Subject CP1

CMP Upgrade 2021/22

CMP Upgrade

This CMP Upgrade lists the changes to the Syllabus objectives, Core Reading and the ActEd material since last year that might realistically affect your chance of success in the exam. It is produced so that you can manually amend your 2021 CMP to make it suitable for study for the 2022 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 2022 *Student Brochure* for more details.

We only accept the current version of assignments for marking, *ie* those published for the sessions leading to the 2022 exams. If you wish to submit your script for marking but have only 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 2022 session.

This CMP Upgrade contains:

- all significant changes to the Syllabus objectives and Core Reading
- additional changes to the ActEd Course Notes and Assignments that will make them suitable for study for the 2022 exams.

0 Changes to the Syllabus

This section contains all the ***non-trivial*** changes to the syllabus objectives in relation to the chapters in the Course Notes.

Chapter 2

Syllabus objective 9.2

In the first line, replace 'benefits on contingent events' with 'financial products'.

Chapter 3

An additional objective 9.1.6 should be added as follows:

9.1.6 Describe the aims of policy developments with respect to climate risks and sustainability.

Chapter 4

Syllabus objective 2.4 is rewritten as follows:

2.4 Describe the ways of analysing the needs of clients and stakeholders to determine appropriate financial products.

An additional objective 14 should be added as follows:

14 Have an understanding of the principal terms used in financial services, investments, asset management and risk management.

(Covered in part in this chapter.)

Chapter 10

An additional objective 14 should be added as follows:

14 Have an understanding of the principal terms used in financial services, investments, asset management and risk management.

(Covered in part in this chapter.)

Chapter 15

The first objective has been rewritten as follows:

9.3.1 Discuss the cashflows of simple financial arrangements and the need to invest appropriately to provide for contingent financial liabilities.

Chapter 18

In objective 10.2.3, add 'and ethical issues' after 'Explain the risks'.

Chapter 21

In objective 11.4.1, replace ‘benefits on contingent events’ with ‘financial products’.

Chapter 22

In objective 10.1, delete the phrase ‘that will provide benefits on contingent events’ from the second line.

Chapter 24

In objective 4.1, replace ‘products to provide benefits on contingent events’ with ‘financial products’.

Chapter 25

In objective 5.1, delete the phrase ‘of benefits on contingent events’.

Chapter 27

In objective 5.4, delete the phrase ‘that provide benefits on contingent events’.

Chapter 28

In objectives 6.5 and 12.3.3, replace ‘benefits on contingent events’ with ‘financial products’.

Chapter 33

In objective 12.3.1, replace ‘benefits on contingent events’ with ‘financial products’.

Chapter 34

In objective 12.4, replace ‘benefits on contingent events’ with ‘financial products’.

Chapter 37

In objective 12.1.1, replace ‘benefits on contingent events’ with ‘financial products’.

1 Changes to the Core Reading

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

Chapter 0

Section 3.1

The following point should be added to the end of the bullet point list:

- model validation

Chapter 1

Section 3.15

Actuaries can also provide advice to:

- **accountholders**

for example, in providing disclosure on products.

Section 4.1

The second paragraph starting '**In many cases …'** should be removed.

Section 5.1

The last sentence of the last paragraph starting '**This is often best achieved …'** should be removed.

Section 6.3

In the first sentence of the third paragraph, remove '**programmes**' after '**reinsurance**'.

Section 7.1

The second sentence of the first paragraph, change '**examination'** to '**subject**'.

The first sentence of the second paragraph of Core Reading, remove '**post-qualification**'.

Section 7.2

The last paragraph of Core Reading, change '**examination'** to '**subject**'.

Section 7.3

The last paragraph of Core Reading, change '**examination'** to '**subject**'.

Chapter 2

Section 8.1

The last paragraph, add '**for insurers'** after '**important consideration**'.

Section 8.2

A new section 8.2 with both Core Reading and ActEd text should be added as follows:

8.2 Banks and the business cycle

For banks the equivalent business cycle is largely driven by the variation in interest rates and economic activity over the wider economic cycle.

When interest rates are high, there may be a greater demand for savings products and a reduction in borrowing. When there is strong economic growth, there may be increased demand to borrow, for example individuals taking out mortgages to purchase houses and companies borrowing to expand.

Section 9

A number of changes have been made to Section 9, including:

- an additional point added to the first bullet list in Section 9.1
- additional material at the end of Section 9.2
- a comprehensive rewrite of the material in Section 9.3
- an additional point in the bullet list in Section 9.6
- additional material at the end of Section 9.6.

As a result replacement pages 13 to 18 have been included at the end of this document.

Chapter 3

Section 4

In the first bullet point list, remove from the third bullet point '**and the way in which they conduct their business**'.

In the first bullet point list, add a fourth bullet point:

- **supervising the conduct of financial businesses, and taking enforcement action where appropriate**

After the first question / solution in this section add the following:

It is become increasingly common for countries to have separate regulators covering prudential management and conduct respectively of financial products.

Section 5.1

In the text box near the top of page 11, add the following after the first sentence:

For example, in banking, regulators can become concerned where banks gain at the expense of consumers, through complex and opaque pricing.

Section 8.1

In the first paragraph, add the following after the first sentence:

For example, central banks are often responsible for the supervision of banks in their jurisdiction.

Section 9

The Core Reading example has been removed and there is a new Section 9 on Climate risk related policy and regulatory developments. Replacement pages 23 to 26 are included at the end of this document.

Chapter 4

Some additional material on banking products has been introduced to this chapter together with some re-ordering of the existing materials. This affects the material in Sections 4 to 7.

We have provided replacement pages 7 to 12e to replace pages 7 to 12 at the end of this document.

Section 3

The title of this section should be replaced with: 'Insurance and reinsurance products'.

Section 8.2

In the third paragraph, change '**age 55**' to '**a certain age**'.

Chapter 5

Section 3.2

In the section headed 'Sponsor the provision of benefits', remove the second sentence starting '**To help small employers,'**.

Section 6.1

At the end of the first paragraph, change '**houses**' to '**companies**'.

Chapter 11

Page 9

A new section 3.5 has been added as follows:

3.5 Negative interest rates

It is possible for negative interest rates to occur. This is where borrowers are credited with interest, rather than having to pay the lender interest.

This is a very unusual scenario.

This scenario does though arise, *eg* Japan has had zero or negative interest rates for many years.

It can occur in situations where the central bank has already lowered short-term interest rates to zero to stimulate the economy (for example in a severe recession).

Section 5

There are changes to the Core Reading on page 24, replacement pages 23 to 26 are included at the end of this document.

Section 8.4

All of Section 8.4 should be removed.

Chapter 14

Section 3.4

The section on ESG has been rewritten, replacement pages 11 to 14 are included at the end of this document.

Chapter 15

Section 4.1

The following sub-section of both Core Reading and ActEd text should be added at the end of Section 4.1:

Banking sector

Some financial institutions actively choose to mismatch their assets and liabilities. For example, banks traditionally 'borrow short and lend long'. That is, the money they loan out to customers will normally have a longer term than the deposits they take in. This creates liquidity risk.

Also bank loans may be repaid early, while instant access deposits may last for years.

This uncertainty about the actual duration of these products makes asset-liability matching and managing the liquidity position more difficult.

Chapter 17

Section 1.5

All of Section 1.5 should be removed.

Section 2.3

In the section headed 'Merits of a deterministic model', add to the list of advantages:

- **Users can get 'blinded by science' by complex models, assuming they must be working correctly, but without verifying or testing this.**

Replace the second bullet point list of disadvantages with:

The disadvantage is that it requires thought as to the range of economic scenarios that should be tested.

Section 3.4

After the second paragraph, add the following:

It is possible for the desired level of profitability to be reached in aggregate, without requiring every single model point to be profitable in its own right.

In the third paragraph after the first sentence add:

If certain model points are unprofitable the aggregate profitability of the business is then exposed to changes in mix and volume of the contracts sold.

Add the following paragraph at the end of this section:

Once acceptable premiums or charges have been determined for the model points, premiums or charges for all contract variations can be determined.

Section 3.6

The third paragraph starting '**It is possible …**' should be removed. The last paragraph of Core Reading starting '**Once acceptable premiums …**' and the ActEd paragraph that follows it should be removed.

Section 5

In the first sentence of the first paragraph, add '**commonly**' after '**Cashflow models are**'.

Chapter 18

Section 1.1

Add the following after the first paragraph:

For example, the amount of data gathered by banks from sources such as transactions on current accounts and credit cards allows them to apply data science techniques in ways that were not previously possible.

Section 1.2

Add the following sentence to the end of the fourth paragraph:

The principles are designed to ensure that personal data is acquired, processed, and held in a way that is accurate, secure and fair to the consumer.

Remove the eight-point bullet point list that follows setting out the principles together with the following two paragraphs of ActEd text.

Replace the first Core Reading paragraph after this eight-point bullet list with:

Non-compliance with the relevant data protection laws when processing personal data can lead to significant legal penalties as well as reputational damage.

The two-bullet point list of examples of penalties on non-compliance should be removed together with the last two paragraphs of Core Reading in this section.

Section 1.3

All of Section 1.3 should be removed.

Section 1.4

All of the Core Reading after the first sentence of the paragraph before the last bullet list should be removed. In other words remove all Core Reading in this section from: '**For example, it may be …**'.

Section 4.2

This section has been rewritten, replacement pages 11 to 12 are included at the end of this document.

Section 10.1

In the first sentence replace 'offices' with 'organisations'

Remove the second sentence of the first paragraph, the second paragraph and the third paragraph of ActEd text.

In the current fourth paragraph, replace '**which does a large amount of work on mortality and morbidity statistics**' with '**which is covered in the later chapter on Setting assumptions**'.

The last paragraph should be removed.

Section 10.2

In the first sentence of the first paragraph, replace '**insurer**' with '**organisation**' and '**(or that part of it represented by the participating insurers)**' with '**(or the relevant part of it)**'.

The last sentence of the first paragraph and the whole of the second paragraph should be removed.

Chapter 21

Section 1.1

Insert the following new paragraph at the end of the first sub-section (*ie* immediately above the heading 'Insurance company expenses'):

The level of fixed expenses can vary depending on the nature of the business being carried out. For example, in banking and insurance the cost of regulatory compliance can be a significant fixed cost.

Section 1.2

Insert the following new paragraph above the bullet point list:

For example, banks and insurance companies often have significant shared costs that are not attributable to any one class of business. Such costs can include central functions, IT, treasury, marketing and distribution costs (such as branch networks).

Chapter 22

Section 1.1

Add another bullet point to the first list: '**the liquidity available**' (now the third item in the list).

Section 2

Insert the following new paragraph below the Core Reading bullet point list:

Banks will often offer customers a range of savings accounts with different access arrangements. Risk averse investors can choose the accounts which allow the greatest level of access, but these accounts will generally offer lower rates of interest than deposit accounts where the account holder is required to give more notice before they can withdraw funds.

Section 7.2

On page 16, insert the following below the paragraph starting '**Policies may give …**':

Banking products may also offer options to customers. For example, banks may allow customers to repay loans before the contractual maturity date with no additional charges, or to withdraw fixed-term deposits early with only limited penalties.

Chapter 23

Section 1.3

At the end of the final paragraph in this section, the phrase '**as a positive cashflow when the contract terminates**' should be amended to '**gradually during the life of the policy as the margins / capital are no longer required**'.

Chapter 24

Section 1.1

In the first paragraph, delete the phrase '**, but particularly by a provider of financial products that provide benefits on contingent events,**'.

Section 1.2

In the final Core Reading paragraph of this section, replace '***raison d'être***' with '**core business model**'.

Section 1.5

In the second paragraph on page 6 (starting '**Frequently risk …**'), replace the final sentence with the following:

Another example would be a bank taking action when one or two loan repayments are missed, rather than waiting for a complete default.

Section 3

This section has been rewritten. Replacement pages 9 to 10 are included at the end of this document.

Section 4.1

The final Core Reading paragraph in this section (starting '**The term …**') should be replaced with:

The financial crisis in 2008 illustrated the inter-connectedness of the global banking industry and the exposure of banks to systemic losses.

Chapter 25

Section 3.4

The following sentence should be added at the end of the final Core Reading paragraph in this section:

This leads to another risk: *capital risk* is the risk that the amount of available capital falls below the level required to support other risks.

A new Section 3.5 has been added and a number of changes have been made to Sections 4 and 5, including:

- additional material in the first bullet point of Section 4.1
- deletion of some Core Reading in Section 4.2
- additional material under the heading 'Banks' in Section 5.2.

Therefore replacement pages 11 to 16b have been included at the end of this document.

Section 7.1

The following should be inserted after the first bullet point in the list in this section:

- **conduct risk, for example mis-selling, interest rate manipulation and money laundering**

Section 7.3

A new Section 7.3 has been added on climate change risks. Replacement pages 19 to 20 have been included at the end of this document.

Chapter 26

Section 2.3

In the third bullet point, replace '**premiums**' with '**benefits**'.

Chapter 27

Section 1.2

Insert the following after the final Core Reading paragraph in this section:

In Europe, banks have equivalent capital requirements to those that apply to insurers under Solvency II.

Section 2.1

Add the following after the current final paragraph of Core Reading text in this section:

There are similar arguments for an individual taking out a bank account.

Chapter 28

Sections 1.4 and 2.1

A number of changes have been made in these sections. Replacement pages 5 to 6a are provided at the end of this document.

Section 2.3

Insert the following at the top of page 9:

For example, the main stress scenario for a bank is typically looking at the impact of a severe economic recession.

Section 3.3

In the first paragraph, delete the phrase '**, but often impractical,**'.

Add the following after that first paragraph:

Possible alternative ways of aggregating risks are using correlation matrices or copulas.

Insert the following new paragraph under the heading 'Correlation matrices':

Correlation matrices can be used directly to aggregate risks across individual risk factors. A correlation matrix specifies the correlations between all pairs of individual risk factors being modelled. The aggregated risk will combine the individual risks in a way which will reflect the diversification benefits between the individual risk factors. Correlation matrices are commonly used in the insurance industry.

Delete the first Core Reading sentence under the heading 'Copulas'.

Amend the final Core Reading paragraph in this section to:

The mathematical details behind correlation matrices and copulas and the details of their use are not in the scope of Subject CP1.

Section 6.3

This section has been rewritten (with all the Core Reading removed). Replacement pages 21 and 22 are provided at the end of this document.

Chapter 30

Section 2.2

Add the following after the solution at the end of this section:

Different financial institutions may underwrite risks in different ways.

For example, banks will commonly underwrite risks before agreeing to provide the individual with a loan. An example of underwriting is a bank requiring an individual applying for a loan to have a minimum credit score before they agree to give the loan.

Sections 5 and 6

There have been a number of changes in these sections. Replacement pages 15 to 18a are provided at the end of this document.

Chapter 32

Sections 1 and 2

These sections have been combined and materially rewritten. Replacement pages 3 to 8 are provided at the end of this document; existing pages 9 and 10 should also be removed. Sections 3 onwards have had their numbering reduced accordingly.

Chapter 33

Section 1

Delete everything in this section from the line '**Various accounting concepts …**' onwards.

Section 2

Section 2.2 has been rewritten and there is a new Section 2.4 headed 'Banks' (with existing Section 2.4 being renumbered as Section 2.5). Replacement pages 5 to 8 are provided at the end of this document.

Chapter 34

Section 2

A new section on 'Insolvency of a bank' has been included and subsequent sections have been renumbered accordingly. An additional page 6a is provided at the end of this document.

Chapter 35

Section 3.7

The word '**any**' should be deleted from the final bullet point in the list at the start of this section.

Chapter 36

Section 1.3

This section has been rewritten; replacement pages 5 to 8 are provided at the end of this document.

Section 2.2

The phrase '**It is worth noting that**' should be deleted from the start of the final Core Reading paragraph in this section.

Section 3.2

The phrase '**for deriving Solvency II capital adequacy requirements**' should be deleted from the first paragraph in this section.

Section 3.3

The short new section below should be added.

3.3 Banks

As for insurance companies, banks may quantify their minimum capital requirements for each of credit risk, market risk and operational risk:

- **by using standardised approaches that are specified in the Basel regulations, or**
- **by using their own internal models, subject to approval by the national regulator.**

Chapter 39

The following terms and definitions should be added to the glossary:

Loss given default

This is the percentage of any loan that a defaulting borrower cannot repay.

Probability of default

This is the probability that a loan will default over a specified period (*eg* over 12 months). This is analogous to the claim frequency in general insurance or mortality rate in life insurance.

Systemic risk

The phrase 'systemic risk' can be used to mean the same thing as 'systematic risk', but it is also often used more specifically to refer to the risk of problems spreading between entities following a trigger event.

The following definition should be amended:

Option

An option is the right but not the obligation to buy or sell an asset. An option writer sells options. The price paid to the writer for an option is called the option premium.

There are different forms of options:

- **A put option is the right, but not the obligation, to sell a specified asset at a specified price on a set date or dates in the future. A call option is the right, but not the obligation, to buy a specified asset for a specified price on a set date or dates in the future.**
- **Traded options are option contracts with standardised features actively traded on organised exchanges.**
- **A warrant is an option issued by a company over its own shares. The holder has the right to purchase shares at a specified price at specified times in the future from the company.**
- **An American option is an option that can be exercised on any date before its expiry. A European option is an option that can only be exercised at expiry.**

The exercise price is the price at which an underlying security can be sold to (for a put) or purchased from (for a call) the writer or issuer of an option (or option feature on a security). This is also known as the strike price.

2 Changes to the ActEd material

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

Many of the Summary pages have been amended throughout to make them easier to use as reference material for the exam, often by shortening the content. Only material changes to those pages are included in this Upgrade document.

Similarly, some Practice Questions have been amended to reduce the level of bookwork testing. Only material changes to those questions and solutions are described here.

Chapter 2

Summary pages

The summary pages have been updated, replacement pages 19 to 20 are included (to replace what was pages 19 to 21) at the end of this document.

Practice Questions

Add the following point to Solution 2.6:

- investments, *eg* new opportunities due to technologies developed to combat climate change

Add the following point to Solution 2.7, in the section headed 'Climate change and other environmental issues':

Climate change may lead to increased risk of claims, *eg* if it leads to more extreme weather conditions at sea. This should be reflected in the pricing of the product. [1]

Chapter 3

Page 2

Amendments have been made to this page to reflect there is new material on regulation and policies relating to climate change and to remove the reference to the Core Reading example. Replacement pages 1 and 2 are included at the end of this document.

Page 27

In the last section headed 'Functions of a regulator', remove from the third bullet point 'and the way in which they conduct their business'. And add a fourth bullet point:

- supervising the conduct of financial businesses, and taking enforcement action where appropriate

Page 29

A replacement summary page is included at the end of this document which incorporates the material on climate risk related policy and regulatory developments.

Practice Questions

A question has been added on climate related risk. Additional pages with the question and solution are included at the end of this document.

Chapter 4

Page 2

Add the following sentence to the end of the second paragraph of ActEd text after the second bullet list:

In addition the chapter introduces the operation of the banking sector and the key products offered.

Summary pages

A revised chapter summary is included at the end of this document.

Chapter 5

Section 3.2

In the section headed 'Sponsor the provision of benefits', remove the last paragraph describing NEST.

Chapter 11

Chapter summary

In the last section headed 'Supply factors', the last paragraph should be removed.

Chapter 12

Page 3

Replace the penultimate paragraph with:

Market-consistent (and fair value) methods of valuing liabilities are described in a later chapter, Valuation of liabilities. The aim of using such an approach is that the value of assets and liabilities will react in similar ways to changes in the investment environment, *eg* interest rates, inflation.

Chapter 17

Practice Question 17.3(i)

Add the following point to the bullet point list:

- users can bet 'blinded by science' with more complex models, assuming they work correctly without verifying or testing appropriately

Chapter 18

Section 2.2

Replace the paragraph of ActEd text which is the second paragraph on page 7 with:

One of the eight principles in the UK's Data Protection Act (mentioned in Section 1 in relation to the collection of personal data) is that data should be 'adequate, relevant and not excessive for the purposes concerned'.

Chapter summary

In the section headed 'Personal data' remove the second sentence of the second paragraph starting 'There may also be' and remove 'and competition' from the last sentence of this paragraph.

Chapter 21

Section 1.2

Insert the following above the new Core Reading paragraph in this section:

Indirect expenses do not have this direct relationship with a particular class or classes of business.

Insert the following two paragraphs after the bullet point list:

The treasury department of a bank oversees the day-to-day management of cashflow and liquidity, and therefore works across all parts of the bank's business activities.

Many marketing and distribution costs will be direct, relating specifically to the line of business being marketed or sold. However, as mentioned, some will be indirect – such as marketing the company's overall brand and maintaining sales offices.

Add the phrase 'and provide justification for your allocation where it is appropriate to do so' to the end of the final sentence in this section.

Chapter 22

Section 1.1

Add the following below the first bullet point list:

The availability of liquidity, and the potential liquidity impact of any new contract, will be of particular concern for a bank.

Section 4

Add the following at the end of this section:

Profitability will also be a key consideration when designing banking products.

Chapter 23

Section 1.3

The title of this section should be amended to 'The influence of provisioning or regulatory capital requirements'.

The final paragraph should be replaced with the following:

These amounts, as they are released, form positive cashflows throughout the term of the policy.

Chapter 24

Section 1.5

In the first ActEd paragraph on page 6 (starting 'This reinforces …'), add the following at the start of the paragraph:

It is, of course, very important that such actions *are* taken when the trigger is reached.

Section 4.1

The following paragraph should be added above the final Core Reading paragraph in this section:

Systematic risk impacts the entire market. The similar phrase 'systemic risk' can be used to mean the same, but more typically refers to the risk that an event impacting one entity (or industry) could trigger a wider collapse, particularly in relation to the financial system.

The following should be added at the end of this section:

This was highlighted in the earlier chapter on Regulation, in relation to the importance of having confidence in the financial system.

Chapter summary

Under the heading 'Risk *vs* uncertainty', replace the existing content with the following:

Risk: all possible outcomes and their probabilities are known or can be estimated.

Uncertainty: possible outcomes and/or their probabilities are unknown.

Chapter 25

Section 2.2

The sentence 'Specific risks relating to climate change are also covered.' should be added below the bullet point list and the following paragraph added before the final paragraph of this section:

Climate change risk could also be considered to be principally an external risk, but similarly impacts other risk categories – particularly market and business.

Section 7

The phrase ‘, including climate change’ should be added to the heading of this section.

Section 7.1

The following paragraph should be inserted below the new Core Reading bullet point:

Conduct risk can be defined as the risk that a company’s actions will result in poor outcomes for its customers or have an adverse impact on market stability. For example, following an investigation starting in 2012, evidence emerged in the UK of several banks colluding to manipulate the level of a reference interest rate (LIBOR, the London Interbank Offered Rate). This led to financial products being mispriced and caused damage to the level of trust in the financial system.

Summary pages

A revised chapter summary is included at the end of this document.

Practice Questions

Two new questions have been included on liquidity risk for banks and climate change risk respectively. An additional page with these questions and solutions is included at the end of this document.

In Question 25.7, ‘global pandemic’ has been added to the list and the following has been included for it in the solution:

- global pandemic – initially external but with consequences across other risk categories

Chapter 26

Practice Questions

There is a new question on climate risk. An additional page with this question and solution is included at the end of this document.

Chapter 27

Section 2.1

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

In depositing funds with a bank, the individual is transferring the responsibility for keeping those funds safe and secure, together with the related risks.

Chapter 28

Section 2.5

Insert the following after the second Core Reading paragraph:

Although this may have been the case in the past, it is now more common to run multiple stochastic variables.

Chapter summary

The third page of the summary can be deleted.

Chapter 29

Summary pages

A revised chapter summary is included at the end of this document.

Chapter 30

Section 2.2

Insert the following after the two new Core Reading paragraphs mentioned previously:

An individual's credit score is a numerical representation of their creditworthiness, based on information about their credit history in terms of paying bills and repaying loans. A credit score is similar in concept to a credit rating for a company.

Chapter summary

Amend the final paragraph under the heading 'Low likelihood, high impact risks' to:

Some such risks can only be accepted, with capital held against them. Very rare events can fall beyond the company's risk tolerance (*eg* with a less than 0.5% probability of happening within a year) and so may be disregarded.

Practice Questions

The following has been added to the solution to Question 30.7 (immediately before the final point):

The earthquake risk might have to be accepted, and the company would then have to determine how much capital to hold against it.

Chapter 31

Section 2.2

In the table in the solution, the accident years should be amended to *X, X+1, X+2 and X+3*.

Chapter 32

Section 0

The reference to Section 2 should be deleted from the second paragraph, and the subsequent section number references each reduced by one accordingly.

Section 5.1 (now 4.1)

The word 'traditional' should be deleted from the title of this section.

Section 5.2 (now 4.2)

The phrase 'market-consistent or' should be deleted from the title of this section.

Insert the following new paragraph after the second ActEd paragraph in this section:

If a risk-neutral valuation approach is used then this, by definition, has automatically allowed for financial risk.

Insert the following new paragraph after the first Core Reading paragraph under the heading 'Non-financial risk':

If this approach is taken, then typically the adjustments would be made to the non-financial assumptions rather than to the discount rate.

Summary pages

A revised chapter summary is included at the end of this document.

Practice Questions

Questions 32.1 to 32.5 have been replaced with new Questions 32.1 to 32.3 (and subsequent questions have been renumbered). Some changes have also been made to the solution to what is now Question 32.4 (was 32.6). Replacement pages 25 to 28 are provided at the end of this document, and please also delete the (duplicated) first six paragraphs on page 29 if using the new pages.

Chapter 33

Section 1

Insert the following after the first paragraph:

Accounting concepts were covered in the earlier subjects.

Summary pages

A revised chapter summary is included at the end of this document.

Practice Questions

Questions 33.1 and 33.2 should be deleted (and the subsequent questions renumbered).

A new question has been inserted. An additional page with this question and solution is included at the end of this document.

Chapter 34

Section 0

The point 'a bank becoming insolvent' should be added to the bullet point list and the following inserted as a new Section 0.2, titled 'Banks':

The situation for banks is very similar to that for insurance companies. Given the interdependence of banks, the regulator may place particular emphasis on ensuring that any insolvency of a bank is managed in an orderly manner. This is called resolution. It is important that insolvency is managed carefully to avoid a contagion effect, *ie* the failure of one bank leading to the failure of others.

Summary pages

A revised chapter summary is included at the end of this document.

Chapter 35

Section 2.1

The title of this section should be adjusted to 'Sources of capital for financial product providers' as most of the points are just as relevant for banks as for insurance companies.

Chapter 36

Chapter summary

Under the heading 'The Basel Accords', replace the content with the following:

The Basel Accords set out regulatory capital requirements for **banks**, including that:

- capital requirements are assessed for each of credit, market and operational risks
- these are aggregated without any allowance for diversification
- additional capital conservation and countercyclical capital buffers must be held.

Practice Questions

A new question has been added on capital adequacy measurement for banks. An additional page with this question and solution is included at the end of this document.

Chapter 37

Section 3

Add ‘for insurance companies and benefit schemes’ to the end of the first bullet point in this section.

Section 3.2

Insert the following above the bullet point list:

The following examples mainly relate to insurance companies.

3 Changes to the X Assignments

Overall

We have made a number of changes to the assignments to reflect the recent changes to the IFoA exams. We have not detailed these changes in the Upgrade.

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 at:

www.acted.co.uk/paper_reduced_prices.html

If you wish to submit your scripts for marking but have only 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 2022 session. We only accept the current version of assignments for marking, *ie* those published for the sessions leading to the 2022 exams.

4 Other tuition services

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

4.1 Study material

We also offer the following study material in Subject 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 2022 *Student Brochure*, which is available from the ActEd website at **www.ActEd.co.uk**.

4.2 Tutorials

We offer the following (face-to-face and/or online) tutorials in Subject 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 **www.ActEd.co.uk**.

4.3 Marking

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

For further details on ActEd's marking services, please refer to the 2022 *Student Brochure*, which is available from the ActEd website at **www.ActEd.co.uk**.

4.4 Feedback on the study material

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

If you have any comments on this course, please send them by email to **CP1@bpp.com**.

9 Other external issues

9.1 Changing cultural and social trends

Changing cultural and social trends can have an impact on the financial products, schemes, contracts and transactions available.

For example:

- **As home ownership becomes more widespread in the population there will be a greater demand for mortgages.**
- **If the State cuts back on healthcare provision for its citizens there will be a greater demand for products that meet the cost of private healthcare.**
- **If individuals have increased amounts of 'spare' income there may be an increased demand for savings products.**
- **Owing to increased awareness of environmental and ethical issues amongst consumers, an insurer may face reduced demand for its products if it fails to satisfy customers that it is contributing towards the transition to a lower-carbon economy, *eg* by continuing to make new investments into companies that generate power from fossil fuels.**
- **In many countries, for motor insurance business, there has been an increase in the use of telematics, whereby to assess the risk factors for an individual, the policyholder's driving behaviour and other factors are monitored through a black box device, installed in the insured vehicle, or through a smart phone app. This makes information available to the insurer on some risk factors which would not normally be readily measureable. Examples of possible additional information include:**
  - **information on the ability of the driver**
  - **the speed at which the vehicle is usually driven**
  - **the vehicle's general level of performance.**

  The insurer could then use this additional information to help price the risks more accurately.

9.2 Demographic changes

Demographic changes to a population can have a major impact on the main providers of benefits on contingent events, particularly the State. There are two main sources of demographic changes leading to population ageing:

- **rising life expectancy**
- **declining fertility.**

The significant decline in the total fertility rate over the last 50 years is primarily responsible for the population ageing that is taking place in the world's most developed countries. Many developing countries are going through faster fertility transitions and they will experience even faster population ageing than the currently developed countries in the future.

The effects of an ageing population are considerable:

- **Economically, older people are more likely to be saving money (*eg* for retirement) and less likely to be spending it. This leads to lower interest rates and deflationary pressures on economies.**
- **Social welfare systems have also begun to experience problems. Some pay-as-you-go State pension systems are becoming unsustainable.**

  The cost of social welfare is often the largest area of expenditure for a government.

  Under a State-run pay-as-you-go system, taxes (or their equivalent) from the current working population are used to pay benefits of current pensioners.

  This may become unsustainable because there are:

  – fewer people in the working population over time, therefore falling contributions
  – more people surviving to retirement age to start receiving the benefit
  – people living longer in retirement, so the benefit is paid for longer.
- **The cost of healthcare systems will increase dramatically as populations age. Governments will be faced with a choice between requiring higher levels of tax to be paid or accepting reduced government role in providing healthcare.**
- **However, the second largest area of expenditure for many governments is education. The cost of educating the population will tend to fall with an ageing population.**

Climate change could also influence population demographics. Whilst there is still uncertainty regarding the actual impact of climate change on population trends, some potential effects could include the following:

- **mass migration from areas at higher risk of flooding due to heavy rainfall and rising sea levels**
- **increased morbidity and mortality**
- **increased incidence of diseases in some areas**
- **increased conflict and wars.**

Climate change might also reduce morbidity and mortality, *eg* due to warmer winters.

9.3 Climate change and other environmental issues

Climate change and a focus on environmental sustainability will have a material impact on financial markets and financial service providers. Rapid transformation of the energy system would mitigate some of the future physical risks of climate change but it also presents greater risks and opportunities in the shorter term due to economic transition.

For example, a move away from fossil fuels:

- may mean the share prices of oil companies fall but the share prices of companies producing batteries for electric vehicles rise
- may lead to less pollution and therefore lighter morbidity and mortality, impacting life and health insurer claims.

Additionally, changing trends in urbanisation, land use and globalisation may increase the impacts of climate change in the following ways:

- **Unplanned urbanisation may lead to environmental issues such as overcrowding, water shortages and poor sanitation as well as its associated diseases such as cholera, diarrhoea, respiratory illnesses and heat stress.**
- **Most major cities are along coastlines, hence have increased susceptibility to sea level rise and extreme weather such as hurricanes and typhoons.**

However, changing trends may also contribute towards mitigation of climate change in the following ways:

- **Building climate-smart cities may aid in reducing greenhouse gas emissions and mitigating the effects of climate change, *eg* erecting flood defences, electric transportation.**
- **Afforestation, which is the planting of more trees, can help in removing greenhouse gases from the atmosphere.**

Climate change will undoubtedly bring opportunities and risks for providers of benefits. For instance, there will be opportunity for new products that protect against the risk of climate change.

It is also expected that because of the effects of climate change, some risks are likely to become uninsurable, *eg* some coastal regions. Insurance companies will need to adapt risk selection and also manage the potential wider social and reputational challenges from withdrawing cover from high risk areas.

Similarly, some asset classes will become obsolete requiring insurers to place greater emphasis on economic, social and governance (ESG) considerations in investments decisions.

For example, insurers may wish to avoid investing in sectors with a large carbon footprint, *eg* providers of fossil fuels and aviation, and instead may choose to invest in businesses that demonstrate they are sustainable over time. We will discuss ESG in more detail in a later chapter of the course.

You can read more about climate change at: metoffice.gov.uk/weather/climate-change/what-is-climate-change.

9.4 Lifestyle considerations

Younger members of the population will have a high demand for loans and mortgages and are less likely to be saving towards retirement.

As individuals age they will pay off some of their loans and begin to save. They may also have an increased demand for life insurance protection products as they have dependent children and a longer working lifetime.

The phrase 'longer working lifetime' in the previous paragraph refers to the expectation of needing to stay in work to a higher age than may have been the case for previous generations.

Once members of the population retire from employment, they are likely to reduce the amount they save and start spending the funds they have saved. They may have a need for annuities and products providing long-term care. Their need for life insurance may decline, if their dependants become more self-sufficient. However, longer working lifetimes and increases in life expectancy will increase the amount of life insurance required and increase the age to which it is required.

At the time at which investors move from savings accumulation to savings decumulation, many may wish to secure certainty of value and avoid investment in volatile markets and volatile instruments. This suggests a gradual move from equity-type towards fixed interest-type assets.

This concept of gradually disinvesting from more volatile assets into more secure assets is known as 'lifestyling'.

However, better-off investors may be able to afford to take more risk during the decumulation phase in order to gain a better investment return.

As people live longer they will need to save more and/or save for longer to ensure that their assets do not run out before they die.

9.5 International practice

Providers may need to look to the international markets to see if products sold in other countries could be replicated in their own country. Often the difference in tax and legislative requirements between countries makes this difficult.

One example of a product that has been imported successfully to the UK from Australia is a mortgage product under which the homeowner can offset any monies held in current and savings accounts against the capital owed on the mortgage loan. Interest is usually calculated daily and charged on the balance of the difference between the loan and balances in the borrower's current and savings accounts.

Another example is critical illness cover, which was developed in South Africa.

9.6 Technological changes

The ways in which financial products are provided for individuals have changed significantly over recent years:

- **Financial products used to be mainly sold by insurance intermediaries who would aim to find the best contract in terms of benefits and premiums for their client. Now, many of these products are sold over the internet with clients being able to obtain a range of quotations for themselves. Clients can purchase the product without ever speaking to a representative of the provider.**
- **For commodity products (motor insurance, household insurance, term life insurance and annuities) there are price comparison websites that save the individual accessing many companies' sites – although not all providers choose to be included on price comparison sites, for which there is a substantial fee to be paid.**
- **Banking and savings services are also now provided over the internet and by telephone as well as in the traditional bank and building society branches.**

- **Some banks are choosing to only deal with their customers online. This can allow the bank to reduce its costs and also potentially meet the needs of its consumers better.**
- **Insurance companies increasingly use websites to:**
  - **capture enquiries from clients**
  - **record changes to clients' personal details**
  - **register claims**
  - **perform other administrative tasks.**
- **Financial product providers are establishing presences on social media, not only for general advertising purposes but also to provide direct links to product sales and customer enquiry websites.**
- **Email is a fully accepted and widely used means of communication.**

Technological changes may also mean improved healthcare and medical techniques, affecting the profitability, and possibly pricing, of relevant products in the future.

Another example is the increased access to mobile phone technology in developing nations, which has contributed to a growth in the provision of microinsurance, *ie* protection products sold to those on low incomes. Mobile phones can be used to make distribution and administration (including premium collection and claims processing) of microinsurance products more efficient, thus lowering costs and broadening access to the intended target market.

Mitigating and adapting to climate change will require wide-ranging technological improvements and innovations, leading to significant changes in capital markets and the asset classes available to financial product providers.

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

Chapter 2 Summary

External environment

The following aspects of the external environment can have implications for the main providers of benefits on future financial events:

Legislation and regulations	• require compulsory insurance in certain circumstances • influence the types of product available • regulate the sales process
State benefits	• raise employers' awareness of the need to top-up State benefits • raise individuals' awareness of the need to top-up State benefits • reduce levels of saving if benefits are means-tested • may require compulsory contributions • can introduce moral hazard, *ie* the risk of individuals relying on the State and not purchasing their own cover
Tax	• affects the form of benefits within products • means that product innovations may be designed to avoid paying tax, *eg* inheritance tax • directs savings towards the most tax-effective forms (*ie* preference for income or capital gains) or tax shelters (*eg* ISAs)
Accounting standards	• influence an employer's provision of employee benefits • influence the range of products marketed
Risk management requirements, capital adequacy and solvency	• form part of banking and insurance regulation • may impose minimum standards of risk governance, including risk management roles within a firm, as well as minimum capital requirements • are moving towards risk-based frameworks, *eg* Solvency II for insurers
Corporate governance	• encourages managers to act in the best interests of stakeholders • incentivises managers accordingly • may utilise non-executive directors • influences the way in which stakeholders' needs are met
Private companies	• may find the same difficulties as mutuals in raising capital, but • benefit from a close involvement of the owners and potential access to significant additional capital All proprietary companies have the issue of how to distribute surplus between shareholders and any with-profit policyholders.

Competitive advantage and commercial considerations	For insurers, an important concept is the *underwriting cycle*. The position in the cycle is an important consideration when making strategic decisions. The underwriting cycle relates to: • profitable business leading to new entrants, greater competition, 'soft' premium rates and reduced profits, leading to … • … insurers leaving the market or reducing their involvement, increased premium rates or loss of business or reduced solvency and the need for capital. For banks, the equivalent business cycle is driven by changes in interest rates and by economic activity.
Changing cultural and social trends	• include aspects such as the level of home ownership • impact on the financial products, schemes, transactions and risk assessment approaches available
Demographic changes	• can have a major impact on main benefit providers, *eg* the State • include increasing longevity and falling birth rates • may result in an ageing population, which leads to: – less spending, as people of working age save more as they get older – a strain on social welfare systems – an increased cost of healthcare – the cost of education falling • are also affected by climate change: mortality, morbidity and migration
Climate change and other environmental issues	• impact on financial markets and financial service providers • are related to changing trends in urbanisation, land use and globalisation • lead to opportunities and risks for providers of benefits, *eg* new products but also need to withdraw cover from high risk areas
Lifestyle considerations	• younger people have preferences for loans rather than savings • people with children may have a need for life insurance protection products • older people may need annuities and long-term care products
International practice	• may lead to overseas products being replicated in the domestic market, subject to tax and legislative considerations
Technological changes	• impact on how financial products are provided, *eg* internet, price comparison websites, telephone and online banking • impact on wider administration processes, *eg* registering claims, customer enquiries

Chapter 3 Additional Practice Question

Exam style

3.1 A proprietary life insurer that invests in corporate bonds, equity and property is considering how to future proof its investment strategy against climate change related risks.

(i) Outline the climate change related risks that might affect the insurer's investments. [4]

(ii) Outline actions the insurer can take to manage these risks. [4]

[Total 8]

Chapter 3 Solutions

3.1 (i) ***Climate change related risks affecting the insurer's investments***

Corporate bonds and equities

The investments may be in businesses with a large carbon footprint … [½]

… which may be less attractive to investors in the future leading to a fall in asset prices. [½]

In addition there may be new regulation introduced, requiring such businesses to reduce their carbon footprint … [½]

… which may lead to high expenses, reduced expected profits and a fall in asset prices. [½]

Property

Property investment may be directly impacted by climate change, for example if properties are in an area now more prone to flooding … [1]

… which will mean the property is less attractive and reduce its value. [½]

It may also become more expensive / difficult to obtain insurance for such assets, *eg* against flood risk. [½]

General points

There may be reputational risk for the insurer, if shareholders and policyholders do not approve of the insurer investing in businesses that have a large carbon footprint. [1]

There may be upside risk, if the insurer's investments are in businesses that are being proactive in moving to carbon-neutral status, as such assets are more likely to rise in value in the future. [½]

[Maximum 4]

(ii) ***Actions to manage risks***

Climate change related risks should be considered when making decisions about future asset purchases and sales. [½]

Environmental, social and governance factors should be taken into account when making investment decisions. [1]

Research should be carried out before investment decisions are made, taking account of the information available in relation to: [½]

- the current carbon footprint [½]
- the actions being taken to reduce the carbon footprint [½]
- any direct implications of climate change. [½]

Modelling can be used to determine the likely impact on asset prices of climate change. [½]

The likely reaction of shareholders, policyholders and other key stakeholders to the investments held should be monitored. [½]

Potential regulatory changes that are likely to be made in the transition to a low carbon economy should be monitored … [½]

… and the impact on assets assessed with action taken as necessary. [½]

[Maximum 4]

3

Regulation

Syllabus objectives

9.1.1 Describe the principles and aims of prudential and market conduct regulatory regimes.

9.1.2 Discuss the role that major financial institutions can play in supporting the regulatory and business environment.

9.1.3 Explain the concept of information asymmetry.

9.1.4 Explain how certain features of financial contracts might be identified as unfair.

9.1.5 Discuss the implications of a requirement to treat the customer fairly.

9.1.6 Describe the aims of policy developments with respect to climate risks and sustainability.

0 Introduction

Like many markets, an unregulated market for financial services may not produce an economically optimal outcome, in which all investors make the best investment decisions and risk is allocated optimally throughout the economy.

The most important cause of market failure in financial services markets is likely to be the lack of (perfect) information available, in particular to private investors, concerning the financial services that they are buying and the risks being taken by the institutions in which they invest.

To counteract this problem, the market for financial services is usually subject to some form of regulation. Indeed, given the nature of financial services – *ie* their complexity, their often long-term nature and the potentially large sums of money involved – the extent of regulation within the financial service sector is often much greater than that found in the markets for other goods and services.

Over time there has been increased focus on the importance of regulation and government / international policies in relation to climate change and sustainability. This includes regulation applicable to financial institutions that may be adversely affected by climate change but equally can play a role in the smooth transition to a low carbon economy.

This chapter therefore outlines:

- the aims of financial services regulation (Section 1)
- the costs and benefits of regulation (Sections 2 and 3)
- the functions of a regulator (Section 4)
- the areas addressed by regulation (Sections 5 and 6)
- some of the possible regulatory regimes that may operate in practice, with particular emphasis on self-regulation and statutory regulation (Section 7)
- the role of major financial institutions in supporting the regulatory and business environment (Section 8)
- regulation and policies relating to climate change, with particular emphasis on regulation of financial institutions (Section 9).

Questions on regulation can cover a wide range of material from this chapter, both in the form of tests of the bookwork and also some quite tricky application questions. It is important to practise plenty of questions.

In other cases, tariff premium rates are set by the government for certain classes of business or types of arrangement. If full tariff rates are not prescribed, the State may still require approval of, or set a maximum level of, charges that an insurance company may impose, in order to protect consumers.

All these features restrict a free market and limit the number of participants in the market to those that can meet the State requirements. State intervention potentially damages innovation and new developments.

The role of the State in the provision of benefits is covered in more detail later in the course.

8.3 Large market participants

Large companies operating within a market can allow smaller participants to find niche markets and can help to stabilise premium rates. However, there may also be negative impacts.

In some markets there is a risk that very large participants could distort the market, potentially to the detriment of consumers in that market. In most developed markets, there will be regulations in place to avoid monopolies and anti-competitive practices in that market.

Regulation or legislation may aim to reduce the power of large market participants. This is in order to ensure that the market is sufficiently competitive and that the main participants do not act or collude in order to set prices and make it difficult for other companies to enter the market. This is often known as competition legislation.

There is also a risk that certain participants in a market could take up a significant share of the available resource that the regulator has. This could mean that the regulator has limited resource available to monitor the smaller market participants. This could be to the detriment of consumers in that market.

9 Climate risk related policy and regulatory developments

9.1 The United Nations policies on climate change and sustainability

Globally, policymakers and regulators have realised the need for actions and policies aimed at mitigating the effects of, and adapting to, climate change. This follows scientific consensus that the warming of the climate is linked to the release of greenhouse gases into the atmosphere from industrial processes. Without an intervention, climate change will continue with increased likelihood of severe and irreversible impacts for environmental and economic ecosystems.

Greenhouse gas emissions continue to rise and are at their highest levels in history. Without action it is projected that the world's average surface temperature will increase by more than 3 degrees by the end of the century. The environmental and economic impact of this is likely to fall most heavily on the poorest and most vulnerable communities.

China is by a significant margin the world's largest emitter of greenhouse gases at over a quarter of global emissions. The USA is the second largest emitter accounting for 13%.

In 2015, most countries signed the Paris Agreement to strengthen global response to climate change, and committed to implement policies such as keeping a global temperature rise of less than 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 degrees Celsius.

The USA withdrew from the Agreement under President Trump but his successor President Biden re-entered the agreement on taking office in January 2021.

Furthermore, all United Nations member states adopted the Sustainable Development Goals (SDGs) which focus on developments that balance social, economic and environmental sustainability.

The sustainable development goals are wide ranging and include removing poverty and hunger, providing access to clean water and sanitation, ensuring good health, education and affordable and clean energy. It also includes goals relating to a decent working environment, economic growth, sustainable cities and responsible consumption.

Most countries are now putting together or have in place policies and regulations to support the attainment of targets outlined within the Paris Agreement and SDGs.

However, government actions to date are thought to be inadequate if the Paris Agreement targets are to be met. Hence, in the near future it is inevitable that governments will adopt more aggressive policy actions to tackle climate change, driven by the emerging impacts of climate change coupled with pressure from key stakeholders.

One possible impact of an abrupt policy response could be a sudden wholesale re-assessment of asset prices in financial markets as assets are revalued to reflect the climate-related policy risks.

For example, if governments introduce aggressive penalties for carbon emissions, there would likely be a significant reduction in the share price of companies with a large carbon footprint. Businesses involved in transportation, electricity production from non-sustainable sources and agriculture could be severely negatively affected. On the other hand, businesses that have worked towards a carbon-neutral position may see their share prices rise.

9.2 The aims of climate change related financial regulations

There is widespread concern among policymakers and financial regulators of the damage that climate change could cause to the financial system. Conversely the financial system can itself play a role in achieving an orderly transition to a low carbon economy.

In order to limit the impact of climate change on the financial system, regulators are working on regulations whose aims include ensuring that financial institutions:

- **consider climate risks in business decision making and strategic planning**
- **effectively disclose and report on climate-related risks and opportunities**
- **adopt a consistent and reliable means of assessing, pricing, and managing climate-related risks**
- **incorporate environmental, social and governance (ESG) factors into investment management decisions**
- **incorporate financial risks from climate change into existing risk management processes**
- **use scenario analysis to inform risk identification and to estimate the impact of financial risks arising from climate change**
- **consider the impact of climate risks on the ability to meet obligations towards policyholders and other key stakeholders.**

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

Role of major financial institutions

Major financial institutions support the regulatory and wider business environment:

- central bank – controlling or influencing economic variables, acting as lender of last resort
- State intervention – provision of products (*eg* through State monopoly companies), control of premium rates
- large market participants – influencing premium rates, allowing smaller participants to find niche markets; however, may distort the market and use up too much of the regulator's limited resources.

Climate risk related policy and regulatory developments

Policymakers and regulators have realised the need for actions and policy to mitigate the effect of and adapt to climate change.

Most countries signed the Paris Agreement in 2015 and have policies and regulations in place to support meeting targets set out in the Agreement and in Sustainable Development Goals (SDGs). Government actions to date though are thought to be inadequate.

Regulators are working on regulations with aims to:

- consider climate risks in business decision making and strategic planning
- effectively disclose and report on climate-related risks and opportunities
- adopt a consistent and reliable means of assessing, pricing, and managing climate-related risks
- incorporate environmental, social and governance (ESG) factors into investment management decisions
- incorporate financial risks from climate change into existing risk management processes
- use scenario analysis to inform risk identification and to estimate the impact of financial risks arising from climate change
- consider the impact of climate risks on the ability to meet obligations towards policyholders and other key stakeholders.

The practice questions start on the next page so that you can keep the chapter summaries together for revision purposes.

5 Insurance principles

There are three main principles of insurance and pensions that impact on the design of financial products and the benefits that can be provided from such products.

These are:

- the existence of an insurable interest
- pre-funding of the risk
- pooling of risk.

5.1 Insurable interest

In most countries, an insurance contract is only valid if the person taking out the contract has a financial interest in the insured event. This is primarily to prevent moral hazard, fraud, and other crime.

In other words the policyholder has an interest in the claim event not happening and will not (in theory) encourage it to happen. Moral hazard is the idea that the policyholder behaves differently (in a way that may increase the likelihood or size of a claim) because they have insurance in place.

For example, if an individual could insure a building in which they had no interest against fire, then they could raise money from the insurance company by setting fire to the building.

Individuals are generally assumed to have unlimited financial interest in their own lives, and the lives of spouses and dependent children, but other financial interests are limited in amount to prevent overinsurance.

5.2 Pre-funding

The key principle of insurance and pensions is that individuals or corporate bodies put money aside in advance of the occurrence of an uncertain risk event. The uncertainty might relate to:

- **whether the event will happen at all, such as the risk of fire or flood**
- **the timing of a certain risk event, such as life expectancy**
- **the cost of an event that is certainly going to occur.**

The key issue for the individual or corporation is how much money is needed to provide a given level of benefit with the desired probability. This will depend on:

- **the probability of the risk event occurring**
- **the amount that the risk event will cost, and**
- **the return that can be earned on the pre-funded money before the risk event occurs.**

We will learn about pricing insurance contracts later in the course. The premium charged will reflect the three points in the bullet point list above.

The individual will also have a risk tolerance – how comfortable they are with the probability of their desired outcome not being achieved.

5.3 Pooling of risk

As an alternative to financing benefits directly for themselves, individuals may group together and pool their finances. This approach will help to protect the individuals against some of the uncertainties that may exist in the cost of financing the benefits. It may also lead to more cost-effective provision than if each individual made their own financial provision.

Question

Explain why such group provision may be more cost-effective.

Solution

It may be more effective as there can be benefits of economies of scale in:

- provision (*eg* sharing of fixed costs)
- administration costs
- investment (as there is a larger pool of assets to invest).

Retirement communities

A trade union, an employee association, or a community or religious organisation may be a way in which individuals can group together to form such a pool. An approach that is common in the USA is the establishment of retirement communities. These originated as religious organisations into which members would contribute their available assets in return for lifetime care.

More recently the idea has developed to provide different levels of continuing care (including housing) according to the levels of initial and annual contributions. Continuing Care Retirement Communities (CCRCs) have also started to be established outside the USA.

Question

Explain why the provision of such long-term care is less of a concern in many less developed countries.

Solution

Life expectancy may be shorter than in developed countries. If this is the case then a smaller proportion of the population will reach old age and therefore fewer will require long-term care, or at least require it for a shorter period of time. In addition, family structures are often strong with higher fertility rates. This results in a greater burden of care being placed on the family.

Microinsurance

Various microinsurance examples exist, for example basic life and health insurance in deprived communities in developing countries.

These policies offer basic benefits at a low premium. The insurer can benefit from pooling large volumes of such business.

6 Banking and banking products

6.1 The operation of a bank

Banks form a key part of the financial services sector.

Types of bank

Retail banks

Retail banks are banks that provide a range of savings and loan products to individuals and to small businesses.

Investment banks

Investment banks undertake a range of activities, for example:

- helping large businesses raise further capital through share and bond issues
- advising large businesses on mergers and acquisitions
- providing trading services for bonds, equities and derivatives
- investing directly in the market, *eg* speculative investment in derivatives with the aim of achieving high returns.

The assets and liabilities of a bank

The assets of the bank will be any cash and other securities such as bonds that are held, together with the future repayments expected from any loans issued to customers.

The liabilities of the bank will primarily be the deposits placed with the bank by individuals and businesses (given that customers will want to withdraw their funds at some point).

Banks and exposure to risk

Banks are exposed to a number of risks, including:

- customers default on repaying loans
- interest rate changes, which can negatively affect the business, *eg* a fall in interest rates reducing the repayments on variable rate loans
- failures of processes, *eg* poor data handling and IT failures
- fraud
- failing to meet regulation, *eg* being fined for failing to spot and act on money laundering
- failing to meet capital requirements
- cashflow issues, an extreme example of which would be a fall in confidence in the banking sector and a run on the bank; this is an example of liquidity risk.

Banks and the role of actuaries

Actuaries can provide support in many areas, including:

- risk identification and management
- data management and modelling
- product pricing
- asset-liability management
- meeting capital and liquidity requirements.

6.2 Banking products

Banks offer a range of different products aimed at saving, investment and borrowing.

Current account

This is a flexible bank account that allows both savings and borrowing. There are multiple payment methods from the account:

- **cash withdrawals**
- **debit cards**
- **regular payments to third parties …**

  … for example, direct debits and standing orders
- **online and mobile payments**
- **cheques.**

Current accounts may:

- **allow a saver to deposit money into or withdraw it from the account at any time they wish**
- **place a limit on when the customer can withdraw their money, referred to as notice accounts.**

  The notice period is often 30 days, 60 days or 90 days. Interest rates on notice accounts are normally variable. Notice accounts often pay a higher rate of interest than instant access accounts since the deposits are more valuable to the bank because these balances do not require the bank to hold a liquidity buffer.

  In other words, the bank has time to realise assets to meet withdrawals.

Some current accounts will have overdraft facilities, which is a flexible borrowing facility linked to a current account. Current account overdrafts are generally treated as unsecured loans.

As overdrafts are not secured on any particular asset of the account holder they are riskier from the bank's perspective and therefore a relatively high interest rate is likely to be charged by the bank to reflect this risk.

Credit card

This is a form of credit with an agreed borrowing limit. The credit card holder can spend up to the agreed borrowing limit and must pay back a minimum amount each month.

This is a form of unsecured borrowing and therefore likely to attract a relatively high interest rate. The credit card may offer some incentives for new customers, *eg* a six-month period where no interest is charged.

Loan

A loan is an amount borrowed by an individual (personal loan) or a company (corporate loan).

Loans may be secured or unsecured:

- **A secured loan is a loan backed by some form of financial asset (often referred to as collateral). This financial asset can be taken by the bank in the event the loan is not paid back in line with the terms of the loan.**
- **An unsecured loan is not secured against another asset. Examples of unsecured loans include current account overdrafts, unsecured personal loans and credit cards. Unsecured loans carry greater risk to the bank than secured loans …**

  … and therefore the bank is likely to charge a higher interest rate.

Personal loan

A personal loan is a loan taken out by an individual and paid back over a fixed period, typically one to seven years. Interest rates on personal loans are often fixed for the life of the loan.

One example is a car loan which is a form of personal loan, taken out to buy a car and secured on the car. Otherwise, personal loans are generally unsecured.

Corporate loan

A corporate loan is a loan by the bank to a company. Corporate loans are normally variable rate.

Corporate loans are more likely to be secured, as most companies will have tangible assets, *eg* a factory or machinery that they can offer as collateral to back the loan.

Mortgage

This is a loan taken out to purchase a property, and secured on the property. In the event that the borrower defaults, the lender can sell the property to recover its debt.

In this situation there is a risk to the bank that the value of the property is low at the point of sale and the amount received is insufficient to meet the outstanding debt and interest.

Mortgages may be:

- **residential mortgages, where the borrower lives in the property**
- **buy-to-let mortgages, where the property is rented to a third party**
- **commercial real estate mortgages.**

Interest rates on mortgages are normally variable (and funded by variable rate deposits), but may be fixed.

Capital is normally repaid over the term of the mortgage.

This is called a repayment mortgage. Early payments on the mortgage will primarily be used to meet interest costs, but over time more of each payment will be used to repay the outstanding capital.

However, in some circumstances, interest-only mortgages may be available.

With an interest-only mortgage, the regular payments made by the customer are only to meet interest costs, with the full capital amount being outstanding throughout the term. The customer will need to have funds available to repay the capital at the end of the mortgage term.

Personal protection insurance (PPI)

This is a form of insurance that ensures that loans are repaid if customers are unable to make the payments because of accident, illness, disability or death.

The product might also repay the loan if the customer is made unemployed.

The mis-selling of PPI in the UK has led to the largest consumer redress scheme in British history. The mis-selling related to banks encouraging consumers to purchase PPI when the product did not meet their needs. For example, because:

- they were self-employed and therefore the product would not pay out
- they had alternative provision for accident and illness, *eg* through their employer.

As of January 2020, the total compensation paid to customers who had purchased PPI was in excess of £38 billion.

Asset-backed security (ABS)

This is a bond backed by a ring-fenced pool of assets.

An ABS is a way of repackaging future loan repayments and selling these repayments to an investor in return for a cash sum now.

For example, a furniture business that offers loans to customers to buy sofas and then receives the loan repayments with interest in future, may at some point wish to repackage the outstanding loan payments, sell them and in return receive a cash payment now.

An investment bank would normally be involved in this repackaging with the business selling its current loan book to the bank.

Investors who purchase the bond receive the interest and capital repayments on the loans, less an administrative fee to meet the bank's costs.

The bank will normally divide the loans into homogeneous groups, for example by likelihood that the loan will be repaid, its maturity date and interest rate. This creates different tranches of loan, with different levels of associated risk of being repaid in full.

ABSs are normally issued in tranches (often called A, B and C), with different yields and different levels of risk. Under this structure, A tranches may get high credit ratings and may be sold to institutional investors.

Institutional investors with specific guaranteed liabilities to pay and regulatory requirements to meet may be unwilling to take too much investment risk and so would be attracted to the higher security offered by tranche A.

Investors are repaid through interest and capital payments made from the pool of assets.

ABSs may be backed by mortgages, car loans, unsecured personal loans, credit cards or other types of loan.

Mortgage-backed security (MBS)

An MBS is a particular example of an asset-based security. With an MBS, the bank will repackage the outstanding repayments on mortgages that are due from customers and sell to investors.

A bond is created on which the payments to investors are made from a ring-fenced pool of mortgage assets.

6.3 Derivatives

Banks act as intermediaries in the derivatives market helping to match sellers and buyers of derivatives and earning commission fees. Banks also participate directly in derivatives markets as buyers or sellers.

A derivative is a financial instrument whose value depends on the value of other investments (*eg* shares, bonds) or variables (*eg* interest rates, exchange rates).

Providers of financial products, schemes, contracts and transactions can pass some of the risks that they take on to third parties through reinsurance contracts.

As with reinsurance, derivatives can also be used to pass risk to a third party. Derivatives are discussed in more detail in a later chapter.

Question

An investor holds shares in a big supermarket chain.

Describe how the investor can protect themselves against the risk of a fall in the value of these shares, using derivatives.

Solution

The investor could:

- sell a futures contract on the supermarket shares, *ie* enter into an agreement to sell the shares on a specified future date at a price agreed now
- buy a put option on the supermarket shares, *ie* give themselves the right, but not the obligation to sell the shares on a specified future date at a price agreed now.

7 Investment schemes

Investment schemes involve an individual paying a single payment or a series of payments to a provider with the expectation that a higher amount will be paid back at a later date.

Again, the generality of the definition enables it to incorporate a wide range of investment schemes. It therefore embraces:

- savings products offered by insurance companies, *eg* a unit-linked savings plan
- collective investment schemes such as investment trust companies and unit trusts.

These products will be covered later in later chapters.

8 Analysing stakeholders' needs

8.1 Logical or emotional needs

This section refers to two possible approaches to establishing a customer's needs:

- a logical approach of systematically and carefully working out what needs a customer has and fitting products to these needs
- an emotional approach, which plays more on what an individual feels is needed.

These two approaches can lead to identification of some of the same needs.

It is important to differentiate between the emotional needs and the logical needs of the customer. If the customer's emotional needs are met, they may get what they want rather than what they really need.

Question

Give four examples of emotional needs.

Solution

Examples of emotional needs include:

- **an individual may believe they have a need to generate additional income in retirement from investment capital. However, this may be an emotional need. On analysis, it may be that the customer's expenditure levels will fall on retirement and that the level of additional income required may be very much lower than perceived.**
- spending money today on enjoying oneself (in preference to protection or savings), *eg* on gambling or going on a spending spree
- providing overly generous death benefits for dependants
- emotional needs also include wanting more benefit than is needed.

The logical needs approach involves establishing the customer's needs, analysing them, prioritising them and fitting the benefits or products provided to those needs. Thus there is reconciliation between the products and the needs.

The process of analysing and prioritising financial needs is called a *fact find* and is often carried out by a financial adviser.

Chapter 4 Summary

Benefits

Benefits can be categorised as:

- benefits on events that are unpredictable – whether *and* when they might occur
- benefits on events certain to occur, but unpredictable in time
- benefits for immediate consumption
- benefits on events predictable in time
- benefits from the accumulation of disposable income and capital.

Types of provision and product

Category	Description
Social security	Benefits vary significantly by country and may be means tested. There is a risk to individuals from the State changing or withdrawing future benefits.
Insurance products	In return for a single (or a series) of payments the provider will pay an individual or any heirs an agreed amount (or series of amounts) that start or end on the occurrence of a pre-specified event. This event may happen to the individual, the individual's property or a third party.
Reinsurance products	Used by providers to pass on some of the risk they take on.
Pension schemes	A scheme where funds are accumulated and paid out on a later event, for example retirement, death or withdrawal from the scheme.
Banking products	Current account – flexible bank account offering savings / borrowing and multiple payment methods. Credit card – form of credit with an agreed borrowing limit and minimum monthly repayment. Loan – lending to an individual or business, may be secured or unsecured. Mortgage – loan to purchase a property and secured on the property. Usually repayment but could be interest only. Personal protection insurance – insurance to repay loans if customers are unable to make payments, *eg* due to illness, death. Asset-based security – future loan repayments repackaged as a bond and sold to investors. Normally issued in tranches based on risk of default. Mortgage-based security – payments relate to a pool of mortgage assets. Derivatives - a financial instrument whose value depends on that of other investments (*eg* shares, bonds) or variables (*eg* interest / exchange rates).
Investment schemes	A single payment (or series of payments) is made to a provider with the expectation that a higher amount will be paid back at a later date.

Insurance principles

There are three main principles of insurance:

- insurable interest
- pre-funding
- pooling of risk.

Continuing care retirement communities and microinsurance are examples of pooling of risk.

Customer needs

It is important to differentiate between a customer's:

- logical and emotional needs
- current and future needs.

Need	Description
Logical	Can be analysed as follows: • maintaining a current lifestyle • protection • accumulation for a purpose • accumulation for a purpose as yet unknown.
Emotional	Not identified in such a methodical way as logical needs but instead are the result of what a customer thinks is needed or wants (rather than needs).
Current	Triggered by an event that has an immediate effect on a customer's circumstances, *eg* protection against sickness.
Future	Relates to a customer's future aspirations, *eg* to retire at a certain age.

Amongst the main factors that influence the general level of the equity market are:

- **expectations of real interest rates and inflation**
- **investors' perceptions of the riskiness of equity investment**
- **the real level of economic growth in the economy**
- expectations of currency movements.

In addition to the factors listed above, any factor affecting supply *eg*:

- **the number of rights issues**
- **share buy-backs**
- **privatisations**

and any factor affecting demand *eg*:

- **changes to tax rules**
- **institutional flow of funds**
- **the attractiveness of alternative investments**

will affect market prices.

To help understand the factors above it can help to think about one approach that can be used to value equity, a discounted dividend model. This model values shares by:

- projecting the future cashflows from the shares (*ie* the dividends)
- discounting these dividends back at a rate of return that allows for the investor's perceptions of the riskiness of the investment.

Future real dividend growth might be expected to occur in line with real economic growth. The discount rate will typically be a risk-free rate (a real rate if it is being used to discount real cashflows) plus a risk premium. So, this model helps us to identify real risk-free interest rates, the equity risk premium and real economic growth as the key factors underlying the general level of the equity market. These points are brought out in the discussions below.

Real interest rates

Real interest rates have two important effects:

1. **Low real interest rates should help to stimulate economic activity, increase the level of corporate profitability, and hence raise the general level of the equity market.**
2. **Also, the rate of return required by investors should be lower, so the present value of the future dividends will be higher.**

Inflation

Equity markets should be reasonably indifferent towards high nominal interest rates and high inflation. If the rate of inflation is high, the rate of dividend growth would be expected to increase in line with the return demanded by investors.

There may be timing differences to the extent that increases in dividends may not coincide exactly with short-term inflation. However, in the long term, inflation should not depress the *real* value of equities. If the income and outgo are increased through inflation by *x*%, then profits are increased by *x*%, and the value of the shares should be *x*% higher (*ie* same *real* value).

There are some indirect effects from inflation:

- **It might be argued that high interest rates and high inflation are unfavourable for strong economic growth, so fears of inflation will have a depressing effect on equity prices.**
- **Real interest rates are probably more important than nominal interest rates for investors.**

Nominal interest rates are the stated interest rate on a bond or loan and take no account of inflation.

The nominal interest rate is the interest rate including inflation, *eg* if the real interest rate is 1.5% and inflation is 0.5% then the nominal interest rate is 2%. Interest rates quoted by banks *etc* are normally expressed in nominal terms, ie before deducting inflation.

Real interest rates are the nominal interest rates adjusted to take into account the effects of inflation.

In other words, the real interest rate is the interest rate with inflation stripped out.

Real interest rates provide an investor with a clearer view of the purchasing power of the interest they receive on their investment over time.

Investors expecting high inflation may also expect the government to increase nominal interest rates in response.

- Often a rise in inflation makes the prospects for inflation less certain.

  Uncertainty about future inflation would make investors more nervous about fixed-interest bonds.

  Nervousness in the bond market might result in an increase in equity investment, as equities should provide a hedge against inflation. This would tend to increase the relative level of the equity market at the expense of the bond market.

Equity risk premium

The equity risk premium is the additional return that investors require from equity investment to compensate for the risks relative to risk-free rates of return. The equity risk premium fluctuates from time to time, depending on the overall level of confidence of investors and their views on risk.

Question

State the main factors that would lead us to require a higher return from equities than from government bonds.

Solution

We would require a higher return from equity risk to compensate for the:

- greater risk of default – with respect to both income and capital payments
- lower marketability of equities compared with government bonds
- greater volatility of income and capital values, *ie* lower liquidity.

Real economic growth

In general, real dividends, and therefore the fundamental value of companies, would be expected to grow roughly in line with real economic growth.

Therefore, changes in investors' views on economic growth have a major effect on the level of the equity market.

Currency

A weaker domestic currency makes exports more competitive, so profits of companies that export goods and services, should increase. Profits earned in other currencies are more valuable when converted into the domestic currency.

A weaker currency makes imports more expensive. This reduces corporate profits if firms cannot pass the higher costs of imported raw materials to consumers. Higher costs of raw materials also lead to inflation. However, if manufactured imports are more expensive, the market share of domestic producers of the same goods should increase.

In countries like the UK, where a high proportion of profits are earned abroad, sterling depreciation should raise the general level of the equity market.

The impact of exchange rate movements will be smaller for countries for which overseas trade and capital flows are less important.

6 Factors affecting the level of the property market

6.1 Introduction

Economic influences have an impact on the property market in three main inter-related areas:

- **occupation**
- **development cycles**
- **the investment market.**

Question

Explain what is meant by the terms:

(i) occupation

(ii) development cycle

(iii) investment market

in the paragraph above.

Solution

(i) occupation – the demand for property for occupation, *eg* businesses seeking commercial property to rent

(ii) development cycle – the supply of newly completed property developments

(iii) investment market – supply and demand for properties as investments

The interaction between occupational demand and the supply of property for rent determines the market level of rents. The capital value of rented property is determined by the investment market.

The capital value will reflect the market level of rental income (just as the capital value of shares reflects dividend income).

We will firstly concentrate on commercial property investment. Economic influences on residential property are covered later in this section.

More generally, the investment fund should act in accordance with the expectations of its investors, which are influenced by:

- any explicitly stated objectives
- marketing literature
- the past investment policy of the fund.

Size of the assets – absolute

A small fund may be unable to invest in some of the available assets, primarily because it will be unable to achieve an appropriate level of diversification.

Question

It would not be sensible for a fund with assets of 100 to invest in a single property with a market value of 60.

Suggest how this fund might instead invest in property.

Solution

The fund might instead invest indirectly in property, perhaps via property company shares or a property unit trust.

Size of the assets – relative to the liabilities

Having assets in excess of the liabilities is normally the most important reason why the investment manager may have freedom to mismatch. The bigger the free assets, the more scope the investment manager has for mismatching, as there is a bigger *cushion* with which to absorb any mismatching losses.

Tax

Investors' preferences for income or capital growth from their investments are governed by two main factors: tax and cashflow requirements. If an institution is subject to different taxation bases on income and capital gains it will prefer to receive as much of its total return as possible in the lower-taxed form.

The market price of low income securities is pushed up if many investors have a preference for capital gains. Therefore we really need to consider the *relative* preferences of different investors.

Demonstrating solvency

For some long-term institutional investors, fluctuations in asset market values are not of much concern particularly if the strategy is to hold assets to maturity. However, they may be important for institutions that are required to demonstrate solvency on a regular market value basis and have a low level of free assets. Fluctuating asset values are also, in general, disliked by retail customers of some institutions.

Environmental, social and governance (ESG) considerations

There is increasing integration of environmental, social and governance considerations (ESG) in investment practices, due to reasons of risk and return and the public interest as well as the more traditional ethical reasons.

Sustainable investment refers to investment approaches which take account of environmental, social and governance (ESG) issues in a way that is consistent with the long-term sustainability of society and the natural environment. This is relevant when investment is motivated by financial objectives having regard to long-term sustainability.

Examples of ESG factors include:

- **environmental – climate change, resource depletion, waste *etc***
- **social – human rights, modern slavery, working conditions *etc***
- **governance – bribery and corruption, executive pay, board diversity and structure *etc*.**

Investors increasingly analyse such non-financial information about a company and its value chain when evaluating investments.

Companies may be required to produce a sustainability report for their business. This information may be combined with the financial reporting of the company or be a standalone document.

Investors will often consider the potential risks from ESG factors when analysing a business. These risks may be:

- **company-specific, such as potential compensation payments / environmental clean-up costs and reputational damage**
- **systemic, from shifts in markets and economies, in response to environmental and social impacts, *eg* technology and demand changes in the energy sector.**

Analysis of non-financial information will also provide investors with insight into a company's controls, risk management, governance and strategy, which can protect investors from risks of a company performing badly due to poor corporate governance.

3.5 Diversification for institutions

Assets are diversified if there is a low level of correlation between the returns from the assets.

Portfolios that are highly correlated are more volatile, and have a lot more specific risk. According to CAPM, no extra return is available for specific risk as it is possibly to diversify it away.

So it is important that a portfolio should be diversified, both *between* and *within* each asset category, *eg* between different industrial sectors and different individual company shares.

When selecting individual investments, the important factor for an institution is the effect that the investment will have on the performance of the total portfolio.

Thus not only are after-tax expected return and variability of the return important, but so is the covariance of that return with the rest of the portfolio. Investments that have a low covariance with the rest of the portfolio represent diversification and will reduce overall risk. For any investment type, there are many issues to be considered.

Question

Suggest ways that a portfolio may be diversified within each of the following investment types:

- domestic equities
- overseas equities
- property
- fixed-interest bonds.

Solution

Domestic equities

- between broad industry groupings and industry sectors
- level of overseas exposure
- size of company
- level of gearing
- growth *vs* income

Overseas equities

As domestic equities but also:

- by country / geographic region / currency
- by state and level of economy

Property

- by property type (residential or commercial, *eg* office, shop, industrial *etc*)
- by location, region and country
- prime and non-prime
- by type of tenant
- holdings and developments
- leaseholds and freeholds
- by size of property
- direct and indirect investment

Fixed interest bonds

- by type of borrower
- by duration
- by currency

- by marketability
- by security / credit rating

Conclusion

Subject to the above considerations, an institutional investor will seek to maximise the investment return. This may be:

- **for competitive reasons, in order to continue to attract new business**
- **to maximise shareholders' returns**
- **to minimise the cost of providing for the liabilities.**

- 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

Background

Algorithmic trading is a form of automated trading that involves buying or selling financial securities electronically to capitalise on price discrepancies for the same stock or asset in different markets.

Often many trades are carried out very quickly to take advantage of temporary price discrepancies, with the aim of making small profits on each trade. The trader will use a formula (or algorithm) to decide whether a financial asset should be bought or sold.

The parameters underlying the algorithm used to determine when assets would be bought or sold will need to be derived using data from an appropriate source(s).

An example of algorithmic decision making is the increasing use of electronic trading in financial assets in the last few decades.

Algorithmic decision making refers to investment trading decisions that are 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.

The benefits of algorithmic trading

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.

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.

Advances in computer power, communication technology and programming capability have offered new tools for investment decisions, trading execution and risk management.

Electronic trading has the advantages of increased speed and efficiency of trading, and can result in lower dealing costs on trades. In addition, automated trading can potentially facilitate the execution of complex trading strategies that would not have previously been possible.

Risks relating to algorithmic trading

However 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.

Ideally, in the management of risk, providers need to look to find the optimal set of strategies that balance the needs for return, growth and consistency. The risk management process should:

- **incorporate all risks, both financial and non-financial**
- **evaluate all relevant strategies for managing risk, both financial and non-financial**
- **consider all relevant constraints, including political, social, regulatory and competitive**
- **exploit the hedges and portfolio effects among the risks**
- **exploit the financial and operational efficiencies within the strategies.**

3 Risk *vs* uncertainty

3.1 Introduction

It is common to distinguish between risk and uncertainty.

***Risk* refers to the situation where all possible outcomes and their probabilities are known (or, at least, can be estimated).**

Risk can usually be managed and typically there is a choice as to whether to take it.

***Uncertainty* refers to the situation where possible outcomes and/or their probabilities are unknown.**

Uncertainty, in this context, is viewed as there being a lack of complete certainty and a lack of knowledge on which to base an estimate or prediction. It cannot be measured or controlled, and typically there is no choice as to whether it is faced.

3.2 Example

Consider an individual with a lump sum that they wish to invest in order to gain high returns.

Investor A has the choice between five investment funds. They have details on the investment objectives, current constituents and past performance of each fund. In allocating their lump sum investment between the funds, this investor is taking on risk.

Investor B has paid their lump sum to a third party, who will make their investment choices for them from across every possible asset type and investment provider available. Investor B has performed no research, provided no instructions about their investment preferences and imposed no limitations on the third party. This investor is facing uncertainty.

3.5 Example

Banks may be exposed to interest rate risk when assets and liabilities are based on different reference interest rates, or when the timing of interest rate changes affects assets and liabilities differently.

This is an example of asset / liability mismatching. The 'assets' of the bank largely comprise the loans that it has made to corporations and retail customers. The 'liabilities' are principally the deposited funds that it has borrowed.

A reference interest rate is an interest rate benchmark, such as SONIA (Sterling Overnight Index Average) in the UK, or the federal funds rate in the USA, or yields on specified securities or money market instruments issued by the government or central bank.

A different reference rate might be used for charging interest on loans than is used for paying interest on deposits. In that case, a mismatch can arise between cashflows received and cashflows paid out – if the reference interest rates do not move in line with each other.

If the notice period for changing interest rates under a variable-rate arrangement differs between loans and deposits, there can also be a temporary mismatch.

Similarly, a mismatch can arise if more of the assets are fixed-rate arrangements (as opposed to variable-rate) than is the case for the liabilities, or vice versa. For example:

- when interest rates fall, having a higher proportion of fixed-rate deposits would be disadvantageous to the bank
- when interest rates rise, having a higher proportion of fixed-rate loans would be disadvantageous.

4 Credit risk

4.1 Definition and examples

Credit risk is the risk of failure of third parties to meet their obligations.

Particular examples are:

- **a borrower defaulting on interest or capital payments**

  The borrower could, for example, be a company issuing a corporate bond, a bank offering deposit accounts, or an individual taking out a loan from a bank.

  There may be credit concentration risk, where lending is heavily weighted towards individual borrowers, industrial sectors or countries.

  This is a particular risk for banks, in terms of their loan portfolios.

  The term 'credit risk' is sometimes also used to describe the risk associated with any kind of credit-linked event. This could include changes to credit quality (up or down) or variations in credit spreads in the market as well as the default events described above.

  A credit-linked event is of interest because it will normally be associated with a change in value of the associated financial instrument.

Question

(i) Define the term 'credit spread' in relation to a corporate bond.

(ii) Explain why credit spreads might change over time.

(iii) Give some examples of 'credit-linked events'.

Solution

(i) Credit spread is the difference in yield between the corporate bond and an otherwise equivalent government bond.

(ii) The most common reason for credit spreads to move will be perceived changes in credit quality of the issuers. However, changes might also occur if the market alters its view on the premium for illiquidity that is placed on corporate bonds in general (in turbulent times, the spread between any investment and government bonds will widen).

Alternatively, the perceived security of a type of bond may change (*eg* the yield gap between secured and unsecured loans may widen and affect the yield on all unsecured loans).

(iii) Examples include:

- bankruptcy (insolvency, winding-up, appointment of a receiver)
- a rating downgrade or upgrade
- failure to pay a coupon or redemption amount.

- **counterparty risk, where one party to a transaction fails to meet their side of the bargain**

  An example of counterparty risk is settlement risk, which arises when a party pays away cash or delivers assets before the counterparty is known to have performed their part of the deal.

- **general debtors – the purchaser of goods and services fails to pay for them.**

Question

Outline possible credit risk exposures of an insurance company.

Solution

Examples of possible credit risk exposures are:

- Issuers of government and corporate bonds in which the insurance company has invested may default on payments or their bonds may be downgraded.
- The company is exposed to the risk of the failure of banks with which its deposits are held.
- The company's reinsurer(s) will represent exposure to counterparty risk.
- If the company uses outsourcing companies or external investment fund managers, it is exposed to the risk that they will not fulfil their obligations (this may alternatively be classified as an operational risk – see later in this chapter).
- General debtors will include brokers who may fail to pass on premiums.

4.2 Security

The extent to which credit risk arises in relation to an amount that has been lent to a third party depends on the security of the loan.

If a borrower can provide security, providing finance to that borrower will be more attractive to a lender.

The decision as to what security is taken is dependent on:

- **the nature of the transaction underlying the borrowing**
- **the covenant of the borrower**
- **market circumstances and the comparative negotiating strength of lender and borrower**
- **what security is available.**

The covenant of the borrower means the overall creditworthiness of the borrower.

The most common asset to take as security is property. This can be built into the debt issue on the basis of a fixed charge (*ie* secured against a specified property or properties) or a floating charge (*ie* secured against a pool of changing properties).

However there are many different ways of 'collateralising' a loan. Banks, for example, may request that assets be assigned in their name before offering a bank loan (*eg* a life assurance policy may be assigned to the bank before a mortgage is given).

It must be within the ability of the lender to realise the security if necessary in a cost-effective manner.

4.3 Credit rating

A credit rating is given to a company's debt by a credit-rating agency as an indication of creditworthiness, *ie* the likelihood of default / credit loss.

Many corporations now take the view that credit ratings play a key role at the centre of the company's wider strategic and financial management.

Rating agencies (*eg* Moody's and Standard & Poor's) are specialised independent companies focused on the provision of high quality, objective credit analysis. They assess, for example, the relative quality of tradable bonds. Each agency has its own classification of ratings, for example:

Moody's	*Standard & Poor's*	
Aaa	AAA	Investment grade
Aa	AA	
A	A	
Baa	BBB	
Ba	BB	Junk bonds
B	B	
Caa	CCC	
Ca	CC	
C	C	

A company may act to improve its credit rating and these actions may affect the market for that company's and other companies' shares.

5 Liquidity risk

5.1 Definition

The normal definition of liquidity risk relates to individuals or companies.

Liquidity risk is the risk that the individual or company, although solvent, does not have available sufficient financial resources to enable it to meet its obligations as they fall due.

This definition can be extended with: 'or that they can secure such resources only at excessive cost'.

5.2 Liquidity risk for different organisations

Non-financial institutions

Liquidity pressures are the most common reason why a trading company goes into liquidation. The phrase 'into liquidation' immediately gives the reason for the action.

A trading company may well have sufficient assets, probably largely stock and work in progress, to cover its liabilities, but if those assets cannot be realised the company may not be able to satisfy its creditors.

In such a case, the creditors may be able to prevent the company from trading.

Insurance companies and benefit schemes

Insurance companies and benefit schemes normally have little exposure to liquidity risk, because a large proportion of their assets are in cash deposits or bond and stock market assets. In general, these can readily be sold in the market to raise cash when required.

General insurers face liquidity risk if claim costs are higher than expected, for example in the event of a catastrophe.

A benefit scheme may face liquidity risk in the event of a bulk transfer out of the scheme.

Banks

Banks are generally exposed to significant liquidity risk. They lend depositors' funds and funds raised from money markets to other organisations and as mortgages to retail customers, and generally do so for longer periods than they offer to the providers of the funds.

A retail bank that offers customers instant access to their deposits needs to maintain sufficient liquid resources to withstand a large number of customers asking for their money back.

For this reason banks frequently offer good investment returns on fixed term deposits, where the depositors are not able to access their funds until the maturity date.

So banks face liquidity risk if more customers than expected demand cash, *ie* withdraw their deposits.

Behavioural aspects can significantly affect liquidity risk. Mortgages are often repaid earlier than the contractual term (leading to interest rate risk as well as liquidity risk) and, in times of stress, more customers than expected may withdraw funds.

Customers repaying mortgages generates liquidity (cash) for the bank rather than reducing it, but the early repayment option adds to the *uncertainty* regarding the bank's liquidity position. The main risk arising for the bank in relation to the early repayment of mortgages is that of lower profits. This would occur either because the contract does not continue or because a borrower with a fixed-rate mortgage might choose to repay it early in order to take out a new mortgage at a lower interest rate. The latter would occur if interest rates have fallen, hence the above reference to interest rate risk.

Collective investment schemes and insurance funds

Similarly, collective investment schemes and insurance funds that invest in real property need to protect themselves if clients request access to their funds when the underlying properties cannot be sold. Such funds frequently have the power to defer withdrawals by up to six months if necessary, to allow time for property sales. Hedge funds that invest in illiquid assets also often have lock-in periods to mitigate liquidity risk.

The reference to 'insurance funds' here means that unit trusts and other funds used as the backing investments for unit-linked business face liquidity risk if more policyholders than expected surrender their policies.

Similarly, collective investment schemes face liquidity risk if more customers than expected wish to sell their units.

This is particularly the case if the scheme, trust or fund is invested directly in property, as this is not a liquid asset.

5.3 Managing liquidity risk

Financial companies will maintain a degree of liquidity to deal with anticipated liability withdrawals. In the event of these withdrawals being greater than expected, the company may have to convert some of its less liquid assets to cash or else try to borrow additional funds (which may be unavailable or expensive).

Financial companies can allow for liquidity risk to some extent, by allowing a margin for withdrawals being higher than they expect and by allowing for predictable seasonal variations (*eg* higher bank withdrawals pre-Christmas). Typically, the biggest liquidity risk issues for a financial company arise as a result of a *sudden surge* in liability withdrawals.

Question

Explain why there might be a sudden surge in customers withdrawing their deposits from a bank.

Solution

A sudden surge may occur for a number of reasons, including:

- concerns about the bank's security (*ie* its continued solvency)
- solvency concerns about one bank leading to heightened concerns about the solvency of other banks – this effect is known as 'contagion'.

Banks do not hold sufficient reserves to be able to repay all deposit holders immediately. Therefore, if concerned about the solvency or security of a bank, customers may be keen to withdraw their deposits in full as quickly as possible.

This would in itself further threaten the bank's solvency, and a 'run on the bank' may result.

5.4 Market liquidity risk

In the context of financial markets, liquidity risk can arise where a market does not have the capacity to handle (at least, without a potential adverse impact on the price) the volume of an asset to be bought or sold at the time when the deal is required.

In general, the larger a market is, the easier it is to trade and the more liquid it will be, because more participants in the market will be trading at any one time. Thus, when any member of the market wishes to complete a trade, it is likely that the market will be able to find a counterparty willing to accept the trade.

The market is sensitive to factors such as changes in interest rates and the economic outlook, which means that the price of the assets can vary significantly over time, so there is a risk that the asset holder may make a loss if they are required to make a sudden sale at a time the price is depressed.

The terms marketability and liquidity are often used interchangeably. Strictly speaking though, the two are slightly different:

- *Marketability* is how easy it is to buy or sell an asset.
- *Liquidity* is a measure of how quickly the asset can be converted into cash at a predictable price.

A highly liquid asset therefore has two characteristics:

1. It either will quickly become cash because of the terms of the asset itself (*eg* a short-term bank deposit or a government bond with one week until redemption) or else there is a high degree of certainty that the asset could be sold quickly if required.
2. The amount of cash it will or could become is (almost) certain.

Marketability considers only the characteristic of how certain it is that an asset can be sold quickly if required.

Question

Give one example of each of the following:

- an asset that is highly liquid but not marketable
- an asset that is marketable but not liquid.

Solution

A seven-day fixed-term deposit at a bank is a highly liquid asset because it will become cash within a week. However, such deposits cannot be traded, so they are completely unmarketable.

A long-term government bond is a marketable asset because there are many market participants willing to trade at any time. However, it is not a liquid asset as the market value is quite volatile.

(We discussed the relative marketability of short-term and long-term bonds in an earlier chapter.)

7.2 External risk

External risk is a form of non-financial risk but is separate to operational risk.

A 'non-financial risk' arises from an event, other than a financial transaction, that can negatively impact the operations of a company. Operational and external risks may be considered to be non-financial risks.

External risk arises from external events, such as storm, fire, flood, or terrorist attack.

However the failure to arrange mitigation against such risks is an operational risk.

In general these are systematic risks. Only for the largest entities is it economically efficient to diversify these by carrying out the same operation on different sites.

Regulatory, legislative and tax changes are some other examples of external risk.

A global pandemic can be considered to be an external risk, which may then lead to risks in other categories.

7.3 Climate change

Climate change could similarly be linked to external risk, whilst generating other types of risk – particularly operational, market and business (including insurance) risks.

Climate risks are risks arising from adverse changes in the physical environment and secondary impacts on the economy at a regional or a global level. Climate risks for financial companies are categorised into physical, transition and liability risks.

Physical

Physical climate risks are the first-order effects of environmental changes such as greenhouse gas emissions, pollution and land use. The effects may be chronic, such as global warming and sea level rise, or they may be acute events, such as instances of extreme weather.

Physical risks can cause operational disruption and can impact both the assets and liabilities of financial institutions. For example, climate change leading to more natural disasters will affect the liabilities of insurance companies. Such physical risks can also indirectly impact the financial markets if the economy is adversely affected and therefore asset values fall.

Transition

Transition risks refer to economic, political and market changes as a result of efforts to mitigate climate change. For example, changes in consumer preferences towards greener products, or changes in government policy towards reducing fossil fuel consumption.

Such transition risks might lead to the value of assets held falling in the future, if those values do not already fully reflect the impact of transitioning to a low / renewable energy approach.

There may also be upside risk, *eg* investing early in companies that have a low-carbon footprint or are involved in the development of 'green' technologies may lead to high returns.

Liability

Climate liability risks can arise from injured parties seeking compensation for the impacts of climate change. These impacts may be the first-order physical impacts related to climate change, or the second-order transition impacts. For example, a new link established between air pollution and adverse health conditions, resulting in a new class of latent insurance claims.

In this context liability risks means the impact on general insurers from claims arising specifically from the liability business that they sell, for example public liability and professional indemnity insurances. If a third party sues a party with liability insurance for damages relating to climate change, there may be a claim to be settled by the insurer.

It can be difficult to predict the likely impact on liability risks as such claims may not be made until many years after the claim event occurred; in other words, there is a long reporting delay.

Chapter 25 Summary

Risk identification

Everyone in an organisation should be involved in risk identification, at all levels.

Techniques that can be used as part of the process include:

- risk classification (to ensure full coverage)
- risk checklists, *eg* as used for setting regulatory capital requirements
- experience of staff joining from similar organisations, consultants, experts
- project management risk identification techniques:
  - high-level preliminary analysis
  - brainstorming
  - desktop analysis
  - risk register / risk matrix.

Risk categories

The major types of risk faced by an organisation are:

- market risk
- credit risk
- liquidity risk
- business risk
- operational risk
- external risk.

Events such as pandemics and climate change can generate risk across these categories.

Market risk

Market risks are the risks related to changes in investment market values or other features correlated with investment markets, such as interest and inflation rates. Market risk can be divided into the consequences of:

- changes in asset values
- investment market value changes on liabilities
- mismatching assets and liabilities.

Credit risk

Credit risk is the risk of failure of third parties to meet their obligations. Examples include:

- borrowers defaulting on interest and capital payments – including credit concentration risk and possibly also credit spread changes
- counterparties to a transaction failing to meet their obligations – including settlement risk
- debtors failing to pay for purchased goods / services.

Security (or collateral) may be required from the borrower as a way of reducing credit risk when lending money.

Credit ratings are an indication of creditworthiness, *ie* the likelihood of default.

Liquidity risk

Individual or company

Liquidity risk is the risk that an individual or company, although solvent, does not have available sufficient financial resources to enable it to meet its obligations as they fall due, or can secure such resources only at excessive cost.

Financial markets

Liquidity risk arises when the market does not have the capacity to handle that volume of transacted asset without a potential adverse price impact.

Therefore liquidity (how quickly an asset can be converted into cash at a predictable price) differs from marketability (how easy it is to trade an asset).

Business risk

Business risk is specific to the business undertaken. Examples include:

- poor underwriting standards (**underwriting risk**)
- poor claims experience (**insurance risk**)
- providing finance for a project that turns out to be unsuccessful (**financing risk**)
- exposure to a particular risk being greater than expected, or lower sales volumes than expected *eg* due to competitor actions (**exposure risk**).

Operational risk and external risk, including climate change

Operational risk refers to the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events.

Operational risk can be controlled by the organisation, and can arise from:

- inadequate internal processes, people or systems
- poor conduct towards customers / the market (*conduct risk*)
- dominance of a single individual (*dominance risk*)
- reliance on third parties (*eg* outsourcers)
- the failure of plans to recover from an external event.

External risk arises from external events such as storm, fire, flood or terrorist attack.

Regulatory, legislative and tax changes are also examples of external risk.

In general, external risk is systematic (*ie* non-diversifiable) risk.

Climate change may generate the following types of risk for financial companies:

- *physical* – arising from the first-order effects of environmental changes, *eg* extreme weather
- *transition* – arising from economic, political and market changes, *eg* reduced fossil fuel consumption
- *liability* – relating to compensation claims due to the impacts of climate change.

The practice questions start on the next page so that you can keep the chapter summaries together for revision purposes.

Chapter 25 Additional Practice Questions

25.1 Give examples of how banks are exposed to liquidity risk.

25.2 Outline the key risks that might arise for a defined benefit pension scheme in relation to climate change.

Chapter 25 Solutions

25.1 Examples of liquidity risk for banks include:

- significantly higher requests for withdrawals from instant-access deposit accounts than expected, for example due to concerns about the security of that bank or banks in general
- if systemic, insufficient liquidity within the banking system to enable the clearing banks to provide excess liquid funds to those who need it (and therefore potentially having to rely on the central bank as lender of last resort)
- having insufficient reserves of liquid assets to meet unexpected short-term cashflows, such as a regulatory fine, and being unable to sell other assets sufficiently quickly at a predictable price.

25.2 Key climate-related risks for a defined benefit pension scheme include:

- market risk – changes in the value of assets held due to both physical and transitional risks, *eg* lower demand for equities of fossil-fuel dependent companies
- insurance risk – greater uncertainty about future mortality rates *eg* as a result of variations in:
  - temperatures, impacting the prevalence and spread of disease
  - the availability and security of water and food
  - the incidence of natural disasters
  - air pollution …

  … potentially leading to falling longevity and lower post-retirement benefit outgo …

  … but increased death-in-service and ill-health benefit outgo
- operational risk – failure to adopt appropriate processes in the light of climate change threats, *eg* not amending investment strategy to take into consideration transitional impacts
- external risk – changes in regulatory requirements to reflect climate change threats, *eg* restrictions on investment choices or an increased reporting burden.

Chapter 26 Additional Practice Question

26.1 Outline examples of climate risk for a company selling health insurance products.

Chapter 26 Solutions

26.1 ***Climate risks for a health insurer***

Physical risks could include:

- damage to property (*eg* office buildings) due to increasingly frequent extreme weather events, such as flooding
- higher sickness claims rates due to food shortages …

  … or due to a greater spread of disease as climate change impacts the distribution of disease-carrying insect populations and access to water
- higher injury claims rates due to more natural disasters and extreme weather events
- disruption to financial markets as a result of more natural disasters and extreme weather events.

Transition risks could include:

- fall in value of investments in companies such as non-renewable energy producers …

  … or companies that incur reputational damage through not meeting environmental targets, *eg* emissions control
- higher than expected costs of updating own operations to meet environmental targets, *eg* converting the salesforce fleet to electric cars.

1.4 Operational risk

Operational risk is one of the most difficult to quantify. There are so many operational risk events that can affect a firm that to quantify each would be impractical, and because the events are rare and often independent each would have little impact on the aggregate risk exposure of the firm.

Not all operational risks are 'rare': events relating to administration and processing errors or systems downtime may occur relatively frequently, but would typically have relatively low severity. The more difficult operational risks to quantify are those that have low likelihood, such as dealing with the impact of external events *eg* terrorism, flooding or a global pandemic. However, as noted above, even the more frequent operational events can be difficult to assess in totality, as there are normally so many possible processes, people and systems where failures could occur.

There are two approaches that are typically used to assess or allow for operational risk with an organisation:

- a broadbrush approach that does not perform any detailed analysis
- scenario analysis.

One approach which has been adopted in the banking sector is simply to add a percentage uplift to the total aggregated risks other than operational risks. In banking, operational risk has typically been measured using a standardised approach, *eg* as a percentage of average income over the last three years.

This relates to the assessment of the amount of capital that is required to be held against adverse outcomes in relation to the risks, and is covered further in a later chapter.

For insurers subject to Solvency II, the standard formula also uses a factor-based approach for operational risk capital requirements, taking specified percentages of provisions and premiums.

Another approach is to use the technique of scenario analysis described in the next section. This could involve dividing the possible operational risks into perhaps 10 – 15 categories and, for each category, assessing the cost of a plausible adverse scenario.

For example, the categories might include:

- **fraud**
- **loss of key personnel**
- **mis-selling of financial products**
- **calculation error in the computer system**
- **loss of business premises**
- **loss of company e-mail access for 72 hours.**

2 Evaluation of risks

Evaluation of risks should take place throughout the risk management process, not just at one specific stage.

Scenario analysis and stress testing are methods for understanding the financial impact of events on a company. They are particularly useful to understand whether a company is vulnerable to certain risks. They are therefore important tools for effective risk management and oversight.

2.1 Scenario analysis

A scenario analysis looks at the financial impact of a plausible and possibly adverse set of events or sequence of events. For example, what would the financial impact on a company be if there were a global pandemic.

Scenario analysis is a deterministic method of evaluating risk. It is useful where it is difficult to fit full probability distributions to risk events (and hence where a stochastic model would be inappropriate). This could be because the risks are not suitable for mathematical modelling, or because the distribution would need so many subjective parameters that the value of using it is eroded.

Scenario analysis is frequently used when evaluating operational risks but can also be used to assess the impact of financial risks such as a global recession. It is also used for assessing emerging risks, such as the possible impacts of climate change.

Scenario analysis involves a number of steps:

- **Risk exposures need to be grouped into broad categories – all risks involving financial fraud, all risks involving systems errors, for example. This step is likely to involve input from a wide range of senior individuals in the organisation.**
- **For each group of risks, a plausible adverse scenario is developed. The scenario needs to be plausible, otherwise it will not be possible to determine the consequences of the risk event. The scenario is deemed to be representative of all risks in the group.**
- **For each scenario, the organisation must translate the scenario into assumptions for the various risk factors in the model. Again, this is likely to involve senior staff input. The consequences of the risk event occurring are then calculated. The financial consequences include redress paid to those affected, the cost of correcting systems and records, regulatory fees and fines, opportunity costs while any changes are made, *etc.***

  In practice the mid-point of a range of possible values is usually taken.

- **The total costs calculated are taken as the financial cost of all risks represented by the chosen scenario.**

Scenario analysis is limited to quantifying the severity of the scenario but not the probability of it occurring. Organisations may use their capital models to determine the probability of an equivalent scenario occurring. Alternatively, they may have an idea for the probability of the scenario and use this in conjunction with the calculated severity to help calibrate or validate the capital model.

If capital requirements have been modelled stochastically, then the probability distributions can be used to identify a confidence level for (or probability of) a particular outcome. Alternatively, scenario analysis could be used to validate the model by comparing its output against the severity as determined by the above process and an estimated probability.

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.

6.3 Issues relating to reporting risk

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
- tailoring to the needs of the intended audience, as with any reporting.

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

Chapter 29 Summary

Responses to risk

When faced with a risk, each stakeholder needs to decide whether to:

- **avoid** the risk altogether
- **reduce** the risk (probability, severity, both)
- effectively **ignore** the risk, *ie* reject the need for financial coverage (*eg* if the risk is trivial or largely diversified)
- **accept** the risk: retain it in full
- **transfer** it in full (through payment of a premium)
- **partly** transfer it.

The choice of mitigation approach will depend on:

- impact on frequency and severity of the risk
- feasibility and cost of implementation
- secondary risks arising and how they might be dealt with.

The extent of risk transfer will depend on the:

- probability of the risk occurring
- risk appetite and existing resources to finance the risk event if it happens
- cost of transferring the risk
- willingness of a third party to accept the risk.

Reinsurance – benefits and costs

The benefits of reinsurance have to be weighed up against the cost. The reinsurance premium will include loadings for profits and contingencies.

The benefits of reinsurance include:

- a **reduction in claims volatility** – and hence smoother profits, reduced capital requirements and an increased capacity to write more business (and so achieve diversification)
- the **limitation of large losses** arising from an individual claim, an event, cumulative claims and concentrations of risk – and hence a reduced risk of insolvency and increased capacity to write larger risks
- **access to the expertise** and data of the reinsurer.

Types of reinsurance

The two main types of reinsurance are *proportional* and *non-proportional* reinsurance.

	Proportional	Non-proportional
Features	Reinsurer covers an agreed proportion of each risk Written under treaty so is administered automatically	Reinsurer covers loss above a stated excess point, normally up to a stated upper limit Purchased in layers from different reinsurers
Types	**Quota share**: proportion reinsured is constant for all risks (simple to administer) **Surplus**: proportion varies by risk, based on a specified retention limit which can be fixed for all risks or variable at the insurer's discretion (flexible and can 'fine-tune' to the size and volatility of risks covered)	**Excess of loss (XL)** Risk XL: covers individual claims on individual risks Aggregate XL: covers total claims from a defined peril(s) over a defined period (*eg* one year) Stop loss: form of aggregate XL that covers total claims from all perils on the whole portfolio / major class Catastrophe XL: form of aggregate XL that covers total claims arising from a defined 'catastrophe'
Uses	Quota share: spread risk, take on larger portfolios of risk, encourage reciprocal business Surplus: write larger risks	Accept risks that could lead to large claims, reduce claims fluctuations and stabilise results by capping claims, reduce risk of insolvency from large losses

Alternative risk transfer (ART)

ART involves tailor-made solutions for risks that the conventional reinsurance market would regard as uninsurable or does not have the capacity to absorb.

Examples of ART contracts include:

- integrated risk covers
- securitisation (*eg* catastrophe bonds)
- post loss funding
- insurance derivatives
- swaps.

Reasons why providers take out ART contacts include:

- provision of cover that might otherwise be unavailable
- stabilisation of results
- cheaper cover
- possible tax advantages
- greater security of payment
- management of solvency margins
- more effective provision of risk management
- as a source of capital.

The practice questions start on the next page so that you can keep the chapter summaries together for revision purposes.

Another example of a management control is the performance of due diligence before entering into an agreement with a counterparty, such as an outsourcing company, in order to reduce credit risk. Due diligence involves performing a comprehensive review and appraisal of the organisation in order to assess its ability to perform the agreed services.

5 Managing the risk associated with options and guarantees

5.1 Risk associated with options and guarantees

Risk management techniques can be used to protect the provider against the possible adverse effects of options and guarantees given in contracts.

There are two main aspects to consider:

- The guarantees / options could cost the provider more than expected.

  This could reflect market risk, *eg* where there is a guaranteed minimum return or benefit level. Falls in market values could cause such guarantees to 'bite' more than expected and therefore be more costly.

  It could also reflect a higher proportion of beneficiaries taking up a valuable option than had been assumed: a type of business risk.

- There could be difficulties arising in relation to asset-liability matching and liquidity management due to the uncertainty of liability cashflows, particularly for options.

Customer optionality can present challenges for financial institutions in asset-liability and liquidity management. The greater the optionality available to customers, the greater the challenge for the financial institution.

For example, if customers are permitted to surrender their insurance contracts in return for a cash payment, there is increased liquidity risk. Specifically, there is a risk of significantly higher than expected surrenders at a time when the company does not have sufficient liquid assets to meet the related surrender value payments.

5.2 Liability hedging

Liability hedging can be used to manage options and guarantees. Liability hedging involves choosing assets which match the liabilities so that they move consistently with each other, thus hedging the underlying market risk that arises from the existence of the option or guarantee.

For example, the value of liabilities may be linked to some external index, such as under 'guaranteed' contracts where the movement of one or more market indices determines the amount of benefit payable in some way. To hedge such liabilities, use can be made of derivatives linked to the same index or indices. Another example would be a guaranteed minimum benefit under a unit-linked or with-profit product, which can be hedged using appropriate put options.

Question

Consider a single premium, five-year term, guaranteed equity bond linked to the FTSE 100 that at maturity will pay out the higher of 90% of the growth in the FTSE 100 over the five years or a return of the single premium.

Suggest two possible sets of assets that could be used to hedge this guarantee.

Solution

The guarantee could be backed by either:

1. a zero-coupon bond and a call option on the FTSE 100
2. shares (to track the FTSE 100) and a put option.

Use is often made of over-the-counter derivatives for hedging purposes, thereby avoiding the uncertainty and expense of 'rolling-over' short-term exchange-traded derivatives over the lifetime of the underlying contract.

For example, the provider may use over-the-counter (*ie* privately negotiated) derivatives because the longest available term of, for example, a FTSE 100 option on an exchange is only two years.

Also, if a contract was based on a different index, *eg* the Transylvanian Tiny Companies Index, then over-the-counter derivatives may have to be used due to a lack of suitable exchange-traded (*ie* standardised) derivatives.

Guarantees and options can be hedged dynamically, that is by rebalancing the underlying hedging portfolio as market conditions change.

Dynamic hedging of liabilities refers to a strategy whereby the underlying assets (here, derivatives) are changed on a regular basis in order to retain close matching as economic conditions evolve.

This can be problematic to implement in practice, particularly when conditions change very rapidly, and the transaction costs resulting from dynamic hedging can be material.

Hedging techniques for options and guarantees are made more difficult because the theoretical matching assets are not always available.

It may not even be possible to obtain over-the-counter derivatives that match the liabilities that arise under the option or guarantee.

Also, as indicated earlier, customer optionality makes asset-liability matching and hedging more challenging due to the greater uncertainty of liability cashflows.

5.3 Eligibility restriction

Another control that can be used to manage risks arising from options is the restriction of eligibility criteria, *eg* only allowing an option to be exercised on a limited number of dates.

6 Low likelihood, high impact risks

Dealing with low likelihood but high impact risks is a particular issue that may arise as part of the 'Risk control' stage of the risk management process.

The risk portfolio analysis described in Chapter 28 will have identified a range of high impact but low probability risks. These are among the most difficult to manage; they are likely to include both risks related to normal business activities and operational risks.

It is important to manage such risks in a measured way. Because credit rating agencies and regulatory authorities pay significant attention to the ability of a company to withstand rare events, there is a temptation for management to concentrate unduly on such risks at the expense of the broad range of risks accepted.

The nature of high impact, low probability risks will depend on the business. For example, for a general insurance company low probability, high impact risks could be due to a natural catastrophe. For a bank, low probability, high impact risks typically arise from operational risk, including conduct risk, and credit risk on loans.

Examples for a bank could include the widespread failure of its electronic payment systems, massive losses incurred by a rogue trader, or a crippling financial / liquidity crisis as was experienced in 2007/8.

Low probability, high impact risks:

- **can only be diversified in a limited way – for example production of a major product line on two sites diversifies the risk of a total loss of business premises by fire, but has attendant additional costs if a total loss by fire does not occur**
- **can be passed to an insurer or reinsurer, usually by some form of catastrophe insurance or whole account aggregate excess of loss cover (commonly called 'stop loss' cover)**
- **can be mitigated by management control procedures, such as disaster recovery planning.**

Some such risks can only be accepted as part of the consequences of the business undertaken, and the management issue then becomes how to determine the amount of capital that it is necessary to hold against the risk event. The techniques of scenario analysis, stress testing and stochastic modelling discussed in Chapter 28 enable this to be done.

Finally, a company will have determined its own risk tolerance – for example, the ability to withstand an event that might occur with a 0.5% probability within one year. This means that the company accepts that it might be ruined by a rarer event, and has decided not to take such events into account in its risk management.

Question

A company is considering purchasing farms in South America for the production of biofuels. Explain how the company might manage the following risks:

(i) government collapse

(ii) fire damage to crops.

Solution

(i) Government collapse – diversify by investing in more than one South American country, foster close links with governments to make event less likely.

(ii) Fire damage to crops – insurance to mitigate consequences of event, health and safety measures to reduce likelihood of event.

1 Valuation methods

1.1 Introduction

There are various approaches that can be taken when carrying out a valuation of assets and liabilities:

- 'traditional' discounted cashflow approaches based on long-term assumptions
- market-based approaches that reflect the assets held: their current value and yield
- 'fair value' approaches.

Regardless of which approach to the valuation is chosen, it is important that the valuation of assets and liabilities is consistent. For example, if assets are valued at market value then a market-based or fair value approach should be used to value the liabilities.

We will look at each of these types of valuation approach, making use of example calculations in order to aid understanding. The example on which we will base the calculations is set out below.

1.2 Example for illustrative purposes

As we discuss each of the methods, we will use the following information for the XYZ benefit scheme:

Asset holding:	Equity with a market value of:	\$950,000
	Cash of value:	\$50,000
Benefits:	Benefit payments of \$125,000 payable annually in advance over the next 12 years and increasing each year with price inflation.	

Liability valuation bases

Traditional long-term basis

Discount rate	8.0% *pa*
Price inflation	5.5% *pa*
Dividend growth	6.0% *pa*

Market-based

Nominal gross redemption yield on index-linked government bonds of matching term	5.0% *pa*
Implied discount rate for actual asset holding	7.0% *pa*
Price inflation	3.5% *pa*
Prospective dividend yield of an appropriate equity index	3.0% *pa*

1.3 Traditional discounted cashflow method

For many years, actuaries valued future liabilities using discounted cashflow techniques where long-term assumptions are set.

These assumptions are chosen based on actuarial judgement.

A key long-term assumption is the future investment return expected. The future cashflows arising from the liabilities are discounted to a present value using this rate. For consistency with this approach, assets are also valued by discounting future cashflows using long-term assumptions.

This approach to valuing the assets was historically used more by pension schemes than by insurance companies.

A major criticism of this approach is that it places a different value on the assets from the market value, which introduces an additional element of risk.

Question

State the types of valuation for which it is particularly inappropriate to value assets at other than market value.

Solution

A short-term valuation, for example a break-up valuation for an insurance company or a discontinuance valuation for a benefit scheme.

Consequently, methods have been developed that value liabilities on a basis that reflects the market value of the assets.

This leads on to the concept of market-based and fair valuations, which are covered after the worked example.

Example: XYZ benefit scheme – traditional discounted cashflow method

Using the information for the XYZ benefit scheme, the traditional discounted cashflow method gives:

Value of assets

We will value the equity holding as the present value of the expected future dividend stream, assuming the current holding is notionally reinvested in the equities underlying the index.

Dividends are assumed to be paid annually in perpetuity, with the next dividend due in a year's time and dividends increasing annually with dividend growth *g.*

So the equity holding is valued as: $MV \times d \times \left\{ \frac{1}{1+i} + \frac{(1+g)}{(1+i)^2} + \frac{(1+g)^2}{(1+i)^3} + \ldots \right\}$

where *d* is the prospective dividend yield of the appropriate index.

In other words: $\frac{MV \times d}{i-g} = \frac{950{,}000 \times 0.03}{0.08-0.06} = 1{,}425{,}000$

So the total value of the asset holding (including the cash holding) is \$1,475,000.

Value of benefits

Benefits are valued using the same long-term discount rate and a long-term assessment of future price inflation *p*:

$125{,}000 \times \ddot{a}_{\overline{12}|}$, calculated at a rate of: $j = \frac{1+i}{1+p} - 1$, *ie*: $\frac{1.08}{1.055} - 1 = 2.37\% pa$

$= \$1{,}323{,}000.$

So the scheme's funding level $= \frac{\text{Value of assets}}{\text{Value of benefits}} = \frac{1{,}475{,}000}{1{,}323{,}000} = 111\%.$

1.4 Market-based approach reflecting assets held

Liabilities could be valued using a discount rate that reflects the weighted average yield on the backing assets held, where this yield is based on the current implied market discount rates. For example, for fixed-interest securities it might be the gross redemption yield, and for equities it might involve estimating the yield implied by the current market price and expected dividend and/or sale proceeds.

For some asset classes, *eg* government bonds, determining the implied discount rate is objective and uses information readily available in the market, *ie* the gross redemption yield. However, the discount rate for other asset classes, *eg* property, may be difficult to determine and subjective.

The 'current implied market discount rate' is equivalent to the 'expected return' that was described in the earlier chapter on the Relationship between returns on asset classes. Under this liability valuation method, there would often be a deduction from the expected return to allow for risk, where relevant, *eg* default risk under corporate bonds.

The method is 'market-based', since assets would be valued at market value and the liability valuation discount rate is linked to current market yields.

Other assumptions used should also be market-based, wherever feasible, and hence consistent. For example, if a salary increase assumption is needed to value a pension scheme's benefits then this should be derived from the market. This might involve determining a market-related price inflation assumption from the gap between yields on fixed-interest and index-linked government bonds and then adjusting this to reflect historical differences between price and salary inflation.

Since the valuation of liabilities under this approach reflects the actual assets held, it is not a 'fair value'. One of the general principles of fair value reporting is that the value of liabilities should be independent of the assets held to back those liabilities.

Rather than using the actual mix of assets held to determine the weighted average discount rate, it might be appropriate to use the strategic benchmark (*eg* if the current asset allocation is not representative of the usual investment strategy) or an alternative hypothetical asset mix – depending on the purpose of the valuation.

1.5 Fair valuation

In recent years there has been a move towards fair value methods of valuation.

Under a fair valuation method, assets would be valued at market value – provided this is readily observable and meets the definition of fair value.

These methods then seek to place a market value on the liabilities. Two definitions of fair value are:

1. **the amount for which an asset could be exchanged or a liability settled between knowledgeable, willing parties in an arm's length transaction**
2. **the amount that the enterprise would have to pay a third party to take over the liability.**

In some cases, a fair value of a liability is straightforward. If a contract provides that it can be terminated at various points in time for predetermined values, with no discretion on the part of the product provider, then those values are necessarily the fair values of the liability. This approach might particularly apply to unit-linked investment contracts.

Consider a simple unit-linked contract under which the amount of any type of benefit payable (death, surrender *etc*) is defined as the value of the unit fund at that time. This is saying that the fair value of the benefit liability is the current value of the unit fund, since the assets held in the unit fund will by definition always be sufficient to meet the benefit amount payable.

However, as there is no liquid secondary market in many of the liabilities that actuaries are required to value, the identification of fair values from the market is normally not practical.

For example, there is no established secondary market in which a general insurance company can sell its domestic household insurance portfolio.

As a result, fair values of liabilities need to be estimated.

Because there is usually no established market in those liabilities, models and assumptions need to be used. The liability valuation needs to reflect the 'market price' of the liabilities, *ie* it needs to be consistent with the amount that an investor in the market would require to be paid in order to be willing to take over responsibility for meeting those liabilities. Assumptions used in the fair valuation, *eg* inflation, should be market-related.

There are two main approaches that could be taken to estimating the fair value of liabilities.

Replicating portfolio approach

One approach to estimating fair values is to find a 'replicating portfolio' of assets that most closely replicates the duration and risk characteristics of the liabilities. The fair (*ie* market) value of the portfolio of liabilities is then taken as the market value of the replicating assets.

This is equivalent to the arbitrage valuation approach that was described in the chapter on the Valuation of investments.

We effectively try to identify the assets that are the best replicators of (or match to) the future liability outgo, so that the market price of the liabilities would be the market price of these assets – under the principle of 'no arbitrage'.

These assets might include non-traded derivatives, so option pricing techniques or stochastic modelling might be required to assess the value. Details of option pricing techniques will not be examined in CP1.

Risk-neutral market-consistent approach

Another approach to obtaining a fair value of liabilities is to use a risk-neutral market-consistent valuation method. This involves discounting future liability cashflows at the pre-tax market yield on risk-free assets, such as government bonds or swaps.

This approach is effectively replicating the projected liability cashflows by using a hypothetical series of zero-coupon risk-free bonds. The value of these bonds would be determined by discounting their redemption amounts using the risk-free yield curve, so the same approach can be taken to value the replicated liability cashflows.

If there is no availability of swaps or government bonds with a sufficiently long term to match all insurance liability cashflows, some estimation of future risk-free yields is needed.

Question

Give an example of the type of liabilities that a general insurer may have for which government bonds or swaps may not be available of a sufficiently long term to match the expected cashflows.

Solution

A general insurer's liability for claim payments may have a very long term for certain classes of business.

For example, claims on employers' liability policies due to asbestosis exposure might take longer than 20-30 years to be noticed by an employee and another five years or more to be settled.

However, government bonds typically have a maximum term of 25-30 years and swaps may only be available for terms of up to 10-15 years.

When setting the risk-free discount rates using government bond yields or swap rates, any credit (or default) risk element in those yields / rates should be stripped out.

Example calculations under each of these two fair value approaches are included in the practice questions at the end of this chapter.

Market value based approaches are being increasingly adopted globally.

For example, these approaches underlie the Solvency II valuation requirements for insurance companies.

Chapter 32 Summary

Valuation methods

Method	Valuation of assets	Valuation of liabilities
Traditional discounted cashflow	Discounted proceeds using long-term assumptions	Discounted outgo using same long-term rate as used for assets
Market-based, reflecting assets held	Market value	Discounted outgo using expected return on assets held (*ie* current implied market discount rates), weighted by proportions held of each asset class
Fair value: replicating portfolio	Market value	Market value of assets in the theoretical replicating portfolio
Fair value: risk-neutral market-consistent	Market value	Discounted cashflows using risk-free rates

Valuing options and guarantees

It is not always appropriate to assume that the highest cost option is exercised. For example, the attraction of cash or a tax-free benefit might mean that individuals do not exercise an option that is in the money from the provider's perspective.

The risk of **anti-selection** must be allowed for when valuing options.

An option within liabilities can be valued by finding a market option that **replicates** it. A closed form approximation may be used, *eg* Black-Scholes.

Guarantees are usually best valued by a **stochastic** approach, allowing for the likelihood of the guarantee biting and its expected cost.

Assumptions used for valuing options and guarantees, particularly relating to customer behaviours, need to take into consideration:

- the state of the economy (and hence must be scenario specific)
- demographic factors such as age, health and employment status
- cultural bias
- customer sophistication.

Sensitivity analysis

Sensitivity analysis can be used:

- to help determine the extent of the margins needed in assumptions, to allow for adverse future experience
- to determine the extent of any global provisions required.

Allowing for risk

For a discounted cashflow valuation:

- build a **margin into each assumption**
- apply an **overall contingency loading** by increasing the liability value by a certain percentage
- adjust the **discount rate** to reflect the risk in the project or liability.

For a fair valuation:

- no need to adjust for financial risk (already implicitly allowed for)
- for non-financial risk:
  - adjust the cashflows (or discount rate)
  - hold an **extra provision** or capital requirement such as the Solvency II risk margin.

Different methods of calculating provisions

For a general insurer:

- statistical analysis – if there are many claims, following a known pattern
- case by case estimate – individual assessment of claim records where there are few claims
- proportionate approach – based on amount of net premium yet to expire.

An equalisation reserve may be set up to smooth results from year to year, where there are low probability risks with a high and volatile financial outcome.

Chapter 32 Practice Questions

32.1 Explain the relationship between the replicating portfolio and risk-neutral market-consistent approaches to the fair valuation of financial product liabilities.

32.2 Calculate the following for the XYZ benefit scheme that was introduced in Section 1.2, using a market-based approach that reflects the assets held:

(a) the value of assets

(b) the value of benefits

(c) the funding level.

32.3 (i) Calculate the following for the XYZ benefit scheme that was introduced in Section 1.2, using a fair value approach:

(a) the value of assets

(b) the value of benefits

(c) the funding level.

(ii) Comment on the likely stability of the XYZ benefit scheme's funding level over time when calculated using this fair value approach.

32.4 Discuss the advantages and disadvantages of the traditional discounted cashflow approach to valuation (of both assets and liabilities) compared to a fair value approach.

32.5 A final salary pension scheme offers members the option at retirement to exchange part of their pension for a pension payable to a chosen dependant. The dependant's pension will be payable from the death after retirement of the member, for the remainder of the life of the dependant.

Suggest restrictions that might apply to the exercise of the option.

32.6 A life insurance company sells a unit-linked five-year savings bond with a guaranteed minimum surrender value on withdrawals after the first 18 months equal to the premium paid.

Exam style

An accountant who is auditing the supervisory provisions has suggested that an appropriate provision for this guarantee should be determined by stochastically modelling withdrawal rates.

Discuss this suggestion, including alternative approaches that could be taken to the calculation.

[6]

32.7 A final salary pension scheme offers members the option at retirement to commute pension for a lump sum payment.

Exam style

(i) Set out a basic equation of value for this option, defining all terms used and stating any assumptions made. [3]

(ii) Discuss the factors to be considered in setting the terms for this option. [10]

(iii) Describe restrictions that might be imposed on the exercise of this option. [4]

[Total 17]

32.8 Describe the advantages and disadvantages of using best estimate assumptions and a single explicit contingency loading for caution, compared with using more prudent individual assumptions.

32.9 Outline the disadvantages to a general insurance company of needing to carry out case by case estimates as opposed to a statistical analysis to calculate the provisions.

32.10 A premium basis allows 20% to cover expenses, commissions and profit. All policies provide cover for a two-year period and are written on 1 January. The total premium written is £200*m*.

Calculate the provision for the unexpired duration six months after the policies were issued.

32.11 An expert witness is advising on a suitable discount rate to use in order to calculate the amount of lump sum payment that should be made to a 50-year old individual in compensation for their claim for loss of earnings following an injury at work.

Exam style

The payment is determined as the present value of annual earnings lost, allowing for the number of years out of work as a result of the injury.

In previous cases, the discount rate used has been the real yield available on an index of long-dated index-linked government securities. It has been commented that this would be an inappropriate discount rate for this calculation.

(i) Discuss the considerations that might have led to this comment. [7]

It has been suggested that a more reasonable discount rate would be based on the expected return above inflation on a portfolio of mixed assets.

(ii) List the types of asset that a typical individual investor would hold in such a portfolio. [2]

[Total 9]

Chapter 32 Solutions

32.1 Under the replicating portfolio approach, a portfolio of assets is found that closely matches or replicates the characteristics of the liabilities.

Under the principle of 'no arbitrage', the value of the liabilities must then equal the value of the replicating assets.

One way to approach this would be to project the liability cashflows (using the chosen valuation basis) and then match these to cashflows arising from a hypothetical series of zero-coupon risk-free bonds. The replicating portfolio therefore comprises these bonds.

The value of this portfolio of bonds would be determined by discounting the redemption amounts using the risk-free yield curve.

This would give the same value as discounting the liability cashflows (that the hypothetical zero-coupon bonds replicate) using risk-free rates …

… which is the risk-neutral market-consistent valuation method.

32.2 ***Market-based approach using actual assets held***

(a) Assets are valued at market value = \$1,000,000.

(b) Liabilities are valued using the expected return on assets, *ie* the implied discount rate allowing for the scheme's actual asset holding (i = 7.0% *pa*), and using a market-based price inflation rate (p = 3.5% *pa*).

$125{,}000 \times \ddot{a}_{\overline{12}|}$, calculated at a rate of $j = \frac{1+i}{1+p} - 1$, *ie*: $\frac{1.07}{1.035} - 1 = 3.38\%$ *pa*

$= \$1{,}257{,}600.$

(c) The scheme's funding level

$$= \frac{\text{Value of assets}}{\text{Value of benefits}} = \frac{1{,}000{,}000}{1{,}257{,}600} = 79.5\%.$$

32.3 (i) ***Fair value approach***

(a) Assets are valued at market value = \$1,000,000.

(b) Liabilities are valued using a risk-free discount rate, which can be taken as the yield on government bonds of appropriate term (i = 5.0% *pa*), and also using a market-based price inflation rate (p = 3.5% *pa*).

$125{,}000 \times \ddot{a}_{\overline{12}|}$, calculated at a rate of $j = \frac{1+i}{1+p} - 1$, *ie*: $\frac{1.05}{1.035} - 1 = 1.45\%$ *pa*

$= \$1{,}387{,}500.$

(c) The scheme's funding level

$$= \frac{\text{Value of assets}}{\text{Value of benefits}} = \frac{1,000,000}{1,387,500} = 72.1\%.$$

(ii) ***Stability of funding level***

The discount rate is based on risk-free bond yields, whilst the scheme is invested primarily in equities. Bond yields and equity returns do not necessarily move in line; in particular equity returns are more volatile.

The funding level is likely therefore to be volatile over time, reflecting the changing gap between the return on the actual assets held and the risk-free rate.

32.4 ***Advantages and disadvantages of the traditional cashflow approach***

Consistency and stability

Under the traditional discounted cashflow approach, the use of a consistent long-term discount rate to value both assets and liabilities gives:

- consistency in the valuation of assets and liabilities, and
- stability to the result over time.

There may be more volatility of results under a fair value replicating portfolio approach, depending on the extent to which the actual assets held correspond with the matching portfolio used to determine the value of liabilities.

If the actual assets held match or replicate the liabilities then there is consistency and the valuation result will be stable.

If a risk-neutral market-consistent valuation approach is used, then volatility will arise to the extent that actual investment performance differs from the risk-free rate.

Practicalities

It will be easier to explain the valuation of assets to clients if a fair value approach is used, since assets are valued at market value …

… although some assets are difficult to price and sometimes a market value does not exist or does not reflect a sufficiently deep and liquid market for it to be deemed to be a 'fair' value.

Purpose

A traditional discounted cashflow approach might not be deemed to represent a sufficiently fair value for some purposes, such as a discontinuance valuation or a transfer between pension schemes …

… given that these are short-term valuations and the traditional discounted cashflow approach is based on long-term assumptions.

2 Interpreting the accounts of financial product providers

2.1 Analysis of accounts

The examiners will expect candidates to be able to comment sensibly on the conclusions (if any) that can be drawn from analysing a simple set of accounts, referring where necessary to the effect of the strength of bases, business growth, *etc*.

Before attempting to interpret the accounts of a provider, it is necessary to be familiar with both the rules governing the preparation of the accounts and also the accounting rules and conventions that apply in the country concerned.

In developed economies, the published financial statements of financial product providers are usually prepared on a going concern basis and are intended to give a *true and fair* view of the provider's performance and financial position.

The prior year's figures will normally be shown alongside the current year. Changes in accounting practice will be identified and, if material, the prior year's figures will be restated on the current basis to enable fair comparisons to be drawn.

The figures published by the company should be comparable from one year to the next. Accounting policies should not, therefore, be changed from one year to the next unless there is a good reason for doing so. Any such changes should be highlighted and their impact explained. You may remember this from your earlier studies as the consistency concept.

2.2 Reports accompanying accounts

The reports accompanying the accounts may reveal much more about the company than an analysis of the published numbers. Because these reports are written to be in the public domain, what is not said or disclosed in the reports can give greater insight to the company's position than what is publicly disclosed.

These additional reports might disclosure information such as commentary on:

- **the performance of the company against key objectives**
- **the company's investment strategy and investment performance**
- **the progress of the company against its long-term and short-term strategic objectives**
- **the company's attitude to risk, the key risks it faces, and how it manages and mitigates those risks**
- **the company's governance arrangements and how the Board assures itself of independence.**

There would typically be a statement from the chairperson and Chief Executive Officer (CEO) that would focus on performance against objectives and any exceptional events that have happened during the period, such as acquisitions or restructuring. The other areas listed above might be covered in separate reports.

2.3 Insurance companies

Insurance business is subject to cyclical effects that may affect many providers at more or less the same time. This makes it necessary to compare the profitability of a provider's business with the results disclosed by the accounts of other providers, especially those transacting similar types of business.

General insurance in particular is subject to cyclical claims experience, *eg* seasonal weather variations. As well as cyclical claims experience, the *underwriting cycle* affects insurance providers.

Although many countries are adopting a risk-based approach to the assessment of solvency, such as the European Solvency II regime or similar, it is not necessarily the case that the published accounts of financial product providers have to follow the same risk-based approach.

The risk-based Solvency II regime is covered in more detail in the later chapter on Capital requirements.

Other methods of making provision for liabilities and margins may be used, for example by including a prudential margin in each element of a valuation basis. It may be that there is no information given in the accounts to assess the size of such margins.

In some countries, insurance companies may be required to put their methods for calculating a risk-based capital requirement into the public domain in a separate report that is filed alongside the accounts. It may be more appropriate to use this additional report for any comparative financial analysis, particularly when comparing companies that use a prescribed standard model for the risk assessment.

It may be possible to get a quick, but limited, indication of the financial position of an insurance company by examining individual accounting items and various ratios of one to another, and comparing them with the accounts of earlier years.

It may be useful to consider the figures and ratios both before and after reinsurance, if available and relevant.

Among the ratios to be considered could be:

- **incurred expenses to premium income**

  Exceptional expenses may be excluded, if there is sufficient data available to identify these.

- **commission to premium income**
- **operating ratio, *ie* the total of incurred claims and expenses to premium income**

  This ratio is used more when looking at short-term classes of business, typically in general insurance, rather than long-term classes.

Question

Explain why the operating ratio is used more in looking at short-term classes of business.

Solution

For short-term classes of business, most of the cashflows occur in a single year and the major items of interest are premiums, claims and expenses. Therefore, the operating ratio can give a meaningful measure of the profitability of a company.

For long-term insurance, the cashflows are spread over a greater time period and include the maintenance of appropriate provisions over this time period. Therefore an analysis of amounts over a single accounting period is not particularly enlightening.

- **outward reinsurance premium income to gross premium income.**

  Outward reinsurance premium income is actually an *outgo* of the insurance company, *ie* the premiums it pays to reinsurers.

Care is needed when drawing conclusions from such high-level analyses. For example, a sharp rise in premium income may be a sign of competitively low, and perhaps unprofitable, premium rates, or it may represent the market success of a new popular product unique to the company concerned.

In other words, aggregate premium may increase because of an increase in volumes sold, which may indicate that the premium rates are too low. Alternatively, it may indicate that the company has been able to exploit a niche market in order to gain market share and still make a profit.

2.4 Banks

Banks are also subject to economic cyclical effects that may affect many providers at more or less the same time.

Similar to the ratios used to get an indication of the financial position of insurance companies, ratios can be used to assess banks. The most important ratios for assessing banks are:

- **probability of default**
- **loss given default.**

These are not accounting ratios as such, *ie* they are not ratios that can be determined from inspecting items from the bank's reports and accounts.

The assessment of the probability of default (*ie* the likelihood of a borrower not repaying their loan) and loss given default (*ie* how much a bank would lose if a borrower defaulted on the loan) would typically be done on a loan-by-loan basis.

Looking at the overall exposure to default losses within the bank's loan portfolio is then one way in which its financial position can be assessed.

2.5 Benefit schemes

Why benefit scheme reporting is different

Reporting on the progress of benefit schemes is different from the reporting of results by corporate entities. Benefit schemes do not generate profits or losses. Indeed if actuarial valuations of the scheme are not made annually, there are no entries that can be made on the liability side of the balance sheet of a benefit scheme, other than 'accumulated fund'.

Profits are a measure of the success of a corporate entity. An appropriate measure of the success of a benefit scheme is more difficult to establish. For example, it could be defined in terms of stability of contributions required or by reference to some measure of assets compared with liabilities, *ie* the funding level.

Without a valuation of the benefit liabilities, benefit scheme reporting is restricted to a statement of the net assets (*ie* net of current liabilities) at a point in time and a reconciliation of how the net assets have changed since the past reporting date, for example showing contributions and investment returns received and benefit payments and expenses paid out.

The two main purposes of the actuarial valuation of a benefit scheme are to:

- demonstrate the solvency (*ie* funding level) of the scheme
- determine the future contribution rate required.

The results of the actuarial valuation of the scheme generate a figure for accumulated surplus or deficit. This amount may be used to adjust the contribution rate for the succeeding period.

Chapter 33 Summary

Accounting concepts

Accounting concepts and principles may vary between countries, but there has been increased harmonisation over time and a movement towards fair values rather than prudence.

Interpreting accounts

In analysing accounts, attention should be paid to:

- any accounting rules, guidance and practice in the country concerned
- whether the accounts have been prepared on a going concern basis
- any changes in accounting practice.

Reports accompanying accounts expand the information available about the company, *eg* providing commentary on:

- performance against key objectives
- investment strategy and performance
- progress against long- and short-term strategic goals
- attitude to risk, key risks faced, risk management and mitigation
- governance arrangements, including independence of the Board.

Insurance companies

Insurance business is subject to **cyclical effects**, so the results of one insurance company should be compared to those of companies transacting similar types of business.

The **strength of the provisioning basis** will affect the reported results.

Accounts can be analysed using **ratios** including the:

- expense ratio
- commission ratio
- operating ratio (particularly for short-term business)
- ratio of outward reinsurance premiums to gross premium income.

Banks

Probability of default and loss given default are useful measures for assessing the quality of a bank's loan portfolio.

Benefit schemes

Benefit schemes do not generate profits or losses, so reporting differs.

Disclosures to beneficiaries

It is important that beneficiaries are given sufficient clear information about the scheme, including details of:

- benefit entitlements
- contribution obligations
- expense charges
- investment strategy
- risks involved
- treatment of entitlements in the event of insolvency.

Where disclosure is required by legislation, this may relate to information given to beneficiaries on entry, at regular intervals, once payments commence and/or on request.

Disclosures in accounts

Where a scheme is sponsored by a company, it is common practice to include details of the benefit obligations in the company's accounts.

Different accounting standards exist but there are generally some common aims:

- recognising the realistic costs of accruing benefits
- avoiding distortions resulting from fluctuations in the flow of contributions from the employer to the pension scheme
- consistency in the accounting treatment from year to year
- disclosure of appropriate information.

Possible disclosures that may be needed include:

- assumptions
- actuarial method
- value of liabilities accruing over the year
- increase in the past service liabilities over the year
- investment return achieved on the assets over the year
- surplus or deficit and the change in this figure over the year
- benefit cost over the year in respect of any directors
- membership movements.

Chapter 33 Additional Practice Question

33.1 The overall probability of default and loss given default on a bank's loan portfolio have increased over the last reporting period.

Exam style

Suggest possible reasons for these increases. [3]

Chapter 33 Solutions

33.1 Possible reasons for the increases include:

- a shift in the balance of the portfolio towards less secure borrowers, possibly due to a change in marketing strategy towards borrowers in lower socio-economic groups [1]
- a recession: [½]
  - so lower company profits are anticipated and therefore higher expected defaults on commercial loans [½]
  - so higher unemployment is anticipated and therefore higher expected defaults on personal loans [½]
- higher interest rates, leading to expectations of higher defaults on variable rate loans due to unaffordable interest payments [1]
- a fall in property values … [½]

  … which could increase the expected loss given default on mortgages if it leads to negative equity (*ie* the property value not covering the amount owed) [½]
- some significant actual defaults, leading to increased uncertainty or concern in terms of the expectation of further defaults. [½]

[Maximum 3]

2 Insolvency of a bank

2.1 Regulation

Banks are also normally subject to some form of State regulation and they are usually required to maintain a certain level of solvency capital.

This is covered further in a later chapter.

They are also required to regularly report to regulators who monitor their financial position.

2.2 Intervention

Banks are also often required to have plans in place with regards to what will happen if they get into difficulties. For example, banks in the European Union have recovery and resolution plans, hopefully enabling them to recover but, if not, enabling them to fail in an orderly manner to limit or avoid a knock-on effect on other banks (*ie* systemic risk).

The close linkages between banks heightens this systemic (or contagion) risk.

Recovery plans set out the actions a company should take in order to keep itself solvent, such as raising further capital and stopping paying dividends or coupons. Resolution plans set out the actions that should be taken if the recovery plans have been ineffective or insufficient, such as radical restructuring.

Under resolution, the regulatory authorities ensure continuity of the bank's critical functions and seek to recover parts of the bank that are viable. Parts of the bank that are not viable are allowed to go into liquidation.

It might be possible to sell parts of the operations to other banks, as was the case when Lehman Brothers filed for bankruptcy in 2008.

As is the case for insurance, customers of a failed bank may have losses at least partly protected under a compensation scheme.

Chapter 34 Summary

Insolvency of an insurance company

Insurance companies rarely become insolvent due to:

- the requirement to hold regulatory solvency **capital**
- the regulator **monitoring** and then **intervening** where necessary.

If the insurer's financial position is serious, it may be required to:

- close to new business
- establish a **recovery plan**.

The insurer may be sold to, or merged with, another provider.

In the extreme event that an insurer cannot meet its liabilities and a buyer cannot be found, there may be a statutory compensation scheme from which some or all of the benefits are paid.

In any of these scenarios, it will be important to project the insurer's solvency position into the future using either a stochastic model or a deterministic model with scenario testing.

Insolvency of a bank

The situation for banks is very similar to that for insurers, potentially with more emphasis on **resolution plans** that aim to ensure that:

- banks that have not been able to recover are allowed to fail in an orderly manner, limiting or avoiding causing damage to other banks
- critical functions can continue.

Closure of a sponsored benefit scheme

There are two types of closure of a benefit scheme:

- no new members but benefits continue to accrue for existing members
- no new members and no further benefit accrual for existing members.

A benefit scheme may cease due to:

- the **insolvency** of the sponsor
- a **decision by the sponsor** to stop financing future benefit provision, *eg* to reduce costs or to follow market trends in benefit provision.

If a scheme ceases, the level of benefits that will be paid will be affected by the:

- **rights** of the beneficiaries
- **expectations** of the beneficiaries
- the level of **assets:**
  - if under-funded, may have to reduce benefits; need to consider the priority of different groups of members
  - if over-funded, need to consider how to use the surplus
  - in either case, follow legislation and scheme rules.

Provision of outstanding benefits under a discontinued defined benefit scheme

Option for benefit provision	**Who takes the risk of adverse experience**
Continue the scheme without any further accrual of benefits	Sponsor (if still solvent)
Transfer the liabilities to another scheme with the same sponsor	Sponsor (if remains defined benefit)
Transfer the funds to the beneficiary, in cash form if permitted by legislation May only be permitted as a transfer to an insurance company or to the scheme of any new employer	Beneficiary (unless guarantees are offered by the insurance company / new employer)
Transfer the funds to an insurance company to invest in a group or individual pension accrual policy (without guarantees)	Beneficiary
Transfer the liabilities to an insurance company to guarantee the benefits	Insurance company
Transfer the liabilities to a central discontinuance fund (national or industry-wide)	Discontinuance fund, but typically passed to solvent sponsors through the levy imposed to maintain the fund

The framework is based on three pillars:

- **quantification of risk exposures and capital requirements**
- **a supervisory regime**
- **disclosure requirements.**

Pillar 1 of Solvency II includes rules for valuing both the assets and provisions for liabilities and also the determination of *two levels of capital requirement*, *ie* a minimum capital requirement (MCR) and a solvency capital requirement (SCR). These two levels are described further below.

Whereas Pillar 1 is *quantitative* and relatively prescribed, Pillar 2 deals with *qualitative* aspects, *eg* a company's internal controls and risk management processes, and the company's own view of its strategic capital needs. The Pillar 2 supervisory regime includes monitoring visits to companies by the regulator.

The Pillar 3 disclosure requirements include both public disclosure and private disclosure by the company to the regulator.

Solvency II establishes two levels of capital requirements:

- **the Minimum Capital Requirement (MCR) — the threshold at which companies will no longer be permitted to trade**
- **the Solvency Capital Requirement (SCR) — the target level of capital below which companies may need to discuss remedies with their regulators.**

The SCR will be greater than the MCR.

If the amount of an insurance company's available capital is less than the MCR, the company is technically insolvent. If the amount of available capital is greater than the MCR but less than the SCR, this provides an indicator that action should be taken to prevent technical insolvency.

Question

Suggest examples of remedies that may be required in the event of a company breaching the SCR.

Solution

In the event of a company breaching the SCR, proposed remedies would need to increase the amount of available capital, including by reducing the company's levels of risk.

Examples of such actions were covered in the earlier chapters on risk management tools, capital management and insolvency and closure. The actions might include:

- closing to new business
- moving to a better matched investment position.

The SCR and MCR both represent capital requirements that must be held in addition to the technical provisions.

Restrictions are placed on the quality of capital that can be used to cover these requirements.

The SCR may be calculated using a prescribed standard formula or a company's internal model, where the latter may be benchmarked against the output of the standard formula.

Considerable work is needed to justify using an internal model, and all but the largest companies are likely to find that any reduction in capital requirements is more than offset by the work needed to support the internal model.

The supervisor can compel an insurance company to develop an internal model, if it feels that the standard formula is not appropriate to the risk profile of the company.

The SCR is calculated by assessing the capital required for each risk against a 0.5% ruin probability in one year.

Hence the SCR is a 'risk-based' capital requirement: the amount of capital that has to be held is directly related to the level of risk within the business.

The various risks are aggregated using a correlation matrix to make allowance for any diversification benefits. In the standard formula the risks tested and the correlation matrix are prescribed. For the market risks, firms may need to use an economic scenario generator to assess the capital required for each risk. The details of the Solvency II calculation are covered in the relevant Specialist subjects.

Although the standard formula uses a correlation matrix, companies using the internal model approach can use different aggregation methods, such as copulas. The calculation of the SCR is considered further in Section 3.

Currently the Solvency II Directive applies to all insurance and reinsurance companies with gross premium income exceeding €5 million or gross technical provisions in excess of €25 million.

1.3 The Basel Accords for banks and credit institutions

Banks also have to hold capital for unexpected losses – including unexpected credit losses, which can be large in periods of recession.

Banks in many countries operate under the Basel regulations, which set out requirements for minimum levels of capital.

The Basel Accords apply to all internationally active banks.

In the EU, the Basel regulations are made law by the Capital Requirements Regulation, which is equivalent to Solvency II for insurers.

The Basel regulations have a three pillar structure like Solvency II.

Under Pillar 1, banks must quantify their minimum capital requirements for their main risks:

- **credit risk**
- **market risk**
- **operational risk.**

As for Solvency II, a bank might be permitted to use an internal model to calculate minimum capital requirements, rather than using the standardised approach as prescribed by the regulator.

Risks are assessed separately, and capital requirements for each type of risk are then aggregated, without any allowance for diversification (*ie* low correlations between risks).

This is saying that the capital requirements are simply added, which implicitly assumes that the risks are fully dependent. This approach therefore ignores the possibility that there might be low correlations between the risks.

On top of their minimum capital requirements, banks must hold capital in the form of:

- **a capital conservation buffer**

  This is to provide banks with an extra layer of usable capital, in the event that the minimum capital requirements are insufficient.

- **a countercyclical capital buffer.**

  Some risks, particularly those relating to credit exposure, are seen to have a cyclical nature across the whole banking system. This buffer extends the level of protection added by the capital conservation buffer and aims to protect the bank from the build-up of these systemic risks. The requirement is adjusted to reflect the level of such risks, to ensure that greater capital is accumulated when the systemic risk is felt to be increasing.

In addition to the above, banks are regulated and supervised by their national regulator who may require banks to hold capital greater than that required by the Basel regulations, to cover their specific risks.

Question

Suggest factors that the regulator could take into account in assessing a bank's risk profile and risk management systems.

Solution

Factors the regulator could take into account in assessing a bank include:

- reviews of the work of internal and external auditors
- the bank's risk appetite and its track record in managing risk
- the nature of the markets in which the bank operates
- the quality, reliability and volatility of its earnings
- the bank's adherence to sound valuation and accounting standards
- the bank's diversification of activities.

2 Economic capital

2.1 Economic capital requirements

The approaches discussed in the previous section can be used to determine regulatory capital needs. However, a provider should not run a business solely on the basis of a regulatory requirement, and thus other approaches should be considered.

As explained in the previous section:

The SCR under Solvency II is a risk-based capital measure.

In practice, financial product providers will have a risk appetite that limits the amount of risk they are prepared to take on. The risk appetite is commonly expressed as a requirement for the company to hold an amount of capital that is based on the regulatory capital requirements.

For example, it might be expressed in terms of the SCR. However, part of the Solvency II regime (Pillar 2) requires each insurance company to consider its *own* view of capital needs, including the ability to meet business and strategic objectives over an appropriate time horizon.

Under Solvency II Pillar 2, all firms are also required to consider their internal economic capital requirements under the ORSA.

The ORSA is the company's Own Risk and Solvency Assessment. It links regulatory capital to economic capital, which is defined as follows:

Economic capital is the amount of capital that a provider determines is appropriate to hold given its assets, its liabilities, and its business objectives.

Typically it will be determined based upon:

- **the risk profile of the individual assets and liabilities in its portfolio**
- **the correlation of the risks**
- **the desired level of overall credit deterioration that the provider wishes to be able to withstand.**

This approach is also sometimes known as *risk-based* capital assessment. The amount of economic capital required would be determined using an internal model, as described in Section 1.2.

The internal-ratings based approach of the Basel Accords and the use of internal models for the SCR in Solvency II has enabled companies to move their regulatory capital requirement calculations to be more in line with their economic capital requirement calculations (provided the regulator is satisfied with the quality of the internal model).

Depending on the provider and its regulatory regime, either economic or regulatory requirements may drive the need for capital. To meet the need for either economic or regulatory capital, various types of capital can be used. The cost to a provider of the various types of capital will depend on the level of relative risk exposure to the investor and on the availability of capital at any time in the market.

Chapter 36 Additional Practice Question

36.1 Compare the Basel Accord approach to capital adequacy measurement for banks with the Solvency II regime that applies to insurers. [3]

Exam style

Chapter 36 Solutions

36.1 ***Similarities***

They both prescribe regulatory capital requirements that are held to cover unexpected losses. [½]

Standardised approaches to determining minimum capital requirements are specified by the regulator in both cases, or alternatively an internal model may be used. [½]

Solvency II and Basel both have a three pillar structure. [½]

They are both international standards. [½]

Differences

Under the Solvency II SCR, capital must be held to meet a wide range of risks. Under Basel, capital must currently be held for the main risk categories: credit, market and operational. [1]

Solvency II includes greater allowance for diversification between risks than Basel. [½]

Solvency II capital requirements may be more complex to model, even under the standard formula, *eg* needing the use of stochastic models. [1]

Under Basel, banks must hold extra buffers: capital conservation and countercyclical capital. [½]

[Maximum 3]