

EXAMINATION - MEMO

13 May 2025 (am)

Subject A311 — Actuarial Risk Management Core Principles

Paper One

EXAMINERS' REPORT

This subject report has been written with the aim of helping candidates. This report summarises the main points that the examiners were looking for and some common problems encountered.

QUESTION 1

Examiner comments: Part (i) of this question was generally well answered, but better candidates would also comment on what happens to benefits at death. Part (ii) was also answered well, but many only made comments on investment risks, losing out on some easy marks. Candidates who did well in part (ii) had many ideas to draw from for part (iii) and did better. Weaker candidates would often make very impractical suggestions, which attracted limited marks.

(i)

- In the case of the immediate annuity, in exchange for a single premium the customer will receive guaranteed income for the rest of their life.
- While there may be some guarantees on the minimum period a benefit may be payable...
- ...the lump sum is effectively paid over to the life office and there is not a “refund” if the annuitant dies earlier than expected.
- For a drawdown/living annuity, the customer can withdraw an amount from the fund each year.
- This may be just the income earned on the fund or may also include some of the fund capital.
- A key difference between the two is for an immediate annuity the income is guaranteed for life...
- ...whilst for an income drawdown the funds can run out.
- The investment risk is taken by the customer.
- The balance of an income drawdown product is paid to dependents/estate after death.

(ii)

- The member is exposed to investment risk of potentially volatile returns.
- If only the income earned on the fund is taken each year, the member’s income could be volatile.
- If too high a level of income is taken...
- ...or the member lives longer than expected, the capital could potentially reduce to zero before the member dies...
- ...leaving the member dependent on other sources of income (e.g. the state or family) at the end of their life.
- The member may be exposed to the risk of making poor investment decisions with regards to the investment of the lump sum.
- The investment charges/expenses for administering the arrangement may be high.
- The remaining fund on the member’s death may be insufficient to provide adequate benefits for a dependant.
- There may be a tax charge on the residual fund on the member’s death.

(iii)

- Set a maximum percentage to be withdrawn per year.
- Limit the maximum withdrawal to not be significantly higher than the income earned.
- Set a maximum age at which drawdowns must cease and a guaranteed pension be purchased.
- Regulate the fees that can be charged for administering the arrangement.
- Regulate the type of investments that may be used for these products.
- Set a minimum amount of funds at retirement for a person to be eligible for an income drawdown product.
- Allow for flexibility in the level of withdrawals to avoid from running out of funds.
- Tax charge on the residual fund on the member’s death should align with the tax charge on similar benefits like those payable to dependants on death of the policyholder.

QUESTION 2

Examiner comments: Overall, this question was well answered by most candidates. Some candidates struggled with business, credit and market risk in the context given for part (ii). Examples of risks that were generic or not really applicable to the setting scored poorly.

(i)

Market risk

- the risks related to changes in investment market values or other features correlated with investment markets, such as interest and inflation rates.

Credit risk

- the risk of failure of third parties to meet their obligations

Liquidity risk

- the risk that the individual or company, although solvent, does not have available sufficient realisable financial resources to enable it to meet its obligations as they fall due. *(give credit if point is clear, even in absence of the word “realisable”).*

Business risk

- the risks specific to the kind of business being undertaken (in this case, the running of the coffee shop).

Operational risk

- the risk of loss resulting from inadequate or failed internal processes, people and systems

Risk from external events

- External risk is a form of non-financial risk that arises from external events such as fire, flood, storms, cyber-attacks, geopolitical developments etc.

(ii)

Market risks

- Example: Inflation and interest rate risk making loan repayments unaffordable in the event of higher inflation triggering higher interest rates.
 - Mitigation: Maintaining emergency reserves to tap into during times of rising/high interest rates.

Credit risks

- Example: Debtors failing to repay debt, i.e. if coffee shop sells to some customers on credit
 - Mitigation: Restrict offering credit to customers
- Example: Suppliers failing to deliver goods on time (or at all)
 - Mitigation: Ensure only to contract with suppliers with established reputation and track record

Liquidity risk

- Example: Not having sufficient cash to pay suppliers, expenses, etc.
 - Mitigation: Negotiating longer payment periods with creditors and restricting further credit whilst servicing credit in arrears
- Example: Too much assets locked up in inventory or in other investments, forcing them to potentially sell at depressed prices to raise the required cash
 - Mitigation: Carefully manage inventory levels and balance with cash reserves/requirements

Business risk

- Example: Coffee shop not attracting sufficient number of customers to be financially viable
 - Mitigation: Sufficient market research prior to opening; ongoing marketing
- Example: Food/drink being contaminated and causing illness/harm to customers
 - Mitigation: Contract with suppliers who supply food/drink which has passed minimum standards tests, e.g. SABS certificates

Operational risk

- Example: Fraud/theft by manager/employees
 - Mitigation: Sufficient training, auditing, monitoring via surveillance
 - Mitigation: Insurance products such as fidelity guarantee

External events

- Example: Fire (or other disaster) at premises
 - Mitigation: Property insurance (including for movable goods/inventory) and business interruption cover

QUESTION 3

Examiner comments: Candidates performed well in part (i) of this question. Of those who did not perform as well, the most common reason was due to vague and/or incomplete responses. Part (ii) was generally poorly answered. Many candidates mentioned points that centred around generic assumption setting considerations rather than specifying which key assumptions would be required and describing briefly how these would be set. Many candidates provided points heavily weighted to one factor, not recognising that a few key assumptions would be required.

(i)

- to determine the liabilities to be shown in the provider’s published accounts and reports
- if separate accounts and reports are prepared for the purpose of supervision of solvency, to determine the liabilities to be shown in those accounts
- to determine the liabilities to be shown in internal management accounts and reports of the provider
- to value the provider for merger or acquisition
- to determine the excess of assets over liabilities and whether any discretionary benefits can be awarded
- to influence investment strategy
- to set future contributions to a benefit scheme
- to value benefit improvements for a benefit scheme
- to calculate discontinuance / surrender benefits
- to provide disclosure information for beneficiaries
- to provide for expected credit losses for a bank.

(ii)

The key assumptions required are :

- mortality rates
- discount rates
- inflation (note that this may be combined with discount rates by referring to “real” yields etc.)
- maintenance expenses.

Mortality assumptions

- If insurer has sufficient and relevant data, they could use own experience.
- If not, assumption could be set based on industry experience as obtained through regulatory data or use of consultant firms.
- Adjustments could be made for expected future changes, e.g. mortality improvements.
- Reinsurers could also be a potential source of data and assumptions.

Discount rates

- Company could develop a yield curve based on available government bond yields by duration...
- ...or market curves could be readily available.
- They could also use a swap curve.

Inflation

- For consistency inflation could be set as a margin to the discount rate set for the company.
- The margin could be the same over the whole discount rate curve or different for each duration based on sufficient experience.

Expenses

- Company should use own experience by conducting an expense investigation.
- This could be adjusted to allow for future expected changes like economies of scale as the company grows.

QUESTION 4

Examiner comments: Responses in part (i) and (ii) show that many candidates were somewhat uncomfortable with bond market concepts. In part (i) many could get half the marks available, often stating one half of the theory but not quite completing the thought. For example, with expectations theory many missed the fact that the market expectation of future interest rates is closely linked to the market expectation of future economic factors (of which interest rates are just a part). In part (ii), better candidates tried to clearly differentiate their comments by duration (short, mid, long) and also did not make their discussions unnecessarily complicated. Future candidates do well to keep this in mind in their attempts. Candidates at times misinterpreted part (iii), commenting on the impact of the recession on the share price, as opposed to the effect of the interest rate announcement. Here too many candidates overcomplicate things by considering exchange rates, import costs etc. There was some credit available for such comments, but fundamentally the potential future profits should drive the share price and simpler comments along these lines generally did better. Better candidates commented that lower interest prices are generally favourable to share price valuations.

(i)

Expectations theory

- Expectations theory states that the shape of the yield curve is determined by economic factors...
- which drive the markets expectations for future short-term interest rates.

Inflation risk premium theory

- Inflation risk premium theory suggests that investors are more interested in real returns...
- ...and require a higher nominal yield to compensate for the risk that inflation is higher than expected and hence real yields lower than expected.
- Uncertainty is greater for longer periods and so the premium will be higher for longer dated stocks.

Market segmentation theory

- Market segmentation theory states that the yield at each term to redemption is determined by supply and demand from investors with liabilities at that term.

(ii)

- The impact would depend on the degree to which this was anticipated and priced in by the market.
- The very short (0-1yr) end of the yield curve would fall causing bonds with short remaining maturity to rise in price.
- Since interest rates are expected to be lower for longer, yields at short to medium (1-5 yrs) duration may also fall leading to an increase in these bond prices.
- Since this is done in an attempt to boost economic growth investors may anticipate longer term inflation as a consequence.
- This may lead to investors at longer durations (5-10 yrs) reducing demand for these bonds...
- ...or demanding higher returns on nominal bonds since these bonds do not offer inflation protection.
- This may cause longer term bond prices to decrease.
- Uncertainty about future inflation may increase yield on longer term dated bonds even further...
- ...due to IRP theory.
- Bonds of much longer duration (10+ yrs) may not be impacted as much due to their duration,...
- ...but any small change in the outlook for long term interest rates could cause a significant change to prices.
- These potential outcomes are based on investors expectation for future economic factors such as interest rates and inflation.
- Demand from overseas investors may reduce if local bonds become less attractive due to lower yields.
- This may cause prices to fall particularly at the terms to redemption favoured by overseas investors...
- ...which demonstrates market segmentation theory.

(iii)

- Share prices of a particular company reflect the expectations for corporate profits going forward by investors.
- Lower interest rates reduce the effect of discounting when valuing companies using discounted dividend models and hence may lead to higher share values.
- Lower interest rates generally increase the overall level of equity markets...
- ...since corporate turnover/revenue/profitability is expected to increase...
- ... as a result of increased spending by consumers.
- Hence, all else being equal prices of these shares may increase.

- The impact on the share price of the clothing retail store may result in a higher price increase than the food producer...
- because consumers will have increased disposable income if their debt servicing costs reduce...
- as well as have cheaper access to further credit.
- Both these factors are likely to boost sales in the clothing sector.

- The impact will not be as large for the food retailer share price.
- Since consumption of staples is unlikely to change in different economic conditions.
- There may be a shift towards more luxurious foods leading to a small decrease in demand for their goods.
- Any anticipated inflation as a result of the lower interest rates would also not impact the company's expected profitability...
- ...since increase in input costs of staple goods can, more easily, be passed onto consumers.

QUESTION 5

Examiner comments: Part (i) of the question was generally well answered, and most candidates could give a few sensible reasons for the company's financial difficulty, but relatively few scored all the marks available. In part (ii) some candidates provided detailed actions a company can take to improve their financial position, based on points raised in part (i), but did not focus on the actions/interventions that the regulator may require. Most candidates did well in identifying at least four to five stakeholders in part (iii).

(i)

- Claims may have been higher than expected.
- Surrenders may have been higher than expected...
- ...this may be exacerbated by an economic downturn could have led to fewer customers taking out policies and even higher than expected surrenders.
- ...these surrenders may have happened for policies with negative asset share or lower than the surrender value.
- The lack of any other product types with no surrenders payable for the company, may have added to the difficulties.
- Underwriting may have been ineffective leading to high risks than priced for been taken on.
- There may have been increased competition leading to fewer policyholders. Those remaining may have been higher risk due to selective withdrawals.
- The company may have been unable to get or set up effective reinsurance.
- The company may have been unable to access more capital...
- ...possibly due to a poor credit rating due to ongoing difficulties.
- There may have been higher than expected levels of new business strain.
- Reserving / capital requirements may have become more onerous.
- Operational risks may have occurred, such as fraud or financial crime (other examples of revenue shocks also acceptable).
- A reputational event may have occurred, leading to losses e.g. mass lapses/cancellations.
- There may have been poor efficiency, or a lack of controls leading to higher expenses.
- Investment returns may have been exceptionally poor...
- ...or severely mismatched to the liability profile.

(ii)

- May require the company to close to new business...
-so that new policyholders are not entering a fund whose solvency may be in doubt.
- The company may also be required to project its solvency for different scenarios.
- The company will be required to establish a recovery plan,...
- ...and this will be monitored closely by the regulator.
- The recovery plan may include some or all of the following actions:
 - o changing the investment strategy to invest in assets that better match the liabilities,
 - o increasing the amount of reinsurance the company has in place,
 - o limiting the levels of new business sold,
- Outstanding liabilities will still need to be met but it should be possible to make costs savings and to release capital which was tied up in financing new business.
- Limits may be placed on the distribution of dividends.
- The insurance company could be sold or merged with another insurer who would take on the liabilities.
- If the insurance company cannot meet its liabilities and a buyer cannot be found there may be a statutory scheme set up to meet existing liabilities.
- The regulator could appoint a curator to run the company to see if it can be restored to positive solvency.

(iii)

- Shareholders – value of their investment is at stake
- Current policyholders – interested in the security of their benefits
- Employees – job security may be threatened
- Brokers – may not want to place business at a company that could put their clients at risk
- Creditors to the company – repayment of monies owed might be at risk
- Auditors – would be keen to understand whether the situation could have been avoided.
Reputation risk of missing something also a concern for auditors.

QUESTION 6

Examiner comments: Most candidates could generate some ideas in part (i), but surprisingly few could achieve the full marks available. Internal data was not really an obvious source as the insurer did not sell annuities prior and would not be credible. Many wasted time discussing the sources at length as opposed to just listing them. Candidates generally did not write nearly enough for the marks available in part (ii) and largely made very generic/theoretical comments with little application to the situation at hand. Weaker responses centered around good features of data as opposed to the issues and need for adjustments required to use past data for future use. Better candidates appreciated that there are some specific comments to make around mortality for annuity/longevity risks compared to life cover. Weaker candidates misread the question and assumed that the company is small as opposed to the country being small.

(i)

- Industry tables on the country's population mortality (or historical population data)
- Industry tables on annuitant mortality (or historical annuitant mortality data)
- Projections of mortality and/or mortality improvements for the country
- Historical population and/or annuitant data for comparable countries
- Medical papers about longevity/mortality
- Data from reinsurers
- Research papers by experts.

(ii)

- Past data can be used to project future mortality and mortality improvements,...
- ...however, the conclusions will rely considerably on use of judgement.
- Due to the uncertainty it may be useful to compare the actuary's judgement with the range of views within the industry.
- In a developed country it is likely that extensive population data will be available,...
- ...though whether there is significant insured life/pension scheme data depends on whether and for how long annuities have been available in the country.
- The country is small so the volume of data will mean it has lower credibility,...
- ...particularly if there are significant numbers of sub-divisions by age/gender/industry etc.
- Data may be over-simplified or not detailed enough.
- It is important that the past data used is relevant to the group of individuals about whom assumptions are to be made,...
- ...for example, general population data may not be relevant for use with insured lives.
- The insurance company's own past data may relate to different products and not annuitants.
- Using data from other countries would alleviate some of the data shortage, however, it will be necessary to either adjust the data,...
- ...or at least recognise differences between the countries both now and historically over time.
- The social and economic conditions are likely to have changed to some degree over any period of history...
- ...which will impact mortality and require changes in the assumptions that the actuary uses.
- Similar to above, lifestyle and healthcare changes/developments may lead to changes in mortality compared to the experience in the data sources.
- The actuary therefore needs to consider the conditions that *will apply in the future period to which the mortality assumptions will relate*...
- ...and how those conditions could lead to a difference from the past data that is being used.
- The relevance of past data to future projections must also be balanced against the need for sufficient data for its analysis to be statistically credible.
- The actuary must manage this conflict between credibility and relevance.
- When using past data the actuary therefore needs to consider how to deal with:

- Abnormal fluctuations, e.g. Covid-19
 - Changes of the experience with time
 - Random fluctuations
 - Changes in the way in which the data was recorded
 - Potential errors in the data
 - Changes in the balance of any homogeneous groups underlying the data
 - Heterogeneity with the group to which the assumptions are to relate
- Mortality data is affected more by medical advances than by economic circumstances...
 - ...and past data should be considered with this in mind.
 - This is likely to result in significant emphasis being placed on the most recent data
 - Might be necessary to consider the views of doctors and other healthcare professionals to understand the range of views about future medical advancements when determining the range of potential future improvement to mortality

QUESTION 7

Examiner comments: Students did not know the basic mechanisms of a pension fund for Q7 - especially the difference between DB and DC. Many stated that the active members would benefit from higher returns as they would receive a higher benefit on retirement (not potentially higher pension increases). Students still continuously refer to a pension scheme needing to keep capital and reserves.

For part (i) many just described the liabilities using the list provided in the notes and did not answer the question- how a matching portfolio could be constructed.

Part (ii) was better answered.

For part (iii) aside from the poor understanding of pension funds discussed earlier, answers were highly repetitive - simply writing the same sentence or point as advantages or disadvantages for each of the parties.

(i)

- The expected annual annuity cashflow payments would be projected based on fund data for existing pensioners.
- This would be based on their current pension (not including future increases).
- As well as date of birth and expected mortality.
- Spouse's details could also be modelled using actual data if available.
- Expected future retirees may be included in the cashflows.
- A portfolio of inflation linked bonds would be constructed so that the coupon and maturity payments expected during each future year (before inflation adjustment) correspond with the expected liability cashflow for that year.
- A small cash portfolio would need to be maintained due to the timing mismatch between asset and liabilities during each year (see below).
- The annual expenses associated with the pensioner liability could also need to be projected into the future and matched.
- One would start by matching the longest dated liability cashflows and work backwards.
- This may be very difficult (if not impossible) given the duration of the liability cashflows and availability of bonds.
- A swap could be entered into whereby the counterparty pays the expected liability cashflows adjusted for inflation each year.
- And the fund pays some predetermined set of cashflows based on a portfolio of underlying assets, or even an upfront premium.

(ii)

There would not be a perfect cashflows match because:

- Pension payments are received monthly and not once or twice a year.
- Timing of coupons and maturities from the bond portfolio would occur at various dates throughout the year...
- ...and will not match the exact timing of the pension payments
- The timing of the inflation adjustment on the asset proceeds would be based on the payment date.
- Possibly with a lag of 3 months.
- Whereas the timing of pension increases is once a year.
- It may not be possible to exactly match the annual liability cashflows if the required inflation-linked bonds are not available.

(iii)

Matching

- Reduce potential volatility of assets versus liabilities and hence stabilize the funding level of the fund.
- This will reduce the potential need for the sponsor to make additional contributions to the fund in the event of adverse investment experience.
- This also secures benefits for pensioners if the sponsor is unable to correct any potential shortfall.
- Pensioners would be guaranteed increases in line with inflation.
- This option will be expensive since the expected returns on the matched portfolio would be much lower.
- As well as additional expenses related to matching.
- This may reduce the existing surplus quite significantly.
- Pensioners may argue this could be better used for a once off bonus and/or higher than inflation pension increases.
- Or the employer could reduce contributions in respect of remaining active members.
- Less need for active decisions on the day-to-day running of the asset portfolio...
- ...so no need to pay an active manager.
- But this strategy would still need to be monitored and altered based on mortality experience and new retirees.
- It may not be possible to fully match the liability if there are not assets available of long enough duration.

Existing strategy

- Potential for higher returns may result in further increase to the surplus
- Which can be used to provide higher than inflation pension increases.
- However, the market value of the portfolio relative to the liabilities could be quite volatile.
- Higher exposure to equities could even wipe out the surplus altogether and result in a deficit.
- This may jeopardise existing pensions in payment and future pension increases.
- Existing strategy bears costs of asset management.
- Need to maintain a cash balance for liquidity to pay pensions (due to volatility of underlying assets even if they are liquid).

QUESTION 8

Examiner comments: Part (i) was pure bookwork from the chapter on other investment classes, but few students mentioned more than two valid points, instead making very generic comments and losing easy marks. Part (ii) was answered better, with most students getting the main points. Some, unfortunately, mixed the two investment vehicles up. Many candidates did not appreciate that an investment trust's share price is the result of supply and demand and not the NAV per share, (although it is expected to be around that value). Many students mistakenly stated that unit trusts are based on NAV and not market value of underlying assets. Part (iii) was poorly answered. Candidates mostly did not really understand how a long holding in an index tracking futures contract works. Futures do not give you the option to walk away at expiry and, given that they are exchange traded, credit risk is insignificant. Also, many confused forward contracts with future contracts and could not articulate how the potential investment return is generated. Some made comments along the line of "locking in the purchase price of the index at a future date" and missing the point that the investor is trying to get exposure to positive movements in the index that will lead to an increase in the value of the position being held.

(i)

Regulations typically cover aspects such as:

- The categories of assets that can be held
- Whether unquoted assets can be held
- The maximum level of gearing
- Any tax relief available
- May only be available to certain classes of investors
- Regulation will vary from country to country
- Different type of CIS will be subject to different rules.

(ii)

- An investment trust is typically a closed ended scheme which means it is closed to new money once the initial tranche of money is invested.
- The total number of shares or units is fixed.
- It is a company and not a trust.
- Most investment trust company shares are quoted on an exchange and bought and sold in a similar way to other shares.
- After launch, the only way of investing in such a scheme is to buy shares (units) from a willing seller.
- An investment trust has the capacity to borrow.
- While the share price is expected to be NAV per share...
- ...the actual price of the share is determined by supply and demand in the market.
- Managed by a board of directors and investment managers.

- A unit trust is an open-ended investment vehicle...
- ...whereby investors buy units in an underlying pool of assets.
- Set up as a trust from a legal point of view.
- Overseen by trustees and managed by a trust management company.
- The scheme manager can create units if there is demand for new units.
- If investors want to sell their units, the manager will buy it back from them.
- Unit price calculated daily by the trust manager as market value of underlying assets divided by number of units.
- Bid and offer prices may be made for units.

(iii)

Unit Trust – advantages

- Underlying share prices are correlated to commodity prices.
- Easier to invest in the unit trust as you do not need to have a brokerage account with an exchange.
- Some costs of direct management or direct investing can be avoided.
- Provides access to expertise of the unit trust manager in selecting the best performing companies
- Unit trust is a CIS and is regulated and provides some level of protection to the investor
- Tax may only be payable when the unit trusts units are sold.
- Liquidity will be very high as you can just redeem some or all your units

Unit Trust - disadvantages

- You do not have any say in which underlying commodities or companies are invested in.
- Unit trust is only invested in mining companies – may not be sufficiently diversified across other commodities.
- The asset management fees associated with this investment can be high.
- Since the underlying assets are company shares the prices are subject to general movement of equity markets.
- Mining company prices are not directly correlated to underlying commodity prices – prices will also depend on company specific factors such as:
 - Management quality
 - Range of offshore investment risk
 - the mining company may hedge the underlying commodity prices.

Future – advantages

- Cheaper exposure to a basket of commodities.
- Given this is a popular index the futures should be readily available.
- The underlying exposure is more diversified than the unit trust.
- Exchange traded futures mean credit risk is minimized due to the presence of a clearing house.

Future - disadvantages

- More complicated to determine how many contracts to buy to gain exposure.
- Not something an individual investor would typically have skills in.
- Contracts are standardized and you will not be able to tailor to your specific needs, for example:
 - The term of the contract will be specified
 - Contracts are generally shorter term which will require rolling over of contracts
 - May trigger a tax event every time there is a roll over.
- If you wish to liquidate your position you will need to close out your contracts.
- Will need to pay margin upfront...
- ...as well as regular adjustments to initial margin if price moves against the investor.
- Margin calls can create liquidity problems be if the index value drops suddenly.