Actuarial Society of South Africa

October 2021

Subject A311 — Actuarial Risk Management

PAPER TWO

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's comments:

This question was well answered by most students, but many students still fail to articulate clearly that there is a ***risk of loss*** *for part (i), and merely outlined types of operational risk events. Many valid ideas were given on part two and many candidates scored well here.*

i.

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

ii.

- It can attempt to reduce the risk by reducing the probability of it happening…
- …e.g. through improving security measures such as…
- …software, limiting staff access to certain sites etc.
- Alternatively reducing the impact of a cyber-attack…
- …by having back-up (or recovery) hardware in place.
- …and having contingency plans and procedures in place to continue operations after an attack.
- They can transfer some or all of the risk to another party…
- …perhaps by purchasing an insurance contract such as cyber insurance.
- They can hold additional capital to withstand such events.

QUESTION 2

Examiner's comments:

Part (i) and (ii) of this question was generally well answered. A significant number of candidates missed the fact that real yield curves were mentioned in part (ii) and would include inflation risk premium theory as one of the responses, which would not be applicable here. Part (iii) however saw many candidates struggling to apply part (ii) in their explanations.

i.

- Initial negative cashflow (outflow) to purchase the bond.
- Followed by regular (e.g. annual) positive cashflows (or coupons / interest) and a single large outflow at redemption.
- Aside from the initial cashflow, the cashflows are unknown at the outset…
- …but will be determined with reference to an inflation index.
- There may be a lag between the date of the index value and the date of the associated bond payment

ii.

Expectations theory

- The shape of the real yield curve is determined by economic factors…
- …which drive investors' expectation of short-term real interest rates in the future.

Market segmentation theory

- The shape of the real yield curve will reflect the relative impact of supply and demand at various durations along the curve.

Liquidity preference theory

- An upward sloping yield curve reflects investors' preferences for less volatile shorter dated ILB's.

iii.

- Investors may believe that short term real rates are expected to decrease going forward.
- Investor demand may be higher for longer dated ILB's.
  - This is often the case as these bonds are preferred by institutions with long term real liabilities.
  - Alternatively, investors may have concerns about high inflation over the longer term (possibly due to government policies) making these bonds more attractive.
- Government may prefer issuing ILB's of shorter duration – increasing supply at the shorter end of the curve relative to the longer end.
- The forces of supply and demand (market segmentation theory) appear to be more than compensating for liquidity preference.
  - Liquidity preference theory suggests that the curve should slope upwards, as long dated inflation linked bonds are very volatile (even when compared with conventional bonds).
  - Long dated ILB's are also often less marketable.

QUESTION 3

Examiner's comments:

This question was poorly answered by students, particularly part (ii). Students who performed well were able to correctly identify the main reserves ***together with*** *a good definition and sufficient example. They were also able to distinguish reserves from capital requirements, something the weaker students consistently confused with each other. Few students were able to distinguish the different reserving techniques/methods involved in setting the reserves.*

i.

- The reserves below are closely linked to the accrual principle of accounting…
- …that requires premiums and claims should be recognised in the period where it was earned (premium) or incurred (claims).

Reserve for unexpired risk (or unearned premium reserve)

- This arises when there is still a period of unexpired risk at the valuation date (or financial period end date) for which premium has already been received.
- This will happen frequently for policies where premium was payable annually in advance, but the reporting period is before the end of the policy period.

Reserve for outstanding claims

- These arise when the provider knows about a claim that it is likely to have to pay…
- …but the actual claim amount has not been finalised and paid.
- An example will be a car accident where the repairs are underway, but the final amount not yet determined.

Reserve for incurred, but not reported claims

- At any given reporting date, it is likely that insured risk events have happened that the insurer would be liable to pay…
- …but these have not been notified to CoverU yet…
- …and in some cases not even the policyholder may know that there is a claim
- An example where an employer with an employer liability policy only gets sued many years after employees were unknowingly exposed to a dangerous chemical.

ii.

Reserve for unexpired risk (or unearned premium reserve)

- Likely to use a proportionate approach.
- The unearned premium reserve is calculated by applying the proportion of unexpired risk period…
- …to the premium written for the risk period.

Reserve for outstanding claims

- Likely to use a case-by-case estimate…
- …where there is an estimated claim amount recorded for each claim notified.
- This amount may be based on expert judgement or the best available information at the time…

- …or a past average amount of similar cases

Reserve for incurred, but not reported claims

- This will likely require a statistical approach/analysis…
- ..that will aim to predict the development of future claims arising from the current risk period.
- Examples of methods are run-off triangles, frequency/severity approaches, ultimate loss ratio.

QUESTION 4

Examiner's comments:

This question was an application of the theory around the pricing of contracts, in particularly general insurance contracts. Candidates who kept things simple in part (i) by considering the components of office premium did well, since they could identify the major components and then elaborate on these in part (ii). Many would discuss how to obtain the rating factors required e.g. insured amount, industry, turnover, number of employees etc. which was not what was required. For clarity, one would need assumptions about how the latter impacts the risk (through frequency and severity) and hence price, but the values of the rating factors themselves would generally be known. Many would recognise that inflation and investment returns would be important assumptions but failed to explain clearly how one could set these assumptions.

i.

- Assumptions relating to the distributions of both the claim amounts…
- … and claim numbers
- investment return …
- …since employers' liability insurance is a relatively long-tailed class of general insurance business…
- … significant provisions may build up prior to making claim payments
- Expenses on this class of business will be significant…,
- … particularly claim expenses such as legal fees.
- Commission may or may not be significant, depending on the distribution method
- Inflation assumptions will also be needed…
- …for both claims and expenses
- Employers' liability insurance is a relatively long-tailed class of business and claims are subject to court award inflation.
- Claims expenses will be subject to inflation of legal expenses.
- Profit margins assumptions.

ii.

Claim amounts and numbers

- Statistical methods could be used to fit a distribution to past claim amounts and numbers…
- …and to solve for the parameters
- Such distributions would need to be adjusted in light of any changes in…
- … policy cover …
- …inclusions and exclusions…
- …claim limits
- … underwriting standards
- … target market.
- If insufficient data exists, then industry or reinsurers' data would be useful.

- Advice from reinsurers may be useful anyway, even if sufficient data does exist, as reinsurers may have a better understanding of the industry

Investment return

- The investment return assumption will depend on…
- … the types of assets…
- …and the mix of assets ……
- in which the premiums will be invested
- If cash and bonds are used, it will be necessary to project interest rates and bond yields,
- If equities are used, it will be necessary to project equity dividend yields and growth rates.
- Past data (e.g., from relevant indices) may be useful.
- However, economic conditions change over time …
- …and therefore, consideration needs to be given to the investment environment that is expected to apply over the future term of the contracts.
- If past data is used, it will need to be modified, to strip out the fluctuations relating to the economic conditions of the time.
- The investment return may need to be netted down for:
  - tax
  - investment expenses.

Expenses

- Expenses could be set by looking at the results from a recent company expense analysis for this product.
- However, if insufficient data exists it may be necessary to use other sources of data, for example:
  - the company's expense data for a similar contract
  - industry data
  - reinsurers' data.
- Any past data will need to be modified for any aspects relating to the expenses which might be significantly different, …
- … for example, underwriting or claims administration

Commission

- Rates should be in line with the market for this type of contract, …
- …then just assume these actual levels in the pricing basis

Inflation (claims and claims expenses)

- Inflation assumptions are needed from the middle of the investigation period (from which any past data on claims and expenses has been taken) …
- … up to the middle of the period during which claims are expected to be paid.
- Industry inflation indices may exist for employers' liability claims and claims expenses.
- These would need to be extrapolated forward.
- Consult with underwriters and reinsurers…
- as they may be aware of any likely future court rulings / changes in legal fees which could affect the cost of claims and the associated expenses.

QUESTION 5

Examiner's comments:

Part (i) was generally well answered although a significant number of candidates did not include setting up of reserves in their explanation, focusing only on expenses. Part (ii) was poorly answered and the majority of candidates were not able to identify that product types with a single or low upfront unit allocation were required. In some cases the products were correct, but the explanations poor (e.g. often mentioning that no reserves are required for lump sum business). Part (iii) shows that this concept is still poorly understood and the majority of candidates did not explain how the release of reserves contributes to offsetting new business strain. The final part of this question had a strong theory component and was well answered.

i.

- New business strain arises when the premiums paid at the start of a contract, less the initial expenses including commission payments,…
- …are not sufficient to cover the reserve that the company needs to set up at that point.

ii.

- *Immediate annuity* policies…
- … as all the premium is received up front and should exceed initial expenses and reserves.

- *Single premium investment* policies,…
- … as all the premium is received up front and should exceed initial expenses and reserves.

- *Unit-linked investment policies with a low first-year unit allocation*…
- …the early premium net of investment may be sufficient to cover initial expenses.

iii.

- To write new business, a life insurer requires some capital /free assets to make up the difference between premiums and initial expenses plus reserves.
- Over the term of the contract, the loss is recouped …
- … as, in subsequent years, the premium received should be greater than the expenses that need paying,…
- …and the reserves and solvency capital released should be greater than the claim that is paid.
- This is because the sum of the reserves plus required solvency capital will have been set at a prudently high level…
- …to increase the likelihood that the claims can be paid.

iv.

- To cover unexpected events…,
- …for example, to cover adverse claim experience, or a miss-selling fine.
- To give investment freedom…
- …since the more free assets, the greater the ability to mismatch in pursuit of higher returns
- To demonstrate financial strength…
- …more capital helps the insurance company to look strong, …

- … which encourages brokers and policyholders to place business with the company, …
- … and credit rating agencies to award a favourable rating
- To act on potential opportunities…
- …e.g. capital can be used for ventures such as mergers and acquisitions
- To smooth dividends / bonuses
- For development expenses…
- …for example costs incurred with product development, research advertising, marketing costs
- To cover and/or offer products with guarantees…
- …since contracts with guarantees tend to have more onerous reserving requirements than contracts without guarantees.

QUESTION 6

Examiner's comments:

Overall, the question was well-answered, indicating that candidates had a good grasp of the bookwork and a student could score most of the marks from the bookwork alone. In order to score well, however, some application to the scenario was required and many failed to do this.

Advantages

- A pension fund needs to be able to value its assets on a regular basis (even daily for a DC fund)…
- …and a (listed) REIT is likely to have daily valuations…
- …whereas a direct holding in a property will only be valued infrequently.
- The cost of valuing a direct investment in property is also higher.
- Useful for obtaining specialist expertise.
- This is a specialist sector and trustees are unlikely to have time and experience required to run a property portfolio.
- They are an easy way of obtaining diversification.
- A shopping centre is a sizeable investment, and the fund would want to diversify to reduce risk…
- …which would be difficult for even large funds.
- Some costs of direct investment management are avoided
- Managing a shopping centre is very complex…
- …and external companies would need to be employed for rent collection, maintenance, security etc.
- Holdings are divisible – a part-holding can be sold.
- If the fund held, for example just one shopping centre it would not be able to realise part of its holding if needed.
- There may be marketability advantages,…
- …since, aside from the poor divisibility, it would probably take a long time to conclude a deal where an entire shopping centre is sold.
- Can be used to track the returns on a specific index (index tracker)
- The fund may just want exposure to property as a sector and this can be achieved by simply investing in an index fund
- In particular the ALM would have modelled the property sector using such index returns, which may be very different to a commercial property portfolio.
- Investing in a REIT provides a strong layer of regulatory protection and governance…
- …which is appropriate where assets are managed by fiduciaries such as a pension fund

Disadvantages

- Loss of control over investments chosen
- Using a REIT will mean a portfolio of underlying properties chosen by the trust…
- …which may or may not include commercial property.
- Extra layer of management charges…
- …since the REIT managers will charge fees for running the fund.
- These fees are more than likely to be economies of scale…
- …so these fees would be offset against the cost of the fund trying to manage its own property portfolio
- Some taxes may not be able to be reclaimed…,
- …for example a pension fund is likely to be tax exempt on rental income…
- …yet the rent earned may be taxed within the REIT.
- The income from a REIT may be diluted by the range of properties and fees whereas a higher running yield may be obtained from direct investment,…
- …which would be useful for a pension fund with pensioner liabilities

QUESTION 7

Examiner's comments:

Part (i) was mostly bookwork, but many students did not generate enough points for good marks or were vague in their comments. In part (ii) the majority of candidates did not write enough for the number of marks or would elaborate at length on a single idea instead of considering various components of the likely approach. The setting (middle/high income policyholders) clearly implies more upfront underwriting and candidates who went into discussions on claims underwriting did worse. Surprisingly many candidates struggled with part (iii) and either did not generate enough comments or gave ambiguous reasons.

i.

- It can protect a provider from anti-selection.
- Underwriting will enable LifeCo to classify the risks into an adequate number of homogenous groups…
- …which will help to ensure that all risks are rated fairly.
- It will enable a provider to identify risks for which special terms need to be quoted.
- For these substandard risks, the underwriting process will identify the most suitable approach and level for the special terms to be offered
- It will help in ensuring that claim experience does not depart too far from that assumed in the pricing of the contracts being sold.
- For larger proposals the financial underwriting procedures will help to reduce the risk from over-insurance…
- …which would be particularly important given the target market where we LifeCo can expect to encounter proposals with very high sums insured.

ii.

- There will be an application/proposal form, with questions on the medical history of the applicant.
- Depending on some of the responses on the proposal form…
- …additional reports may be requested from a medical practitioner…

- …or additional medical tests may be requested.
- Certain additional information may only be required for certain combinations of ages and sums insured…
- …with higher sums insured (and/or older applicants) likely requiring more comprehensive information to underwrite on.
- The evidence obtained will be interpreted by specialist underwriters.
- The outcome of an application is either to be accepted at standard rates.
- …or accepted with special terms…
- …or declined cover.
- Special terms may include an addition to standard premium…
- …or reduction in cover offered…
- …or exclusions clauses added that will exclude benefit payments as a result of certain claim causes.
- There will be financial underwriting to ensure the amounts of cover requested are in line with the applicant's financial situation…
- …which may include comparing required sum insured with income or financial position (e.g. net worth, assets, liabilities etc.)
- There may also be lifestyle underwriting to identify any high-risk occupations…
- …as well as dangerous past time activities.

iii.

- Actual claim experience suggested that less underwriting would not result in significantly worse risks being taken on.
- It may be that there is currently a margin between actual and expected mortality experience…
- …suggesting that that the basis can accommodate less stringent underwriting.
- Excessive costs associated with underwriting may have led to the company re-evaluating the benefit vs. cost of some underwriting.
- The competition in the market may have moved to less stringent underwriting…
- …making the LifeCo's current offering less attractive.
- It may have found that using cheaper, less invasive medical tests yield similar insights…
- …or that due to technological/medical improvements in testing the need for more complex/invasive tests was eliminated.
- By asking more and smarter questions upfront, they eliminate the need for certain tests.
- It may be that LifeCo is compensating for the reduced underwriting by actually increasing the base mortality assumption.
- Some underwriting criteria were triggered so infrequently that it could be removed without consequence.
- Medical improvements have led to certain conditions having much better outcomes than in the past.

QUESTION 8

Examiner's comments:

This question was poorly answered by the majority of candidates. It is clear that the candidates had a poor understanding of the manner in which defined benefit funds operate, in particular the levers affecting contribution rates. There was also little appreciation of the regulatory regimes typically applied to retirement funds and a weak understanding of how hybrid funds and investment choice operate in practice. Candidates did not seem to realise that the probability of the guarantee biting in the near term would be extremely low, as up until the change, the funding was targeting an accrual rate 66% higher than the guarantee level.

A surprisingly high number of candidates showed poor planning in answering part (ii), where advantages and disadvantages to both the company and the member were required. Well organised candidates showed each of the 4 sections separately, making it much easier to follow the thought processes used in deriving their answer. Part (iii) required simple application of bookwork, which was often not made.

i.

The contribution rate may have risen due to:

- increasing longevity
- poor investment returns
- default of some investments
- salary growth higher than expected, increasing the liabilities for active members
- expenses higher than expected
- more stringent regulation
- reduction of tax incentives relating to employer contributions or investments for pension schemes
- option costs greater than expected
- changed number of deaths in service
- pension increases greater than expected
- more ill-health retirements than expected
- benefit improvements required by regulation
- increasing maturity of the membership

ii.

Advantages to the company

- Likely to help attract and retain staff …
- … due to the guarantee provided by the underpin …
- … noting that competitor companies do not appear to offer such an underpin.
- A switch from a defined benefit scheme to a pure DC scheme may be felt to be too great a change for existing members.
- The hybrid scheme provides an intermediate step which may be more acceptable, therefore maintaining good industrial relations.
- Offering an underpin may appeal to the paternalistic aims of the company.
- The underpin is set at a low level (only a 1/100th accrual rate) and therefore should not prove too onerous.

Advantages to the members

- The hybrid scheme gives additional security …
- …as there is a minimum benefit
- Members retain all the upside risk in the hybrid scheme…
- …but have limited exposure to downside risk.
- Members who join late are likely to benefit from the underpin.
- Members with significant salary growth in later years are likely to benefit from the underpin.

Disadvantages to the company

- If the underpin bites, then costs of benefit provision will be higher than if a pure DC scheme had been offered.
- The contribution rate for the hybrid scheme will be less stable and predictable than for the DC scheme.
- A sustained period of poor investment performance may lead to the underpin biting for many members …
- … it is likely that it would bite for all members with similar characteristics (e.g. retiring with the same years in service)…
- ... at a significant cost to Major Motors.
- This may arise at a time that the company's business is also performing poorly …
- …for example, a recession leading to a fall in the stock market and lower demand for new cars.
- Expenses will be higher under the hybrid scheme…
- …due to the cost of testing whether the underpin bites …
- …and modelling the likely timing and cost of the underpin.
- The hybrid scheme may need to meet the regulation that applies to both DC and DB schemes.
- The scheme will be more difficult to explain to members ...
- … and there is a chance that the benefits are not appreciated.

Disadvantages to the members

- The operation of the hybrid scheme may be difficult to understand.
- The underpin is set at a low level, such that it may not provide adequate protection.

iii.

- The underpin may be funded in advance…:
- … by regular contributions…
- … gradually building up a fund to meet the cost if the underpin bites, or …
- Potentially by a lump sum payment when the member joins the scheme …
- … which may cause liquidity issues.
- Funding in advance represents an opportunity cost for the company.
- The underpin may be unfunded...
- … on a pay-as-you-go basis …
- …. with Major Motors providing the money to meet the underpin only when the underpin bites.
- This may cause liquidity problems for the company …
- … and does not give security for members.
- The company may have no choice in the financing method as it may be dictated by regulation.
- Shareholders in the company might also demand a particular financing method

iv.

- Members have all the upside …
- …and limited downside risk in the scheme…
- …, so they may choose risk-seeking funds to try to maximise returns.
- If these funds perform poorly then the underpin may bite
- The company may choose to purchase derivatives to hedge such risks ...
- ... but this will have a cost.
- The wide range of funds might be off-putting to some members …
- …noting that the company will have a wide range of workers, …
- …some of whom will have limited investment knowledge.
- Such members may choose the very low risk funds …
- … e.g., cash funds …
- … but such funds are likely to achieve low returns …
- … increasing the possibility that the underpin will bite.
- It will be important to offer a default fund for members …
- … who do not feel able to make a choice.
- The administration costs associated with offering many funds will be high…
- …particularly if members are allowed to switch funds frequently.
- It will be important to clearly communicate the characteristics of each investment fund.