

Subject CP1

CMP Upgrade 2020/21

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 2020 CMP to make it suitable for study for the 2021 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 2021 *Student Brochure* for more details.

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 2021 exams.

1 Changes to the Syllabus objectives

There have been no changes to the Syllabus objectives.

2 Changes to the Core Reading

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

Chapter 2

Section 9.3

This section (on Climate change and other environmental issues) has been amended significantly (both the Core Reading and ActEd text). Replacement pages 13 to 18 are provided at the end of this document.

Chapter 5

Section 1.7

The reference in the first paragraph to a 'defined ambition scheme' should be changed to a 'hybrid scheme'.

Chapter 6

Section 7.1

In the first sentence the phrase '(or consideration)' should be removed.

Chapter 9

Section 6.2

On page 17, the paragraph below the solution, the first two sentences have been rewritten as follows:

The largest companies can invest in properties beyond the scope of most pooled funds. Property companies will general not have restrictions on the investments they can make or the management expenses they can incur.

Chapter 10

Section 2

On page 6, in the second bullet point change 'the shares' to 'their share price' and add 'that of' before 'the underlying equity'..

On page 7, the second bullet point has been rewritten as:

- **Share prices in closed-ended funds are also more volatile than the prices of the underlying equities because the size of the discount can change. The volatility of unit prices in an open-ended fund should be similar to that of the prices of the underlying assets.**

Page 22

Two new investments (infrastructure projects and commercial mortgages) have been added to the end of the chapter. As a result there are two new sections of reading, Sections 8 and 9 (containing both Core Reading and ActEd text). Additional pages 22a and 22b are included at the end of this document.

Chapter 11

Section 3.2

In the last sentence of the first paragraph, change 'be able' to 'have'.

Page 8

A new Section 3.4 on quantitative easing (containing both Core Reading and ActEd text) has been added. Replacement page 8 and additional page 8a are included at the end of this document.

Section 5.2

In the second bullet point on page 23, change 'real' to 'nominal' in the second sentence.

Page 34

A new Section 8.4 on the impact of government monetary policy on supply has been added. Replacement page 34 and additional page 34a are included at the end of this document.

Chapter 14

Section 3.1

There is an additional factor to be added to the list:

- 17. environmental, social and governance (ESG) considerations.**

Section 3.4

Some additional material on Environmental, social and governance (ESG) considerations has been added at the end of this section. An additional page 11a is provided at the end of this document.

Chapter 19

Section 3.5

In the second sentence of the second paragraph, change 'effect' to 'buy'.

Chapter 22

Section 10.4

The following has been added at the end of this section:

For a defined benefit scheme, the scheme rules will need to set out the benefits that will be provided on discontinuance. (See also Chapter 34.)

Chapter 23

Section 2.1

In the fourth bullet point, the first sentence has been deleted and the second sentence has been combined with the existing Core Reading in the third bullet point.

Chapter 26

Section 3.2

Under the heading 'Excessive contributions required', in the first sentence delete '/ provider'.

Under the heading 'Cost of guarantees', the following has been added after 'extra costs' in the first sentence:

(depending on who has given the guarantee)

Chapter 28

Section 2

There are a number of amendments to this section (up to the end of Section 2.3) in both the Core Reading and ActEd text. Replacement pages 5 to 8a are provided at the end of this document.

Section 3.1

The first Core Reading sentence under the sub-heading 'Partially dependent and independent risk events' should be changed to the following:

If the risks have less than 100% correlation, the capital requirement for a combination of risks that occurs with a given probability is less than the sum of the individual capital requirements.

Section 5.2

The final word in the first sentence should be amended to 'reduced'.

Chapter 31

Section 5.6

In the first sentence of the second Core Reading paragraph, the phrase 'that will grow older' should be amended to 'that is likely to grow older'.

Chapter 34

Section 2.2

The following Core Reading paragraphs should be deleted:

- the first paragraph of the section
- the first Core Reading paragraph in the sub-section 'Level of assets – schemes in deficit'
- the third Core Reading paragraph in the sub-section 'Level of assets – schemes in surplus'

Chapter 37

Section 3.5

In the first bullet point under sub-heading 'Example 2', the phrase 'a permanent health insurance' should be amended to 'an income protection insurance'.

Chapter 39

'Defined ambition scheme' should be amended to 'Hybrid scheme'.

'Self-administered scheme' has been deleted.

3 Changes to the ActEd material

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

Chapter 2

Summary

The changes to the Core Reading material on climate change and other environmental issues have been reflected in the summary pages. Replacement pages 21 and 22 are provided at the end of this document.

Chapter 5

Throughout the chapter, all references to ‘defined ambition schemes’ should be changed to ‘hybrid schemes’.

This occurs in the following places:

- Section 1.4, third bullet point and second paragraph in the box that then follows
- Section 1.7, in four places
- Section 1.8, in part (iii) of the question
- Section 1.9, second paragraph after the bullet point list
- Summary, page 21, third paragraph.

Chapter 6

Section 7.1

The last sentence of the first paragraph of ActEd text, starting ‘The word ...’ should be removed.

Chapter 10

Two new investments (infrastructure projects and commercial mortgages) have been added to the chapter.

Section 0

Add the following points to the bullet point list:

- the key considerations when investing in infrastructure projects
- the key characteristics of commercial mortgages.

Summary

The summary has been extended to include the two new products. Replacement pages 27 and 28 are included at the end of this document.

Practice Questions

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

Chapter 11

Practice Questions

The following point should be added to Solution 11.8, after the point starting 'Other reasons for changes ...':

Government monetary policy, such as the use of quantitative easing, can also influence investor preferences.

Chapter 14

Section 4.3

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

Personal investors may also choose investments based on environmental, social and governance factors, for example the choice of 'green' investment funds.

Summary

On page 23, the following point should be added to the numbered list:

17. environmental, social and governance (ESG) considerations.

On page 24, the following point should be added after the sixth sub-bullet on 'feel-good' factors:

- environmental, social and governance factors

Solution 14.3

The following point should be added to the solution:

- environmental, social and governance (ESG) considerations [½]

and the [Total 8] should be changed to [Maximum 8].

Solution 14.4

The last point of the section headed 'Investment objectives' should be amended to read:

An example would be the need for investments to meet certain environmental, social and governance standards.

[½]

Chapter 17

Section 2.3

At the end of this section, in part (ii) of the solution change 'defined ambition' to 'hybrid'.

Chapter 20

Practice Questions

Part (b) of Question 20.3 has been amended to the following:

- (b) '1% of the coronavirus tests carried out in a London hospital proved to be positive. So there are 600,000 people with coronavirus in the UK.'

The Solution has been changed accordingly:

- (b) The individuals tested are not representative of the general population. There are influences from class selection: people tested at the hospital would include those who are already ill with the virus and health workers who have a high level of exposure to it. There will possibly also be self-selection, if the test was offered on a voluntary basis: people are more likely to volunteer to have the test if they consider themselves to be at greater risk or if they have had potential symptoms of infection. Extrapolating the experience in London to the rest of the country may also not be valid. London is likely to have a higher incidence of coronavirus than less densely populated areas, due to lower levels of transmission in the latter.

Chapter 21

Section 2.4

The second point has been expanded to the following:

- prospective (to inflate the expense data to the time when the expenses are expected to be incurred, which may be taken as the mid-point of the period for which the premium rates will apply).

Chapter 23

Section 1.3

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

The release of the prudential margins and solvency capital may occur gradually throughout the term of the policy, as they are no longer needed.

Section 2.1

The material relating to the third and fourth bullet points has been combined into one bullet point.

Summary

The following should be added at the end of the final sentence:

also has an effect on the amount of contributions required.

Chapter 25

Section 2.2

The following should be added before the final paragraph in this section:

Some sources of risk will span several categories. For example, the global pandemic arising from the COVID-19 coronavirus could be considered to be an external risk, but it also led to business, operational, market, credit and liquidity risks.

Section 7.2

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

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

Chapter 26

In Sections 0 and 3.2, all references to 'defined ambition scheme' should be changed to 'hybrid scheme'.

Section 5.4

The following should be added before the final paragraph of this section:

A global pandemic might lead to significantly lower than expected claims for some types of business (*eg* fewer motor insurance claims if there is a lock-down imposed on the population), but higher than expected claims for others (*eg* travel insurance claims for cancelled holidays).

Chapter 28

Section 5.2

The ActEd paragraph should be amended to the following:

An example of a risk being 'reduced' could be taking internal actions that reduce the probability of the event happening.

Summary

Amendments have been made to the descriptions of scenario and stress testing. Replacement pages 23 and 24 are provided at the end of this document.

Practice Questions

In the solution to Question 28.2 part (ii), the final two half mark points (from 'There are two types of ...') should be replaced with the following:

Other impacts that could be tested within the stress scenario include the potential for higher surrenders.

[½]

Chapter 34

Section 1.2

The first bullet point should be changed to:

- changing the investment strategy to invest in assets that better match the liabilities

Chapter 35

Section 1.3

The third paragraph in this section (the second ActEd paragraph) should be changed to:

The position is more complex when we look at a long-term financial product such as a life insurance contract. There is likely to be a significant period of time (quite possibly several decades) during which premiums are accumulated, before the benefit is paid to the customer. This long-term nature gives rise to the need to set aside provisions to meet future benefit outgo. The appropriate level of provisions is difficult to quantify, so additional capital is held as a buffer against the provisions being insufficient.

Chapter 37

Section 3.4

The first sentence of the final paragraph in this section should be replaced with the following:

The *number* of claims will be reduced because some losses will be lower than the excess level. Also, policyholders may be deterred from submitting claims that are a little above the excess, if they feel that it is not worth the effort to make the claim.

4 Changes to the X Assignments

Overall

There have been minor changes throughout the assignments. More significant changes are listed below.

Assignment X2

Solution 2.7

On page 11 the last point in the section headed 'Restrictions' should now read:

The trustees and ATG Ltd may choose to avoid certain investments because of environmental, social and governance considerations. [½]

Assignment X6

Case Study 2

All references to 'defined ambition' in the scenario and in Question 6.7 (i), (iii) and Question 6.9 should be changed to 'hybrid'.

Solution 6.7(i)

All references to 'defined ambition' or 'DA' should be changed to 'hybrid'.

5 Other tuition services

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

5.1 Study material

We also offer the following study material in Subject CP1:

- Flashcards
- 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 2021 *Student Brochure*, which is available from the ActEd website at www.ActEd.co.uk.

5.2 Tutorials

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

- a set of Regular Tutorials (lasting five full 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.

5.3 Marking

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

For further details on ActEd's marking services, please refer to the 2020 *Student Brochure*, which is available from the ActEd website at www.ActEd.co.uk.

5.4 Feedback on the study material

ActEd is always pleased to get 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.
- 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 measurable. 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.**

9.3 Climate change and other environmental issues

Climate change

There is scientific consensus that warming of the climate is unequivocal and linked to increasing atmospheric concentrations of greenhouse gases, of which a key driver is the burning of fossil fuels. The effects are already apparent and further warming is inevitable due to inertia in the climate system, which means it can take decades for the full effect of emissions to be felt.

Similarly any steps taken to control the factors leading to global warming will not have an immediate impact.

It is increasingly apparent that climate change will have a material impact on financial markets and financial institutions. The key findings from the Intergovernmental Panel on Climate Change Fifth Assessment Report (2014) [<https://ipcc.ch/report/ar5/>] for investors and financial institutions are as follows:

- **Climate change will affect all sectors of the economy, and is relevant to investors and financial institutions. However, not all macroeconomic changes and microeconomic conditions will apply equally to all investments.**
- **There are risks and opportunities associated with policy measures directed at reducing greenhouse gas emissions. To meet the internationally agreed target of keeping the global average temperature rise since pre-industrial times below 2°C, patterns of investment will need to change considerably.**

- **Physical impacts of climate change will affect assets and investments. Climate change and extreme weather events will affect agriculture and food supply, infrastructure, precipitation and the water supply in ways that are only partially understood.**
- **Decisions made by private sector investors and financial institutions will have a major influence on how society responds to climate change.**
- **There will be significant demand for capital, with governments looking to the private sector to provide much of it. To keep the global temperature increase below 2°C, additional investment required in the energy supply sector alone is estimated to be between USD 190 and 900 billion per year through to 2051, accompanied by a significant shift away from fossil fuels towards low-carbon sources such as renewables and nuclear.**

Climate change can also affect demographic experience. For example, increasing temperature can have an impact on the spread of diseases such as malaria. It can also increase instances of natural disasters such as floods and worsen issues such as pollution, and there may be related impacts on the availability and security of water and food. These effects are generally negative for mortality and morbidity experience. However, there is a possibility of 'positive' impacts, such as reduced cold-related deaths in some northern hemisphere countries.

These climate change issues may impact pension schemes, life, health and general insurers.

Impact of environmental and ethical issues on providers

Governments, advocacy groups and the observed preferences of individual participants in investment markets have acted to ensure that the concern felt by the public on the environment and ethical issues impacts the behaviour of financial markets.

Providers that want to be attractive to the widest possible range of investors will provide products where environmental and ethical issues are part of the investment process and decision making.

These products have a 'socially responsible overlay' and the investment managers commit to engaging in a constructive dialogue with company management to promote environmental and ethical objectives.

The environmental impact of the way providers communicate with the public may also need to be considered, especially with regard to the volume of paper produced which is never read.

Emissions trading

Emissions trading is a market-based approach, among others, to address pollution. The overall goal of an emissions trading plan is to minimize the cost of meeting a set emissions target.

The government sets an overall limit on emissions and issues permits to emit, up to the overall limit.

Usually, the government lowers the overall limit over time, with an aim towards a national emissions reduction target.

In many emission trading schemes, polluters and organisations which do not pollute (and therefore have no obligations) may trade permits and financial derivatives of permits. This creates a market in which financial institutions and product providers can participate.

Climate change and the insurance sector

The risks of climate change can manifest in different ways. In its report, 'The impact of climate change on the UK insurance sector', the Prudential Regulation Authority in the United Kingdom described three categories of risk arising from climate change, as follows:

- **Physical risks** arise from the effects of a changing climate itself. Such risks may arise in the short term from damage to property and from business disruption due to extreme weather events. In the longer term, chronic impacts may dominate, such as rising temperatures, rising sea levels and changes to rainfall patterns affecting use of land for agriculture.

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

- **Transition risks** arise from the shift away from fossil fuel use. Sources of transition risk include policy measures (eg carbon taxes and energy efficiency standards), technological change (eg a move to renewable energy and electrical vehicles) and changing customer preferences (eg increased demand for 'green' products). Transition risk is a particular concern for fossil fuel-dependent companies and associated infrastructure.

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

- **Liability risks** relate to the potential costs from third parties seeking compensation because they have suffered loss or damage from the effects of climate change. It is possible that actuaries and their clients could face legal claims themselves in future if they fail to consider climate-related risks.

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.

(You can access this report at <https://www.bankofengland.co.uk/prudential-regulation/publication/2015/the-impact-of-climate-change-on-the-uk-insurance-sector>.)

Climate change and the future

Climate change brings opportunities as well as risks. Companies that offer solutions to climate change, such as lower emission technologies and energy efficiency measures, are well-placed to benefit from a low carbon transition.

It is currently very unclear where the world will end up on the spectrum between rapid transformation of the energy system (with associated transition risks) and massive climate change (with associated physical risks).

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

In May 2017, the IFoA issued a risk alert highlighting that actuaries are expected to consider climate risks and communicate their approach. A particular challenge is that the future may look very different to the past, so models that are calibrated using past data may give misleading results.

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 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.
- 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 come through in terms of improved healthcare and medical techniques, impacting profitability, and possibly pricing, of relevant products in the future.

Increased access to mobile phone technology in developing nations 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.

Climate change and other environmental issues

- influence the ways in which the Government, advocacy groups and individual participants act, and hence the behaviour of the financial markets
- have led to providers offering products that promote environmental and ethical issues
- affect how providers communicate with customers, *eg* reducing the amount of paperwork
- the government may seek to control emissions by issuing permits, which may be traded between polluters and organisations that do not pollute
- climate change may lead to physical risks, transition risks and liability risks for the insurance sector

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 have a need for 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 the way in which financial products are provided, *eg* internet, price comparison websites, telephone banking, social media
- impact on wider administration processes, *eg* registering claims, customer enquiries

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

8 Infrastructure assets

Both governments and private institutions undertake large infrastructure projects.

Infrastructure projects can be very diverse. Possible examples could include building highways, telecommunication networks, or hospitals.

Infrastructure projects are often characterised by high development costs and are generally financed on a long-term basis.

The financing of infrastructure projects is often done *via* debt and equity. Investors are paid back from the cashflow generated by the project.

For some projects the cashflow generated by the project will be obvious, for example if a new highway is built and then tolls are received from motorists using the highway. For other projects, such as the government building a public hospital, there will be no obvious cashflow generated but the State will need to repay investors from tax revenue.

The risks of investment in infrastructure projects may be generally divided into:

- **the risks specific to the infrastructure asset, which can include risks around design, construction and operation of the infrastructure asset**

These risks are likely to be greatest in the early part of the construction phase of the project.

- **broader asset class risks, which include market / economic risk and regulatory and political risk.**

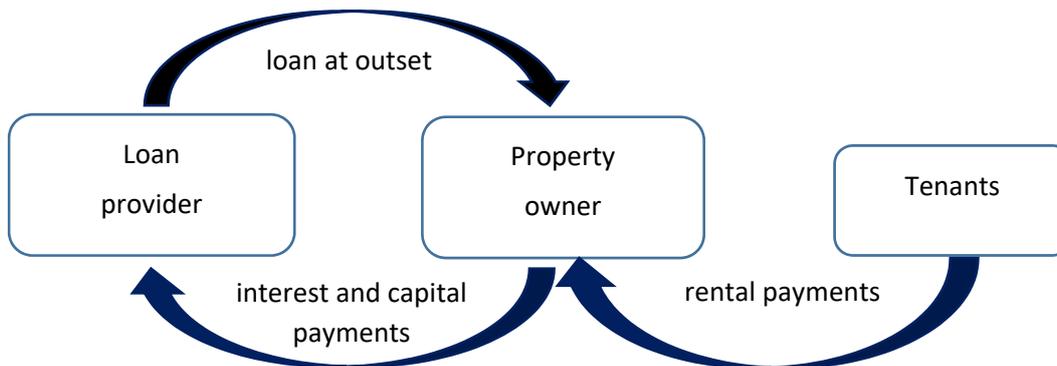
Returns from individual infrastructure investments vary depending on the characteristics of the underlying asset, its maturity, risk and taxation treatment in the context of the prevailing macro environment.

Given their size and importance, infrastructure assets may be subject to varying degrees of government regulation.

9 Commercial mortgages

Commercial mortgages are a type of loan used to buy or refinance a property, where the property is let out to tenants (rather than being occupied by the purchaser).

The rents paid by the tenants are used to meet the loan repayments. Here is an example of the potential cashflows:



Commercial mortgages are fixed income instruments, whereby the income produced on a commercial property is used to pay interest and any repayment of principal due over the loan.

There is a risk that the income from tenants does not match the payments due on the loan, *eg* if there were a void period on the property.

Any outstanding principal is due to be repaid at the end of the loan period, either from the proceeds of the property sale or from refinancing a further loan.

Commercial mortgages are generally long term investments, offering the potential for higher yields than government bonds.

This is a reflection of commercial mortgages being a riskier investment.

In the event that either the interest or principal is not paid when due then the property value at that point provides security.

At outset the lender will need to assess the risks posed by providing the loan for a particular property, and determine whether the loan is viable, the amount to lend and the terms on which to do so.

The key risk areas to consider as part of this risk identification exercise are the:

- **commercial mortgage loan – loan to value, terms and conditions, legal risks**
- **property collateral value and income production**
- **property owner – financial strength, borrower history?**
- **financial and investment markets – *eg* property liquidity risk, refinancing risk (interest rate risk, credit spreads *etc*).**

Emerging markets

Emerging markets (stock markets in countries with developing economies) can offer high growth rates and possible market inefficiencies, giving investors the chance of making very big gains (or very big losses).

The economies and markets of many smaller countries are less interdependent than those of the major economic powers, resulting in good diversification.

Factors to consider before investment in emerging markets include:

- current market valuation
- possibility of high economic growth rate
- currency stability and strength
- level of marketability
- degree of political stability
- market regulation
- restrictions on foreign investment
- range of companies available
- communication problems
- availability and quality of information.

Infrastructure assets

Infrastructure projects:

- are substantial long-term projects
- are often financed *via* debt and equity finance
- have finance repaid from the project cashflows
- can be high risk:
 - project specific risks (design, construction, operation)
 - broader risks (market / economic, regulatory and political).

Commercial mortgages

Commercial mortgages are loans used to purchase or refinance property where the property is rented out to a tenant.

The fixed loan repayments (which may be both interest and capital) are met from the rent paid by the tenants.

Any outstanding capital at the end of the term is met by selling the property or refinancing.

Key areas of risk for the loan provider to assess at outset:

- commercial mortgage loan – loan to value, terms and conditions, legal risks
- property collateral value and income production
- property owner – financial strength, borrower history?
- financial and investment markets – *eg* property liquidity risk, refinancing risk.

10.11 Premier Bank has been approached to provide a commercial mortgage loan. The details are as follows:

- £60m loan, 15-year term, interest only loan with principal repaid as a lump sum at the end of the term
- the property is an industrial unit based in a small town, with a current value of £80m
- the current lease on the property has a 15-year term, with upward-only rental reviews every three years
- the rental yield is 7% *pa*
- the tenant is a manufacturing company supplying parts for the automotive industry.

Outline the key risks to the bank in providing this commercial mortgage loan.

10.11 A key risk is the proposal owner being unable to make the interest payments during the 15-year term, for example due to the rent from the property not covering this interest.

This might happen if:

- the interest rate pa was higher than the 7% pa rental yield
- the tenant defaulted on their rent for a period of time, *eg* due to difficult economic conditions
- the tenant's business failed ...
... the automotive industry might have a significant change in demand due to climate change and a move to the use of electric vehicles ...
... and it might be difficult to find a new tenant in this small town
- new regulation were introduced that limited rent increases for tenants.

The property owner being unable to repay the £60m capital at the end of the loan term.

This might happen if:

- there were a fall in the property market so it did not achieve £60m when sold
- it was difficult to sell the property ...
... there might be limited demand given the type of property and location
- the owner could not refinance the loan at that point.

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Solution

Demand-pull inflation refers to a situation in which there is excess demand within the economy so that firms are able (and more likely) to increase their prices. As a consequence, the general level of prices may be pulled up.

3.3 Controlling the exchange rate

If interest rates in one country are low relative to other countries, international investors will be less inclined to deposit money in that country. This decreases demand for the domestic currency and tends to decrease the exchange rate.

(Conversely, *high* interest rates relative to other countries' interest rates can be used to support the value of the domestic currency.)

A decrease in the exchange rate induced by a cut in short-term interest rates may lead to *cost-push inflation*.



Question

Explain briefly what is meant by *cost-push inflation*.

Solution

Cost-push inflation refers to a situation where if firms' costs go up, they will tend to pass on at least part of the increase to consumers through higher prices.

The average price level can be 'pushed' up by an increase in costs. Possible sources of cost-push inflation include:

- an increase in the price of raw materials
 - higher wage demands not met by productivity increases
 - a weakening of the domestic currency, leading to higher import prices
 - an increase in the profit margins applied by firms.
-

3.4 The role of quantitative easing

As outlined above, governments and central banks can vary short-term interest rates as a tool to influence the rate of growth in an economy. In particular, cutting short-term interest rates can be used by governments as a means to temporarily increase the rate of growth in the economy.

This is because low interest rates fuel consumer spending and company expansion as borrowing costs are low and there is little incentive to save.

Where short-term interest rates are already close to zero, governments have limited scope to reduce interest rates further. Governments and central banks must then consider other means of influencing the rate of growth in an economy.

An alternative approach is called quantitative easing (QE). QE works as follows:

- **The central bank creates money electronically and uses it to buy assets, usually government bonds, from the market.**
- **This purchase of assets directly increases the supply of money in the financial system, which encourages banks to lend more and can push interest rates lower.**
- **The purchase of assets can also reduce the returns on money market assets and bonds ...**

... because the price of the remaining bonds will rise (as there are fewer available) and so the return falls, and because interest rates earned on deposits will be lower ...

... **reducing the appeal of those asset types.**

- **Investors may look to rebalance their portfolios by investing in other assets with a higher yield, such as equities and property.**

Lower interest rates also reduce the cost of borrowing for businesses and households. If businesses use the money to invest and consumers spend more, this can boost the economy.

Stock markets therefore typically respond to news of quantitative easing, with stock markets tending to rise when the central bank announces increased quantitative easing and fall when the central bank announces a contraction in quantitative easing.

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8.2 Bond markets

In government bond markets the supply is largely controlled by:

- **the government's fiscal deficit**
- **its strategy for financing the deficit**
- the redemption of existing government bonds.

As with new share issues, non-government borrowers will prefer to issue debt when the bond market is performing well, and so borrowing is effectively cheaper.

In particular, when prices are high and yields are low, they will be able to raise more money for a given level of interest payment and consequently the ongoing costs of servicing the debt will be lower.

8.3 Other investment markets

Occasionally, supply is increased by technological innovation. It can be argued that this is the case in the derivatives markets where a greater understanding of the pricing of and reserving for complex products has allowed investment banks to supply them to end users more cheaply, thus increasing the quantity demanded.

The increasing sophistication and availability of computer technology has enabled creative investment banks to come up with increasingly innovative and complex over-the-counter derivatives to meet the requirements of their clients.

In theory, an appropriate derivative security could be created to reduce or even eliminate the risks associated with almost any event or set of circumstances – albeit at a price. The advances in the available technology, plus the reduction in its cost, have also reduced the cost of creating such complex securities.

As a result, the range of investments available to investors has been greatly increased, enabling:

- investors to meet their objectives more closely, *eg* matching their liabilities and/or minimising the risks that they face
- the creation of more innovative products, such as tailor-made derivatives to greatly reduce any risks involved, *eg* equity-based products that offer guarantees.

The resulting expansion of the range of investments available to investors, together with the awareness that banks are able to meet their particular requirements, have led to an increasing demand from investors for further complex made-to-measure derivative securities.

A distinction between derivatives and other securities is that they can be created and destroyed on demand. The supply of any particular derivative is therefore limitless – in theory at least.

8.4 Impact of government monetary policy on supply

Investor preferences can be influenced by government and central bank attempts to control growth in an economy through influencing the monetary supply in the market.

One option governments have to encourage companies or individuals to spend money rather than save is to reduce interest rates.

When interest rates are close to zero, governments and central banks will consider a different approach. One approach is quantitative easing (QE). This was described in Section 3.4.

Quantitative easing reduces the supply of money market instruments and government bonds, by buying them back and thus removing them from the market.

QE can lead to lower interest rates which can:

- reduce the returns on money market assets and bonds, reducing the appeal of those assets
- reduce the cost of borrowing for businesses and households. If businesses use the money to invest and consumers spend more, this can give the economy a boost.

Environmental, social and governance (ESG) considerations

It is increasingly common for institutional investors to incorporate environmental, social and governance (ESG) considerations into their investment practices, with a shift away from considering ESG factors for ethical reasons towards considering them for financial reasons.

A very wide range of investment considerations is included within the scope of ESG.

Examples of ESG factors include:

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

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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. This approach is also followed in the European Solvency II standard formula model for insurers.

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.

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 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.**

One drawback to scenario analysis is that it quantifies the severity of the scenario but not the probability of it occurring. Organisations often use their capital models to determine the probability of a particular scenario occurring.

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.

2.2 Stress testing

A financial stress test is a projection of the financial condition of a company under a specific adverse event over a period of time. For example, the financial impact on a company of an immediate increase in interest rates of $x\%$ or an improvement in mortality of $y\%$ and this continues in the future.

Stress testing is also a deterministic method of modelling risks. It is commonly used to model extreme market movements, but also has applications in modelling credit and liquidity risks.

The risks that are incurred by extreme events can be identified and investigated by the process of financial stress testing.

For example, in relation to market risk, this involves subjecting an asset portfolio to extreme market moves by radically changing the underlying assumptions and characteristics, in order to gain insight into the portfolio's sensitivities to predefined risk factors. In particular, both asset correlations and volatilities are often observed to increase during extreme market events.



Question

Give two examples of assets where a positive correlation may exist.

Solution

Examples of assets with a positive correlation:

- assets in the same sector, *eg* two shares in the same industrial sector
 - assets from different sectors that react in the same way, *eg* shares and property are both correlated to inflation.
-

2.3 Combining stress and scenario testing

The principle of stress testing can be coupled with scenario testing to determine a stress scenario. In this case, the stress test is performed by considering the impact of a set of related adverse conditions that reflect the chosen scenario.

Scenario analysis identifies the factors which are impacted under the chosen scenario, and these become the factors to which stress tests can be applied. The overall stress scenario test combines the individual factor stress tests, and this is ideally done simultaneously in order to allow for inter-relationships.

When constructing a stress scenario, decisions need to be made as to how other aspects of the business will react if a stress event occurs.

For example, for a provider of unit-linked investment bonds, a sustained reduction in market values will affect:

- **income received from fund management charges**
- **persistence of existing investment bonds**
- **new business volumes**
- **the provider's regulatory capital requirements**
- **the value of the shareholders' interests**
- **the probability of any guarantees biting.**

All these factors need to be built into the model.



Question

Explain how the above factors might be affected under the given scenario of a sustained reduction in market values of the assets in which the bonds are invested.

Solution

The following might occur:

- income from charges would fall if the fund management charges are expressed as a percentage of the fund value
- persistence might worsen (*ie* higher levels of surrender) due to nervousness about the future performance of the underlying assets, or due to policyholders needing to cash in *eg* due to a shortfall of income from other investments
- new business volumes might fall, due to uncertainty about when it is best to invest in a falling market
- regulatory capital requirements might have to increase, *eg* if the calculation is risk-based and there is greater uncertainty or volatility in the market and/or if there is greater risk of not meeting expenses due to the lower expected future charges
- the value of free capital (which is ultimately shareholder-owned) would fall if invested in the same type of assets, and the value of profits expected to arise on these investment bonds would also fall due to the lower future charges, higher withdrawals and lower new business volumes
- the probability of a guaranteed minimum benefit coming into the money will increase.

Other economic factors, such as interest rates, inflation and investment returns on other asset types might also be impacted to the extent that they are correlated to this market.

The scenarios should be tailored to reveal weaknesses in terms of risk exposure and sensitivity, and should thus focus on the risk factors to which the business is most exposed.

There are two types of stress scenario test:

- **to identify 'weak areas' in the portfolio and investigate the effects of localised stress situations by looking at the effect of different combinations of correlations and volatilities**

For example, a 'weak area' may be corporate bonds if there is too high an exposure to a particular type of industry.

- **to gauge the impact of major market turmoil affecting all model parameters, while ensuring consistency between correlations while they are 'stressed'.**

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Chapter 28 Summary

Risk quantification

For all risk events, the probability of occurrence (frequency) and expected loss (severity) need to be assessed. These are normally treated as random variables in models.

Risks are commonly assessed using simple scales which rate frequency and severity from low to high. The product of frequency and severity scales represents the overall score for that risk, enabling them to be ranked. The assessment would be done with and without controls, to assess their efficiency. The assessment may be recorded in a risk register.

It is difficult to model low frequency events due to a lack of data.

Operational risk in particular can be difficult to quantify. Typical approaches are:

- a broadbrush addition to other risks (for capital requirements)
- scenario analysis.

Evaluation of risks

Scenario analysis looks at the financial impact of a plausible and possibly adverse set or sequence of events. It is useful where it is difficult to fit full probability distributions to risk events.

It involves the following steps:

- grouping of risks into broad categories
- development of a plausible adverse scenario
- calculation of the consequences of the risk event occurring for each scenario
- total costs calculated are taken as the financial cost of all risks represented by the chosen scenario.

Stress testing involves assessing the impact of a specific adverse event, such as an extreme market movement (or credit or liquidity risk event).

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

There are two types of stress scenario test:

- to identify 'weak areas' in the portfolio and investigate the effects of localised stress situations by looking at the effect of different combinations of correlations and volatilities
- to gauge the impact of major market turmoil affecting all model parameters, while ensuring consistency between correlations while they are 'stressed'.

Reverse stress testing is the construction of a severe stress scenario that just allows the firm to be able to continue to meet its business plan, eg having insufficient capital to meet solvency requirements or to cover its minimum risk appetite. The scenario may be extreme, but must be plausible.

Stochastic modelling is a natural extension of stress testing but can be complex and impractical in many cases.

The model is often limited by one of following approaches:

- restrict the duration (or time horizon) of the model
- limit the number of variables modelled stochastically and use a deterministic approach for the other variables
- carry out a number of runs with a different single stochastic variable and then a single deterministic run using all the worst case scenarios together.

Aggregating risks

In many regulatory regimes, the capital requirement is set in respect of an event occurring within 12 months with a probability of 0.5% (a '1 in 200-year event'). Individual risks need to be aggregated in order to allow for correlations and inter-actions. This can be done through:

- stochastic modelling – although this may be impractical
- simple formulae if risk events are fully dependent (sum of individual capital requirements) or fully independent (square root of sum of squares)
- correlation matrices
- copulas – functions that take as inputs marginal cumulative distribution functions and output a joint cumulative distribution function.

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

Risk measures

Active risk measures for asset risks include historic tracking error and forward-looking tracking error.

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

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