 1.1.4 Why subjective attitudes of clients and other stakeholders – especially towards risk – are relevant to giving advice.
- 1.1.5 The professional and technical standards that may apply to actuarial advice.

# 0 Introduction

This chapter looks at the different clients that actuaries are called on to advise or communicate with, and other stakeholders who may be affected by any advice in the wider context. It also considers the information that should be sought from the client before advice is given and discusses the professionalism framework of the Institute and Faculty of Actuaries.

It is very important to take on board the contents of this chapter, as failure to act in a professional manner could result in fines and disqualification from the actuarial profession.

Advice provided by actuaries might be:

- indicative – giving a high-level opinion without full investigation of the issues
- factual – based on research
- recommendations – fully researched and modelled, considering alternatives.

Often actuaries will involve other professionals in giving advice, such as accountants or lawyers.

It is important when providing advice that:

- all assumptions made are relevant to the client and their circumstances
- these assumptions are clearly explained to the client
- the rationale for any decisions made is clearly documented
- alternative solutions are also set out and clearly explained.

Normally, it will be the client that decides which solution to adopt. The actuary needs to be aware of whether the client is asking them solely to give advice, *eg* to *recommend* bonus rates on with-profit policies, or to make a business decision, *eg* to *determine* surrender values.

The majority of the additional material in this chapter (beyond the Core Reading) is in the form of examples and questions, to encourage you to think about and apply the information as you read.

On your first reading, you may find that you have questions about the finer details of some of the issues mentioned, *eg* setting premium rates for insurance policies and funding retirement benefit provision. These, and many other areas, will be considered throughout the rest of Subject CP1. The purpose of this chapter is to give an overview of the context in which actuaries may provide advice.

 

# 1 The clients actuaries advise

## 1.1 Possible clients

**There are many clients whom actuaries can advise or provide information to. The types of advice and the stakeholders that may need to be provided with advice will vary depending on the work involved.**

**In the private sector, actuaries can provide advice to providers of financial services and benefits, and to a potentially wide range of stakeholders such as scheme sponsors, providers of capital to such organisations, consumers and regulators. In the private sector, actuaries providing advice may be employees of the organisation or independent consultants.**

Stakeholders advised in the private sector include:

- policyholders
- prospective policyholders
- members of benefit schemes and their dependants
- employers
- insurance company – board of directors
- insurance company – shareholders
- insurance company creditors
- trustees of benefit schemes
- sponsors of benefits schemes
- employees
- auditors of insurance companies
- auditors of the sponsors of benefit schemes
- investment fund managers
- members of investment schemes
- sponsors of capital projects
- banks.

**In the public sector, actuaries could advise central and local government departments and related organisations, such as central banks and regulatory bodies.**

# 2 Other stakeholders affected by actuarial advice given to clients

**It is important to identify all the stakeholders involved when any actuarial advice is given.**

As well as the client, there will be other interested parties.

**In most circumstances different categories of stakeholder have different interests. In most situations one or more stakeholders will remunerate the actuary, but there will be several other stakeholders with significant interests who do not contribute directly to the actuary's remuneration.**

**In many cases the advice given to a client by an actuary will impact on other stakeholders. The actuary needs to consider the interests of all stakeholders, and not only those who seek (and pay for) advice.**

**It is important to consider all stakeholders because omitting a stakeholder will distort the context, *eg* one stakeholder's risk can be a source of another stakeholder's gain.**

For example, consider the level of contributions to be made by the sponsor of a benefit scheme. A lower level of contributions may reduce the sponsor's costs (at least in the short term) but increase the risk of insufficient funds being available to meet the members' expected benefits.

**It is also necessary to retain a sense of proportion in considering who else may be affected by advice given.**

The actuary should consider the extent of each stakeholder's interest and how significant it is compared to those of the other stakeholders. Where stakeholders' interests conflict, difficult judgements may be required.

The following sections gives examples of the range of stakeholders who might be involved in what may initially appear to be a simple situation.

## 2.1 Example: business expansion

**For example, where an actuary is advising the board of directors of an insurance company that is planning a large expansion in business, the advice may have an impact on the following and many other factors:**

- **the level of benefits received by policyholders**
- **the level of premiums paid by policyholders**
- **the volume of new business written by the company**
- **the solvency of the company**
- **shareholder dividends.**

The advice might also have an impact on:

- the level of taxes that the Government receives on the profits earned by the company
- other insurance companies that are competing in the same market
- reinsurance companies through the level of reinsurance business that the company requires
- the employees of the insurance company through the employment benefits they receive
- job security for the employees of the insurance company
- the work of the regulatory authorities that monitor the insurance company
- other insurance companies who may be required by legislation to contribute to a compensation scheme that pays benefits to the policyholders of insurance companies that fail
- employed sales staff and independent intermediaries.

**Similar lists of stakeholders can be developed in other scenarios where actuarial advice is given.**

## 2.2 Example: pension scheme investment policy

Where an actuary is advising the trustees on the investment policy for the assets of a pension scheme, the main other stakeholders who could be impacted by that advice are:

- the employer who sponsors the scheme
- the providers of capital to the sponsoring employer
- the members of the scheme
- the dependants of the members of the scheme.

However there are many other potential stakeholders in this advice, including:

- the fund managers who will be responsible for implementing the policy and will consider issues such as their expertise and experience in the proposed investment style and the associated costs
- employees who are not members of the scheme who may be affected if their employer is faced with unanticipated pension scheme liabilities in the future as a result of the investment policy chosen
- creditors and customers of the sponsor of the scheme, who may be similarly affected if the employer faces unexpectedly large pension scheme contributions in the future.

This is a good example of the need to retain a sense of proportion when considering who may be impacted by actuarial advice. The stakeholders identified in the first list are the more significant and so should be given greater weight by the actuary giving the advice.

 

## 2.3 Example: insurance company takeover

Where an actuary is advising an insurance company (Company A) that is taking over another insurance company (Company B), that advice can have an impact on:

- the shareholders of Company A
- the shareholders of Company B
- the policyholders of Company A
- the policyholders of Company B
- the employees of Company A
- the employees of Company B
- the future policyholders of the combined company.

### Question

Suggest other less significant stakeholders on whom this advice may have an impact.

### Solution

Other stakeholders in this advice may include:

- the auditors of the two companies
- the regulator (who is likely to be particularly interested in the security of the benefits of the existing policyholders)
- the Government (which may be interested in, for example, the level of competition in the market)
- any providers of finance to the insurance companies in addition to the shareholders
- the board of directors of the two companies as a new joint board will need to be established
- competitors, as the new merged company may be a bigger rival.

# 4 Information about the client

## 4.1 Gathering the required information

**Often in their work actuaries are giving advice to a client with a particular problem. Such advice will often set out alternative solutions and the implications of each solution. These solutions must always be relevant to the specific circumstances of the client.**

**It is important that before starting analysis of the problem, the actuary is fully briefed about the client and the particular circumstances of the problem they are solving.**

**There will be a significant amount of information in the public domain, for example information in any company accounts or similar publications. Many clients also have websites that contain important information. Before starting on the specific task, the actuary should research and assimilate such information.**

**Where the publicly available information is not sufficient to fully understand the problem, the advising actuary will then need to request additional information from their client and agree to keep any sensitive information confidential.**

**This exercise might then require a follow-up pre-project meeting with the client to ensure that their position has been fully understood.**

## 4.2 Conflicts of interest

**At all times the actuary should be aware of any conflict of interest.**

**An example of when a conflict of interest could arise is when an actuary is advising both the trustees and the sponsor of a benefit scheme. The primary concern of the trustees will be the security of members' benefits, whereas the employer will also be concerned about costs.**

**The advising actuary is responsible for identifying and declaring such potential conflicts of interest and withdrawing when it is not possible to resolve the conflict. This is to ensure there is no bias (actual or perceived) in their actuarial advice.**

It may not always be possible for conflicts of interest to be avoided. At the very least, potential conflicts should be disclosed and any appropriate safeguards put in place. For example, measures should be put in place to ensure the independence of teams working for different clients within a firm. These measures are commonly called 'Chinese walls'. Originally it was sufficient to have physical separation of the different teams, but it has become increasingly important to ensure that electronic communications and data are also kept secure and separate.

# 5 Attitudes of clients and other stakeholders

## 5.1 The client

**As well as the factual information referred to in the previous section, there is a wealth of subjective information that the actuary needs to assimilate before giving advice.**

**As with the information discussed in the previous section, if the actuary is not aware of information regarding the client's background, ethical position and culture, there is a risk that the advice given will be inappropriate. For example, most charities have objectives that cannot be quantified in financial terms and that they would expect advice given to consider. An example of this could be a charity for animals that would have specific aims relating to the welfare of animals.**

A charity's objectives would normally relate to its own purpose and aims, including ethical concerns. Such objectives will be an important consideration when providing advice on aspects such as investment strategy. For example, it is unlikely to be appropriate to recommend that the charity mentioned above should invest in a company that tests its products on animals.

**Corporate bodies have a risk appetite, which is essentially driven by the risk appetite of their stakeholders, particularly their owners. Corporate bodies frequently describe their risk appetite openly in the annual accounts or other published statements.**

Companies may describe their risk appetite in terms of a certain risk tolerance or limits. Companies may also detail their key risks and strategies in place to manage these risks.

### Question

Outline examples of the key risks that an insurance company may highlight in its report and accounts.

### Solution

Key risk examples include:

- market risk – adverse changes in the prices of assets, liquidity risk, currency risk
- credit risk – defaults of assets, reinsurers, customers, suppliers
- insurance risk – longevity, mortality, morbidity, persistency, expense, reinsurance
- operational risk – fraud, IT, human resources, outsourcing, branding, reporting
- external risk – catastrophes, war, regulation, tax.

These risk categories will be covered in more detail later in the course.

**It is also important for the actuary to be aware of the general style and culture of the client.**

# 6 Professional and technical standards

The professionalism framework of the Institute and Faculty of Actuaries comprises professional conduct, technical and ethical standards.

## 6.1 Professional conduct standards

**The Institute and Faculty of Actuaries' (IFoA) requirements in relation to professional conduct are set out in the Actuaries' Code. Detailed knowledge of the Actuaries' Code is not required for this subject, but all actuaries should be aware of the issues that are addressed in the Actuaries' Code.**

The Actuaries' Code came into force on 1 October 2009 and forms part the Institute and Faculty of Actuaries Standards framework. The code is structured around the following six principles:

- integrity
- competence and care
- impartiality
- compliance
- speaking up
- communication.

Further details on the framework can be found on the Institute and Faculty of Actuaries website: actuaries.org.uk.

**Professional skills and detailed consideration of the Actuaries' Code are covered in an online course, and actuaries subject to the continuing professional development scheme are required to keep their professional as well as their technical skills up to date.**

**Professionalism is essential in setting the scene for the context in which the actuary will operate. The basic principles of professionalism will determine the suitability of solutions to the problems raised. The Actuaries' Code is therefore essential background to the consideration of the solution to any actuarial problem.**

## 6.2 Technical and ethical standards

**Ethical and professional best practice and standards are the responsibility of the IFoA, and apply to all members of the profession, regardless of the territory or area of work in which they operate. These are referred to as IFoA Standards. IFoA Standards comprise the Actuaries' Code together with Standards developed since the introduction of the current professional framework in 2006.**

**In the UK, technical actuarial standards are the responsibility of the Financial Reporting Council (FRC). This is a body that is independent from the IFoA. The FRC issues Technical Actuarial Standards (TASs).**

There are plans to replace the FRC with a new regulatory body, whose responsibilities are expected to include oversight of the UK actuarial profession.

**The aim of the TASs is to ensure that 'users for whom actuarial information is created should be able to place a high degree of reliance on that information's relevance, transparency of assumptions, completeness and comprehensibility, including the communication of any uncertainty inherent in the information' (the Reliability Objective).**

**There are a number of different technical standards that apply to work done in the UK and to non-UK operations which report in the UK. This includes more general standards covering the principles of technical actuarial work, and also technical standards covering work in particular practice areas.**

At the time of writing (May 2023), the TASs comprise:

- TAS 100: Principles for Technical Actuarial Work – covering judgement, data, assumptions, models, communications, and documentation (with 'risk identification' due to be added)
- TAS 200: Insurance
- TAS 300: Pensions
- TAS 400: Funeral plan trusts.

**Work may depart from the requirements of a TAS if the departure is considered not to be material. The departure is considered material if its effect could influence the decision making process.**

The TASs are principles based, which means that they aim to move away from detailed, prescriptive rules and allow actuaries to focus instead on achieving desirable outcomes.

**Most major actuarial organisations around the world have their own frameworks of professional standards of practice and codes of professional conduct. Whilst there are some differences, there is a considerable amount of consistency in the approach taken to standard-setting by many of the major actuarial organisations around the world.**

**One reason for this consistency in approach is the influence of the International Actuarial Association (IAA). The IAA is a worldwide association of professional actuarial bodies. Its aim is to represent the actuarial profession and promote its role, reputation and recognition in the international domain.**

**Knowledge of the detailed technical content of actuarial standards is not required for this subject.**

More information about the IAA and its role can be found at its website: actuaries.org/iaa.

## 6.3 The Actuarial Quality Framework

**The Financial Reporting Council has developed an Actuarial Quality Framework which is designed to support effective communication between actuaries and other stakeholders in actuarial work. These stakeholders include the clients and employers of actuaries, senior management and members of governing and review bodies, other professionals such as lawyers and accountants, end-users and their representatives, policymakers and regulators.**

**The Framework is intended to be complementary to professional and other regulation affecting actuaries and those who rely on their work.**

# 4 Characteristics of direct property investment

## Exam Tip

As in previous chapters, the SYSTEM T acronym can be a useful starting point for exploring the characteristics of this asset. However, property investment also has a few other characteristics which can be added to the standard list, *eg* large unit size, risk of obsolescence, ability of the owner to change the investment characteristics of the asset.

## Nature of return

**Property is a real asset and would therefore be expected to provide a hedge against inflation.**

In this context 'real' means that property returns move broadly in line with changes in inflation.

Assuming that there are no other external influences, the owners of a property should be able to increase rents in line with inflation so that the *real* value of rent is not compromised. In practice, the impact of other economic influences, operating upon the supply of and demand for property, mean that rents and capital values will increase only *broadly* in line with inflation.

## Cashflow pattern

**Leases are for fixed terms with relatively infrequent rent reviews. These may be 'upward only'. The income stream might, therefore, increase in steps every few years. However, for a property that is rented at a level above current market rents, the income stream may be fixed for many years.**

The term of a lease may range from about five to over 100 years. The lease agreement will typically provide for periodic reviews of the rent – often at five-yearly intervals – so that the income from a property will normally increase in a series of steps. For a portfolio of properties, a broad spread of review dates should generate a gradually increasing income stream.

An *upward only* rent review is one whereby the level of rent cannot be reduced at any review. Consequently, if the level of market or *rack* rents decreases between reviews, the rent will *not* be reduced at the next review, but must remain fixed at its existing level.

Rack rent is the rent that would be received from a building if it were subject to an immediate open-market rental review. This may be different from the rent actually being received.

**The running yield (*ie* rental yield) on property varies with the type of building.**

The running yield of an asset tells us how much of the return is given though income as opposed to through capital growth. For property:

$$\text{running yield} = \frac{\text{rental income (net of all management expenses)}}{\text{cost of purchase (gross of all purchase costs)}} \ .$$

More risky types of property will generally offer a higher running yield.

Property rental yields have often been lower than conventional bond running yields because of the prospect of a capital gain, reflecting the anticipated growth of rental levels. The relationship between the running yields on property and equity is less clear cut. In addition, since the economic uncertainty that followed 2008, running yields on property (and indeed on other asset classes) have been much less stable, which makes comparisons between asset classes more difficult.

## Marketability

**Property is very unmarketable. It can take a long time to buy or sell and dealing costs are high.**

This is because of the following characteristics of property:

- ***Unit size:*** **the unit size of most investment in property is large and, in general, single properties are indivisible.**

  This is in contrast to most other securities, which may be purchased in small quantities. Indivisibility may prevent smaller investment funds from investing in property, or lead them to invest in property indirectly – for example, *via* property company shares.

- ***Valuation:*** **property valuation is a matter of professional judgement and there is no central market with quoted property prices. There may be significant variations in valuations carried out by different valuers or by the same valuer on different bases. As sales take place infrequently the property market is characterised by a lack of information.**

  Property valuation is both subjective and expensive and therefore the *true* market value of a property may be known only when a sale occurs. In addition, as sales are infrequent and prices agreed are normally treated with a degree of confidentiality, it may be difficult to place a certain value upon a particular property. The relative uniqueness of individual properties also makes it harder to assess their value. The difficulties arising from valuation could reduce the appeal of direct property investment to certain investors.

## Security

**The security of income depends very much on the quality of the tenant.**

**Rent payable by a company is a prior charge on its profits, but costs of recovery from tenants in arrears can be high and there is a risk of 'voids' – periods when the property is not let.**

Whilst a property has no tenant and is therefore void, no income is received. The possibility of void periods must be allowed for when estimating the expected returns on a particular property. Rental income will be particularly secure when the property is rented to a profitable tenant for whom the rent represents only a minor proportion of their total costs.

## Spread

**Capital values of buildings can be volatile over the longer term, although infrequent valuations and stable valuation methods reduce short-term volatility. As land is indestructible, a good site is always likely to have some value.**

Property values tend to move in cycles, closely related to but lagging behind the general economic cycle, as supply is slow to respond to changing economic conditions. They are usually determined by reference to the expected flow of rental income, which is relatively stable. This stability may enhance the attractiveness of property to investors who prefer stable asset values.

The site value is the element of the value of a property that derives from the site alone. Where the site value represents a significant proportion of the total capital value, the property value itself will be more secure.

**Owing to its political significance, property is susceptible to government intervention such as rent and planning controls.**

Changes in such intervention can cause volatility in the property market. For example, planning controls might limit the supply of property and rent controls might reduce the attractiveness to investors.

**Maintenance and upkeep expenses may also be high and unpredictable.**

Expenses are a significant component of the net return on property, and so the variability in these costs also contributes to volatility in property returns.

## Yield

**In comparison with index-linked government bonds, property is less marketable and less secure. Investors would therefore be expected to require a higher return from property.**

### Question

Describe the other factors that will influence the size of the margin between property and index-linked government bond returns.

### Solution

The margin also reflects the fact that:

- Unlike index-linked government bonds, property does not provide an exact hedge against inflation. Rents tend to increase *broadly* in line with inflation, over the medium to long term.
- Property is much more expensive to buy, sell and manage than is a corresponding portfolio of index-linked government bonds.
- Property is also indivisible.
- Property has the risk of obsolescence / depreciation.

## Expenses

**Property management costs are high, although the tenant is often responsible for building maintenance and insurance.**

This is the case with a *full repairing and insuring lease.* The other ongoing management costs will include the costs of rent collection and review. The high expenses involved with buying, selling and ongoing management mean that for most investors property is a long-term commitment.

Freeholders also incur expenditure relating to obsolescence and depreciation.

Land is virtually indestructible, and buildings normally have a long life if maintained in a satisfactory condition. Buildings can, however, suffer from obsolescence: they become out of date and are no longer of use to potential tenants. This results in a slowdown in the relative rate of growth in value between old and new buildings. In time, expenditure on modernisation becomes necessary.

Similarly, buildings depreciate over time as they become older and their condition deteriorates. The cost of refurbishment is thus a major expense of property management that does not arise with financial securities.

Modernisation and/or refurbishment would typically take place on expiry of a lease, before re-letting.

## Other considerations

**It is possible for the investment characteristics of individual property assets to be substantially changed by the owner. Examples of this would be redevelopment of an existing property or re-negotiation of a lease with a sitting tenant.**

There may also be utility value (additional satisfaction or a 'feel good factor') related to the ownership of a property.

# 4 Bond valuations

## 4.1 Discounted cashflow approach

**Government or similar high-quality bonds can be valued by discounting cashflows at rates consistent with the market spot rate yield curve.**

The market spot rate yield curve can be derived from the yields available on zero-coupon bonds, where they exist, or from government bond 'strips'. In a developed economy, the risks arising due to lack of security and marketability may be negligible and so these rates may reflect a risk-free yield.

**Other bonds, such as corporate bonds, can be valued similarly but adjusting the yield to allow for lower security and marketability.**

## 4.2 Valuing bonds with option features

**Many bonds have option features (*eg* callable and puttable bonds).**

A *callable* bond is a bond that the borrower can choose to repay at any time. Similarly, with a *puttable* bond, the investor can demand repayment at any time.

**Such bonds should theoretically be valued using option pricing techniques, although this is not always done in practice.**

The value of a *puttable* bond to the investor – and so the market price – should equal:

- that of an otherwise identical bond that does not include an option
- *plus* the value of the choice provided by the option.

The value of the option will be greater, the more likely it is that the option will be exercised.

### Question

Explain how the value of a *callable* bond compares with a similar bond without the call option.

### Solution

It is lower due to the additional uncertainty that the investor faces, being unsure of the exact date at which the capital will be repaid, and hence unsure of the future series of cashflows received.

The option has a *positive* value to the borrower and a *negative* value to the investor.

# 5 Equity valuations

In this section we look at a number of approaches for placing a value on equity:

- market value
- dividend discount model
- net asset value per share
- value added measures
- measurable key factors.

## 5.1 Market value

**The starting point for valuation of an individual equity is the market value, if there is a suitable market.**

For most shares this will be a simple and objective means of valuation.

## 5.2 Dividend discount model

A discounted cashflow calculation may be carried out to value the shares, if the investor wants to:

- value unlisted shares
- check whether they think the market value is reasonable, or under- or over-priced.

**The dividend discount model derives the value of a share as the discounted value of the estimated future dividend stream.**

This approach is described in Subject CM1, so we provide a recap of that material here.

We start with a general approach, and then introduce simplifying assumptions so that we end up with a very useful, simple model for valuing the shares of a company.

Pay close attention to the assumptions that are used in order to appreciate the limitations of the discounted dividend model.

### General model

The general model can be expressed as:

$$V = \sum_{t=1}^{\infty} D_t v(t)$$

where: $V$ is the value of the share

$D_t$ is the gross amount of the $t^{th}$ dividend payment

$v(t)$ is the discount factor applied between time 0 and the time of the $t^{th}$ dividend payment.

This assumes that:

- there are no expenses or tax
- shares are held forever (or would be purchased by an investor using the same valuation model).

## Simplified model

A simplified equation can be obtained by assuming in addition that:

- dividends are payable annually, with the next payment in one year's time
- $g$, the annual dividend growth rate, is constant over time
- $i$, the annual required rate of return, is constant over time
- $i$ is greater than $g$
- $i$ and $g$ are defined consistently – *eg* both include inflation or are net of inflation
- the dividend proceeds can be reinvested at $i$ *pa.*

With these additional assumptions, the equation simplifies to become:

$$V = \frac{D}{i-g}.$$

Thus we now have a very simple model for assessing the value of the share.

Starting with $D$, the dividend to be paid one year from now, gives this very neat result. In most investment textbooks, the algebra starts with the dividend just paid, which is arguably more sensible as this is known.

The equation is then:

$$V = \frac{D_0(1+g)}{(i-g)}$$

where $D_0$ is the most recent dividend received.

## Issues to consider when applying the simplified model

There are several issues to be aware of when applying the model:

1. We do not know the value of $i$ to use in the model. Additionally, the assumption of a constant required rate of return $i$ over time might not be appropriate during an era when the yield curve is steeply sloping upwards or downwards.

   **In order to calculate a value it is necessary to decide on an appropriate required rate of return. This would often be calculated as the yield on long-term government bonds plus an appropriate addition for the riskiness of the income stream.**

Conventional investment wisdom says that we will require a higher return from equities than from government bonds to compensate for the:

- risk of dividends being reduced or even not be paid and loss of capital on wind up
- uncertainty of return and the volatility of the share price
- lower marketability and higher dealing costs.

2. We do not know what the growth rate $g$ should be.

**Investors with real liabilities might start from an index-linked government bond yield and estimate the real, rather than nominal, rate of dividend growth.**

The value of $g$ used in the model will reflect the investor's estimates of the future dividend growth of the company, which will in turn reflect the investor's view concerning the future profitability of the company.

**In practice it might be felt that constant dividend growth is not a realistic assumption. An alternative approach would be to use dividends based on profit forecasts for the first few years, then apply a short-term rate of growth for a period until the growth rate settled down to a long-term average.**

3. The results obtained are very sensitive to the assumed level of $i - g$.

4. **Tax-paying investors should use the net dividends received and a suitable after-tax rate of return.**

The equations given above ignore tax and expenses.

5. This model assumes annual dividend payments even though the payments might be half-yearly on individual shares. This is not a key factor; there are much bigger causes of uncertainty within this model than the frequency of dividends.

6. The model is of no use unless $i > g$.

# 1 The principles of investment

**The principles of investment for a provider of benefits on future uncertain events can be stated as follows:**

**(1) A provider should select investments that are appropriate to the:**

- **nature**
- **term**
- **currency, and**
- **uncertainty**

**of the liabilities, and**

- **the provider's appetite for risk.**

**(2) Subject to (1) the investments should also be selected so as to maximise the overall return on the assets, where overall return includes both income and capital.**

These two sentences are probably the most important in this chapter. The balance between risk and return is the key idea when developing an investment strategy.

A provider of financial benefits needs to decide whether to:

- follow the first principle set out above, *ie* invest so that the expected cashflows from the assets held match the expected cashflows from its liabilities, or
- move away from this matched position in order to seek higher returns, subject to this being within its risk appetite.

If the decision is taken to match the assets to the liabilities, then the optimal matched position will need to be determined. However, this is not a trivial task given the uncertainties in the future cashflows of both liabilities and (some) assets.

## Question

Suggest what is meant by the *optimal* matched position.

## Solution

The *optimal* matched position will be the matched position that satisfies the provider's required degree of certainty in meeting the liabilities for the least cost. Given infinite resources, it will always be possible to meet the liabilities by buying excessive amounts of assets, but this will not necessarily give the optimal matched position.

If the decision is taken *not* to match the assets to the liabilities, then additional capital will need to be held to cover the possibility that there are insufficient assets to meet the liabilities when they fall due. This capital provides a cushion against adverse market movements.

The higher the level of excess assets over liabilities (which may be referred to as *free assets* or *available* capital) within the provider, the more able it is to cover the additional capital needed to support mismatching (the *required* capital).

Putting this additional capital aside means that there should be sufficient assets to meet the liabilities when they fall due despite, say, a sudden fall in the market value of the assets. However, the determination of how much extra capital will be needed is not trivial.

Much of the rest of this chapter looks at these decisions in more detail, in particular exploring the non-trivial exercise of finding a matching portfolio of assets and considering how to determine what constitutes a sufficient amount of free assets.

 

## Solution

(i) ***Money-weighted rate of return***

Only the last two payments represent new money. So the equation of value (working in £000s) is:

$$3{,}300(1+i)-60(1+i)^{8/12}+95=3{,}800$$

Evaluating the LHS at an interest rate of 14.25%, gives a result of 3,799.68 ≈ RHS.

(ii) ***Time-weighted rate of return***

The progress of the fund (again working in £000s) was as follows:

| | |
|---|---|
| *1 January to 30 April* | Fund value increased from £3,300 to £3,500 |
| *1 May* | Cashflow of –£60 |
| *1 May to 30 December* | Fund value increased from £3,440 to £3,705 |
| *31 December* | Cashflow of +£95, taking fund value to £3,800 |

So, during the period from 1 January to 30 April, there were no cashflows and the fund value grew by a factor of:

$$\frac{3{,}500}{3{,}300}=1.0606$$

During the period from 1 May to 30 December, the fund value grew by a factor of:

$$\frac{3{,}800-95}{3{,}500-60}=1.077$$

So the growth factor for the whole year is $1.0606\times1.077=1.142$ and the TWRR is 14.2%.

## 6.3 Collective investment schemes

Let's finally consider analysing the performance of collective investment schemes such as investment trust companies.

**Collective investment schemes have a daily (sometimes less frequent) pricing point. This is the time of day at which the values of the underlying assets in the scheme are captured. It is commonly noon or 3 *pm* and is rarely at market close. Published market indices are normally quoted at close of business.**

**Intra-day movements in certain markets can be material and so to make a fair assessment of the scheme manager it is necessary to capture the relevant benchmark indices at the same time of day as the pricing point.**

**Not all market indices are available publicly on a continuous basis.**

## 6.4 Measurement of investment risk

The measurement of risk is covered in more detail in a later chapter (Risk measurement and reporting).

However, it is worth revisiting here the idea of 'tracking error': divergence between a fund manager's actual performance and that of their allocated benchmark. This is particularly the case where they are taking active risk and/or performing tactical asset switches.

This risk can be measured by determining the standard deviation of the difference between the two returns (actual and benchmark), either using historical performance data or an estimate of future experience if the current structure of the portfolio remained unchanged.

Investment risk is also typically measured using Value at Risk, *ie* the modelled value of the maximum potential loss on a portfolio over a chosen time period (*eg* one day) at a chosen level of confidence (*eg* 95%).

# 4 Risks associated with the use of data

## 4.1 Data risks

**An actuary is faced with a range of possible risks when using data, such as:**

- **The available data might contain errors or omissions, which could lead to erroneous results or conclusions.**
- **There may be insufficient historical data available to estimate credibly the extent of a risk, and the likelihood of the occurrence of that risk in future.**
- **Even where there is sufficient data to estimate credibly future experience in normal conditions, there may be insufficient data available to provide a credible estimate of a risk in very adverse circumstances, which may be necessary for some purposes (*eg* estimating the tails of a distribution).**
- **Where there is insufficient data it may be possible to use data from other sources (*eg* industry data, other countries, competitors), but there is a risk that data from other sources may not be a sufficiently good proxy for the risk being assessed.**
- **Historical data may not be a good reflection of future experience. This could be due to:**
  - **past abnormal events**
  - **significant random fluctuations**
  - **future trends not being reflected sufficiently in past data**
  - **changes in the way in which past data was recorded**
  - **changes in the balance of any homogeneous groups underlying the data**
  - **heterogeneity with the group to which the assumptions are to relate**
  - **the past data may not be sufficiently up to date**
  - **other changes – *eg* medical changes, social changes, economic changes *etc*.**
- **There are risks where an actuary attempts to group data into broadly homogeneous groups. The risks associated with this are:**
  - **the individual data groups may be too small for a credible analysis**
  - **if data groups are merged so there is sufficient data in each group to be credible, the combined data set may not be sufficiently homogeneous.**
- **The available data may not be in a form that is appropriate for the purpose required.**
- **The available data may have been collected for a purpose, which means that it is not appropriate for a different purpose.**
- **A lack of confidence in the available data will reduce the confidence in an actuary's conclusions.**

The key risks relating to data can therefore be summarised as:

- the data are inaccurate or incomplete
- the data are not credible due to being of insufficient volume, particularly for the estimation of extreme outcomes
- the data are not sufficiently relevant to the intended purpose
- past data may not reflect what will happen in the future
- chosen data groups may not be optimal
- the data are not available in an appropriate form for the intended purpose.

A lack of ideal data is considered in more detail later in this chapter.

## 4.2 Algorithmic decision making

**Advances in computing science mean that ever larger amounts of data can now be collected, stored and analysed much more quickly than in the past. These advances require new tools to analyse and make decisions. Increasingly algorithmic tools are being used in decision making processes across many sectors.**

**Algorithmic tools can potentially lead to quicker, more consistent and fairer decisions being made. This has the potential to be good for consumers, businesses and society.**

For example, investment trading decisions can be automated, so that they take place without human intervention. The quality of these automated decisions depends on the robustness of the programmed trading rules, which in turn rely on the data used.

**Algorithmic trading looks at prices of stocks across all markets. An early development was known as programmed trading, which just considered automated rules for trading individual stocks on a single market.**

### Risks relating to algorithmic trading

Although designed to improve efficiency, algorithmic decision making is not without risk.

**There have been a number of examples where the use of algorithmic tools without appropriate care has created problems. For example:**

- **organisations have used algorithmic decision making which has led either consciously or unconsciously to decisions for some individuals that were unfairly biased**
- **where the algorithm did not perform as expected.**

**This has led to some concern from the public and regulators about the use of algorithmic decision making, particularly where the decisions could materially impact the lives of individuals.**

**It is important that steps are taken to ensure that risks and the potential for bias in decision making are managed. Organisations will need to carefully consider what constitutes an appropriate level of due care in any algorithmic decision making.**

 

**The following risks are associated with algorithmic trading:**

- **There could be an error in the algorithm or the data used to parameterise the model could be wrong, leading to potential losses on each trade, rather than the expected profits.**

  **This is an issue when a large number of trades could be completed very quickly.**

- **The algorithm may not operate properly in adverse conditions.**

  **For example, the algorithm could stop trading an asset in turbulent markets, reducing liquidity of the asset and increasing volatility.**

- **In very turbulent conditions, trading in individual stocks, or even entire markets, may be suspended before an algorithmic trade can be completed.**

- **The main risk of algorithmic trading is the possible impact on the financial system.**

  **An example of this was a 5%-6% plunge and rebound in major US equity indices within the span of a few minutes due to a large number of trades done at erroneous prices in May 2010.**

  **The increasing integration between markets and asset classes means that a meltdown in one market could impact other markets and asset classes.**

# 5 Operational data requirements

## 5.1 Main uses of data

**Actuaries use data in many aspects of their work.**

### Question

List the areas of work in which financial services organisations use data.

*Hint: think about the different departments of such organisations.*

### Solution

The uses of data include for:

- administration
- marketing
- premium rating, product pricing, determining contributions
- setting provisions (*ie* setting aside reserves to meet future benefit payments and future expenses)
- experience analyses
- investment
- accounting
- risk management, including using underwriting and reinsurance
- management information.

Many of these activities (setting premiums / contributions, setting provisions, performing experience analyses and risk management) are described in more detail later in the course.

**The interaction between the data requirements for the various tasks that actuaries carry out can be complex and will vary from organisation to organisation. Essentially, however, for a given type of work the underlying data requirements will normally be similar.**

# 1 Risk classification and grouping

## 1.1 Heterogeneity

**The providers of financial products offer cover against risk events. Individuals or companies buying these products all have different features – no two people in the world are alike in every respect, not even identical twins. A product provider could assess each individual or company and determine the premium to charge and the cover to provide for each risk it considers.**

**This approach works when the risks are rare and large and it is very difficult to group them. Marine hull and cargo covers are a good example: not only are ships generally different from each other but the cargos they carry and the routes they travel accentuate the differences. It is appropriate and practical to assess each risk individually.**

**Other risks are smaller and individual assessment would be prohibitively expensive. For these risks the provider usually has access to a large amount of data concerning how the population behaves. If the population can be divided into relatively homogeneous groups, a price can be determined that applies to all risks in that group.**

**If a product provider can pool independent homogeneous risks, then as a result of the Central Limit Theorem the profit per policy will be a random variable that follows the normal distribution with a known mean and standard deviation. The company can use this result to set premium rates which ensure that the probability of a loss on a portfolio of policies is at an acceptable level.**

The process by which potential insured lives are separated into different homogeneous groups for premium rating purposes, according to the risk they present, is called risk classification. It involves trying to identify any risk factors specific to the individual that might influence the likely risk of that individual.

### Question

List eight risk factors the insurer would wish to identify when offering pet insurance.

### Solution

- type of pet
- breed
- gender of pet
- age of pet
- location
- extent of cover chosen
- pre-existing medical conditions
- age of owner

This chapter focuses on risk classification in relation to mortality and morbidity experience.

## 1.2 Selection

**Irrespective of how a provider constructs its homogeneous risk pools, there will be a range of risks in the pool. In life assurance, mortality and morbidity risk increases rapidly at later ages. If the provider sets a rate for male lives aged 82 (presumably based on the expected experience of a life aged 82.5), then a person aged 82.9 will be getting better terms than appropriate given the risk that person poses. If everyone aged 82.9 realised this and took out policies, the pricing assumption of an average age of 82.5 would be wrong, and the company would incur a loss.**

**Selection (sometimes called anti-selection or adverse selection) is taking advantage of inefficiencies in a provider's pricing basis to secure better terms than might otherwise be justified, normally at the expense of the product provider. Selection is not a fraudulent, immoral, or illegal activity.**

In other words, adverse selection can occur when a person buys a policy that they believe is a 'good deal' (and therefore a 'bad deal' for the provider). Policyholders with worse than average experience will be more likely to take out the contract.

### Question

Suggest two examples of how anti-selection can arise within a life insurance company.

### Solution

People who smoke will tend to seek life assurance from companies that charge identical premiums for smokers and non-smokers, whereas non-smokers will apply to companies that differentiate between them and therefore charge cheaper premiums to non-smokers. The first company will suffer from adverse selection, as the ratio of smoker to non-smoker lives that it takes on will increase.

Selective withdrawal (of healthy lives) worsens the company's average mortality experience from those policies that remain.

## 1.3 Risk grouping

**The main aim of risk classification is to obtain homogeneous data. The reduction of heterogeneity within the data for a group of risks makes the experience in each group more stable and characteristic of that group. Furthermore, it enables the data to be used more appropriately for projection purposes.**

**This is important when monitoring claims and mortality experience. Any heterogeneity in data groups will serve to distort the results and can lead to setting provisions that are too big or too small and calculating premiums or contributions that are incorrect.**

### Setting provisions

For example, for immediate annuity business written on impaired lives, mortality experience will differ considerably by health status as well as by age and gender. It is important, therefore, to reflect these differences when setting provisions.

## Question

Outline the problems that can result from setting provisions that are too big or too small.

## Solution

If the provisions are too big (*ie* the provider sets aside unnecessarily large reserves):

- capital may not be being used efficiently (opportunity cost)
- the funding / solvency level will appear to be lower than it actually is, resulting in interested parties, *eg* brokers, analysts, the regulator and shareholders, viewing the company as financially weaker than it is in reality.

If the provisions are too small:

- over time it will become apparent that additional money is required
- in the worst case scenario, insolvency could result if that money could not be found
- profits will be recognised earlier and the payment of tax will be accelerated
- inappropriate business decisions may be made.

Setting provisions is covered in more detail in later chapters.

## Setting premiums

**Careful underwriting is the mechanism by which a provider ensures that its risk groups are homogeneous for pricing purposes. The risk groups are defined using rating factors, *eg* age, gender, medical history, height / weight, lifestyle. In theory, a provider should continue to add rating factors to its underwriting system until the differences in risk between the different categories of the next rating factor are indistinguishable from the random variation between risks that remains after using the current list of rating factors.**

**Both the ability of prospective policyholders to provide accurate responses to questions and the cost of collecting information limit the extent to which rating factors can be used. In general, a proposal form should not ask for information which requires specialist knowledge. For example, the cost of undertaking extensive blood tests has to be weighed against the expected cost of mortality or morbidity claims that will be 'saved' as a result of having this information.**

**From a marketing point of view, prospective policyholders will want the process of underwriting to be straightforward and quick.**

**In practice, rating factors will be included if they avoid any possibility of selection against the company, and satisfy the time and cost constraints of marketing. This decision is often driven by competitive pressures. If several companies introduce a new rating factor, which is a good descriptor of the underlying risk, then other companies will need to follow this lead or risk adverse selection against them.**

## Question

Outline the likely effect on a company's mortality experience if it issued assurance policies for the same rates of premium to smokers and non-smokers, when most of the other companies in the marketplace charged different rates for the two groups.

## Solution

It is likely that the company's mortality experience would worsen substantially.

Assume that smoker mortality is higher than non-smoker mortality, and so premium rates for smokers would be higher than for non-smokers. An insurer that does not distinguish between the two groups will charge the same rates for both, and these rates will be in between the market rates of other companies, *ie* its rates for smokers will be cheap, and for non-smokers will be expensive.

The company will therefore attract large numbers of smokers. However, non-smokers will find its rates too expensive, and will therefore buy from other companies in the market place. Before long the company may find that its portfolio consists almost entirely of smokers, and its mortality experience will be heavier as a result.

# Performing an experience analysis

The in-force data of an insurer or other benefit provider will need to be grouped appropriately and analysed at regular intervals. When forming the groups for such analyses, sufficient data will be required in each group to ensure the results are credible, but this needs to be balanced against not making the definition of a group so wide that heterogeneity is a significant issue.

**Ideally data to be analysed should be split into homogeneous groups, for example, by age and gender in a mortality investigation. However, where data is scarce, such as for numbers of deaths at young ages, splitting data into homogeneous groups may result in data groups that are too small to enable any credible analysis to be carried out.**

**In such cases data may need to be combined into groups which are less homogeneous, but which are large enough to be credible. Whenever data is to be analysed there needs to be a balance between splitting the data into homogeneous groups and having sufficient data in each group to enable a credible analysis to be carried out.**

**There is also a need to carry out sensitivity testing to check that if the data are grouped in a different way, the same results are obtained.**

# 2 Why it is necessary to have different mortality tables for different classes of lives

**When a life table is constructed it is assumed to reflect the mortality experience of a homogeneous group of lives, *ie* all the lives to whom the table applies follow the same stochastic model of mortality represented by the rates in the table. This means that the table can be used to model the mortality experience of a homogeneous group of lives which is suspected to have a similar experience.**

**If a life table is constructed for a heterogeneous group, then the mortality experience will depend on the exact mixture of lives with different experiences that has been used to construct the table. Such a table could only be used to model mortality in a group with the same mixture. It would have very restricted uses.**

**For this reason, separate mortality tables are usually constructed for groups which are expected to be heterogeneous, for example separate tables for males and females.**

**Sometimes only parts of the mortality experience are heterogeneous (*eg* the experience during the initial select period for life assurance policyholders), and the remainder are homogeneous (*eg* the experience after the end of the select period for life assurance policyholders). In such cases the tables are separate (different) during the select period, but combined after the end of the select period.**

The 'select period' is the time horizon beyond which we assume no significant difference in mortality between two types of lives. You may remember this from your previous studies.

## Question

A life insurance company wants to construct its own mortality tables and is considering how many data groupings to use.

(i) Describe the risk to the company of using one mortality table for all classes of lives together.

(ii) Describe the problem with producing tables for different classes of lives.

## Solution

(i) If the life insurer is using the same mortality table for all classes of lives together it will be charging the same premium to lives which present different risks. The premium will be based on the average risk. This practice leaves the company in a risky position because it could easily lose the low risk lives to a competitor who charges differential premium rates. High risks will be attracted to the company and it will be selected against.

(ii) The problem with producing tables for different classes of lives is that whilst we would wish to subdivide the data into homogeneous groups as far as possible we cannot reduce the size of each group below the level at which observations may be statistically significant. It is also administratively inconvenient to use too many different tables.

# Chapter 20 Summary

## Risk classification

The aim of **risk classification** is to have homogeneous data, since heterogeneity distorts results.

Providers use **rating factors** to identify the characteristics of the risks they underwrite and to pool risks into **homogeneous groups**. All risks in a group can then be charged the same premium. In theory, ratings factors should continue to be applied until the difference in risk is immaterial. However, there are practical, cost and marketing constraints to this.

If risks are not classified appropriately and heterogeneity exists within a group, the insurer will be exposed to **adverse selection.** This arises due to differences between the insurer's own premium rates and the premium rates charged by competitors.

It is also important to remove heterogeneity within data groups for the purposes of analysing experience, *eg* for setting projection assumptions. However, this needs to be balanced against having sufficient data in each group to ensure **credibility**.

The existence of **different mortality tables** for different classes of lives enables the insurer to deal with heterogeneity within a population.

## Principal factors contributing to variations in mortality and morbidity

Mortality and morbidity rates are observed to vary:

- by age and sex
- between geographical areas
- by social class
- over time.

The underlying factors that cause the observed differences include:

- occupation
- nutrition
- housing
- climate / geography
- education
- genetics.

These risk factors become less significant in old age, leading to **mortality convergence**.

## Selection

The process by which lives in a population are divided into separate homogeneous groups is called selection.

There are five main forms of selection:

- **Temporary initial selection** – the level of risk varies between groups that have and have not experienced a specified event, but the difference is observed only for the first $s$ years after the event (the select period).
- **Class selection** – the population is divided into classes that exhibit different risk characteristics due to a permanent factor.
- **Time selection** – the level of risk varies between groups that have otherwise identical characteristics but are taken from different calendar years.
- **Adverse selection** – the individual's own choice influences the composition of a select group.
- **Spurious selection** – the distorting effect of another factor gives the false impression that one of the other forms of selection is present.

**Decrements** such as withdrawals may be found to have a selective effect. For example, those withdrawing from life insurance protection products typically have a lighter mortality than those who remain in-force.

## Risk matrices

A risk matrix can be a very useful tool for the risk analyst because it acts as a reminder to consider particular types of risk, which may not otherwise have been sufficiently considered. It may be linked to the use of risk checklists, and also provides a convenient categorisation for risks.

The cells in the matrix can be ticked off to show whether the risk in question applies to the given situation, with a cross-reference to the appropriate entry in the risk register.

An example is given below for a risk matrix used for a typical project. The rows in a risk matrix represent the *stage of the project* at which the risk arises. The columns represent the *causes (or types) of risk*.

| | | **Causes (types) of risk** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Political | Natural | Economic | Financial | Crime | Project | Business |
| **Stages in the project** | promotion of concept | | | | | ✓ | ✓ | |
| | design | | | | | ✓ | ✓ | |
| | contract negotiations | | | | ✓ | | ✓ | |
| | project approval | ✓ | | | | | ✓ | ✓ |
| | raising of capital | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | construction | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | operation and maintenance | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| | receiving of revenues | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | decommissioning | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |

Both the columns and the rows would normally be further subdivided. For example, 'Natural' causes of risks may be subdivided into earthquakes, hurricanes, *etc*.

**VaR can be measured either in absolute terms or relative to a benchmark.**

**VaR is based on assumptions that may not be immediately apparent. In particular, it is frequently calculated assuming a normal distribution of returns. If the distribution of returns is 'fat-tailed', or skewed, tracking error (with its focus on the standard deviations of returns) may be misleading.**

The normal distribution bell cuts off at around three standard deviations from the mean. However, if the underlying distribution is not normal, but skewed, the tail may be much longer than three standard deviations.

**Unfortunately, portfolios exposed to credit risk, systematic bias or derivatives may exhibit non-normal distributions. The usefulness of VaR in these situations depends on modelling skewed or fat-tailed distributions of returns, either in the form of statistical distributions or via Monte Carlo simulations. Lack of sufficient data observations within the 'tails' of the distributions means there is increasing subjectivity in the choice of the underlying probability.**

Another weakness of VaR is that it does not quantify the size of the 'tail'. An alternative risk measure is the *Tail Value at Risk*, sometimes referred to as Tail VaR or TVaR. This is the expected shortfall below a certain level, given that the shortfall has occurred. For example, if we believe that our average loss on the worst 5% of the possible outcomes for a portfolio is $5 million, then the Tail VaR is $5 million for the 5% tail.

 

# 5 Risk reporting

## 5.1 Designing risk reports

Regular risk reporting is a key part of an effective risk management process.

**Risk reporting should be designed to be clear and relevant. It should be closely linked to the management of the organisation's risk appetite and risk tolerances, so that risk reports can link clearly to decisions that the organisation needs to make. Key Risk Indicators (KRIs) should be included within risk reports to help provide sufficient information to allow clear and timely decision making.**

**Risk reporting can be structured in a number of ways, but it is typically split according to risk types and operating units.**

**Well organised risk reports typically include summaries of key risk areas, ideally in a tabular or graphical form, with an indication of likelihood and severity impact of each (*eg* low, medium, high, very high).**

These example indicators are equivalent to the 'subjective assessment' approach described earlier in this chapter, using a four-point scale.

**'Traffic light' systems are a common way in which to highlight areas of focus or concern within a risk report.**

For example:

- red could be used to highlight risks of high or very high likelihood *and* high or very high severity
- green could be used to highlight risks of low or medium likelihood *and* low or medium severity
- amber could be used to highlight the others.

Alternatively, if a simple scoring system were used (*eg* 1 to 4 in the example above):

- red could be used to highlight risks where the product of the likelihood and severity scores meets or exceeds a certain level (*eg* 8)
- green could be used to highlight risks where the product is at or below a certain level (*eg* 2)
- amber could be used to highlight the others.

## 5.2 Risk registers

The first stage of risk reporting would normally be to establish a risk register, which captures all the risks to which the company is exposed.

For each such risk, the register could include:

- estimates of the likelihood and severity of that risk
- the response taken (*eg* accept, transfer) and details of any chosen control measures
- the risk owner, *eg* the senior manager with oversight of that risk.

The risk register may be created at the 'Risk identification' stage of the risk management process and then used throughout the process to monitor and report on the risks.

## 5.3 Reporting at enterprise level

**Chapter 24 on Risk governance discussed the advantages of managing and budgeting for risk at the enterprise level. By budgeting for risk across the whole enterprise, maximum use can be made of diversification benefits, and thus the minimum capital required to support the risks undertaken.**

**One of the consequences of this approach is that it is necessary to have a system of risk reporting across the whole enterprise. It is important for the Chief Risk Officer to be aware of whether all business units are using the risk allocation that they have been given.**

This 'risk allocation' refers to the maximum amount of risk exposure that each business unit is permitted to accept, *ie* the way in which the overall risk appetite is split across the enterprise.

**If two business units are allocated risk exposures that diversify away at the enterprise level, but one of the two units does not take on the risk exposure allocated, this could increase the capital requirements of the enterprise. Risk exposures will not be matched, and additional capital will need to be held to cover the unbalanced risks taken on.**

**Where diversification between business units is used to minimise group capital requirements, the individual business units will need to report data at a much more granular level than their own total capital requirement to the group. Analysing the data from diverse business units can be a costly task, especially for multinational operations.**

**There is a trade-off between the costs of the additional analysis required to minimise capital requirements in this way and the cost of holding additional capital if risk diversification between business units is not assumed.**

## 5.4 Issues relating to reporting risk

**Risk is often a complicated subject, and therefore the design of risk reports will reflect a balance between the need to include all relevant information against the need for clarity and simplicity.**

**It is vitally important that risk reports include information at the appropriate level of detail for the intended audience.**

Other issues that arise in relation to reporting risk include:

- whether to use a qualitative or quantitative approach
- if the latter, how best to communicate:
  - the level of uncertainty within the figures given
  - the limitations of the assessment approach used, including simplifications.

# Chapter 28 Summary

## Risk quantification

For all risk events, the probability of occurrence (frequency / likelihood) and expected loss (severity) need to be assessed.

**Simple scales** can be used to separately rate frequency and severity from low to high. The product of the two scales represents the overall score for that risk, enabling ranking.

## Evaluation of risks

**Scenario analysis** looks at the financial impact of a plausible set of events. It is useful where it is difficult to fit a full probability distribution to risk events, *eg* operational risk, emerging risks. It provides information on the severity but not the likelihood of the risk.

**Stress testing** assesses the impact of a specific adverse event over a period of time, such as a shock fall in equity values or shock increase in claim frequency.

Stress and scenario testing can be combined to determine a **stress scenario**. In this case, the stress test is performed by considering the impact of a set of related adverse conditions that reflect the chosen scenario, *eg* a severe economic recession.

**Reverse stress testing** is the construction of a severe (but plausible) stress scenario that just allows the firm to be able to continue to meet its business plan.

**Stochastic modelling** is a natural extension of stress testing, although with increased complexity.

## Aggregating risks

When assessing overall risk exposure, individual risks need to be aggregated in order to allow for correlations and inter-actions. This can be done through:

- stochastic modelling
- simple formulae – if risk events are fully dependent or fully independent
- correlation matrices
- copulas – functions that take as inputs marginal cumulative distribution functions and output a joint cumulative distribution function.

Different copulas are used to describe different degrees of dependence between random variables, including in the tails of distributions.

## Risk measures

Asset risks: active risk can be measured using tracking error.

Liability risks: commonly measured by carrying out an analysis of actual *vs* expected experience.

**Value at Risk** (VaR) represents the maximum potential loss on a portfolio over a given future period with a given degree of confidence. VaR calculations may be based on assumptions such as a normal distribution of returns.

## Risk reporting

Risk reporting should:

- be clear and relevant
- be closely linked to risk appetite
- include Key Risk Indicators (KRIs)
- allow timely decision making
- be well organised, *eg* split by risk types / operating units
- balance the need to include all relevant information against the need for clarity and simplicity
- include the appropriate level of detail for the intended audience.

Risk reports could include:

- summaries of key risk areas, ideally in a table or chart
- an indication of the likelihood and severity of each risk
- the use of 'traffic light' systems to highlight areas of focus or concern.

Risk reporting should be consistent across the **enterprise** in order to optimise the allocation of risk appetite and to make the best use of diversification for capital efficiency.

At the end of the three months, on the expiry date of the option, the *actual* value of the temperature index is $I$ = 1,200 temperature units, *ie* the winter has been considerably milder than expected.

As the energy company bought a *put* option, this means that it has the right to *sell* at the exercise price of $I$ = 1,350.

The payoff from the option on expiry will be:

$$\$10{,}000\ (1{,}350 - 1{,}200) - \$20{,}000 = \$1.48m.$$

The profit from the option should offset the loss that the energy company will have incurred from reduced revenues from its customers.

## 6.6 Swaps

**Organisations with matching, but negatively correlated risks can swap packages of risk so that each organisation has a greater risk diversification.**

If organisations can't find *negatively correlated* risks to swap, then swapping *uncorrelated* risks would provide some risk diversification.

### Example 1 – reinsurance swap

**For example, a reinsurer with exposure to Japanese earthquakes may swap some of this risk with a reinsurer with exposure to hurricanes in Florida.**

This is an example of a swap of uncorrelated risks.

### Example 2 – longevity swap

**With increasing volumes of annuities as the post-war 'baby boom' generation in developed countries ages, longevity swaps are becoming popular.**

The arrangement may be set up in the form of a traditional swap, with the 'fixed leg' being based on expected annuity payments and the 'floating leg' being the actual annuity payments.

### Example 3 – weather swap

**Swaps can also be set up between non-insurance organisations with opposite risks.**

Insurance companies can also utilise weather swaps, particularly general insurers.

**For example, energy companies dislike warm weather as consumers use less of their product. Conversely, household insurers dislike cold weather as it leads to insurance claims. The two organisations can, however, swap their risks.**

This is an example of a swap of negatively correlated risks.

A *unit of trading* will be required. This could typically be a given sum assured in insurance swaps, *eg* £1*m* sum assured of property risk, classified by location and peril. Therefore, the swap might be X units of property risk for Y units of some other risk. For non-insurance swaps, the unit of trading may be an amount of revenue or profits.

 

## 6.7 Reasons for using ART

**There are a number of reasons why providers take out ART contracts. For example, to:**

- **stabilise their results**
- **manage their capital**
  - through a reduction in capital requirements, due to the reduction in risk
  - by raising new capital, *eg* through post loss funding or securitisation
- **for risk management purposes.**

(Capital management is covered further in a later chapter.)

As mentioned earlier, ART might be chosen as a risk management tool:

- to gain greater diversification
- because more traditional risk transfer arrangements such as reinsurance are unavailable or more expensive.