Actuarial Society of South Africa

May 2021

Subject A311 — Actuarial Risk Management

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

<u>Examiner's comments:</u>

This question was generally well answered. Those candidates who scored poorly listed the financial statements issued by companies which was specifically excluded in the question.

Chairperson and CEO's statements

- Might give details of successes of the year.
- Performance against key objectives will be reported
- Normally refer to changes at board and senior management level…
- …and give an idea of whether the company is flourishing or not.

Investment report

- Gives a summary of investment strategy and/or performance.

Strategic report

- Refers to the company's long-term and short-term objectives.
- Reports how objectives have been met.
- Might give performance against key indicators.

Risk report

- Explains the company's attitude to risk
- Outlines key risks faced and how these are managed/mitigated.

Remuneration report

- Records the pay for executive and non-executive directors
- Shows attendance at board meetings and turnover of directors…
- …both of which give an idea of the state of the company.

Corporate governance report

- Describes how the company is organised in terms of board and board committees
- May include statements of how the board assures itself of independence.

QUESTION 2

<u>Examiner's comments:</u>

Overall, candidates performed satisfactorily for this bookwork-based question. Several candidates explained certain point(s) in unnecessary detail, which was not required. Credit was awarded for points that referred to the risk register being used for monitoring purposes, or as part of the risk control cycle. Credit was awarded for points that referred to the risk register being used to identify correlation among the various risks which could then be allowed for appropriately in risk mitigation and control strategies. Several candidates provided detail on the risk identification process involving performing a preliminary analysis, brain-storming sessions, involving experts etc, which was not required for this question, but some credit was given in lieu of the concept of risk identification.

- A risk portfolio or risk register is a document that contains all the material risks a business/individual is exposed to…
- …as well as some categorisation of the various risks.
- Against each risk would be a quantification of the impact…

- …as well as probability of it occurring.
- The product of impact and probability gives some measure of the relevant importance of each risk.

- The risk portfolio should then be extended to indicate how each risk was dealt with:
  - Avoided
  - Retained (and how much capital is needed to support it)
  - Diversified (and an assessment of the remaining combination of risks)
  - Mitigated, including any remaining risk,
  - …and whether this was internally or by transfer to another party.

- For retained risks, the portfolio would also contain details of:
  - Control measures
  - Reassessment of the impact and probability after control measures
  - The risk owner
  - Board committee/senior manager with oversight of this risk.
  - Identification of risk concentrations.

QUESTION 3

<u>Examiner's comments:</u>

Overall, most students were able to score well on this question. It was largely a bookwork question, which distinguished those who had prepared well. Part (i) was reasonably answered by students with many able to identify suitable product, although some did venture more into the realm of traditional life insurance than healthcare related products. Part (ii) was well answered by most students. Those who did not perform well were unable to generate enough distinct points, and instead just repeated the same ideas.

(i)

Private medical insurance
- This cover aims to indemnify the policyholder from the cost of medical treatment.
- The treatment is usually provided by a private service provider.
- The extent to which indemnity is provided is usually governed by a set of scheme rules.

Critical illness cover
- Also known as dread disease, trauma, serious illness cover
- Benefit is typically a lump sum…
- …payable on the diagnosis of an illness…
- …or on the occurrence of a defined event…
- …as defined/included in the contract wording
- The lump sum is not necessarily related to the financial consequences of the event occurring.

Long term care
- These are amounts payable in the event of an individual requiring ongoing nursing or personal care.
- It can be pre-funded or an immediate needs policy.
- ADLs (activity of daily living) usually used to define claims.

Cash benefits
- Provides a cash pay-out on the occurrence of a defined event.
- Can take the form of major medical expenses…

- …Hospital cash plans…
- …medical shortfall (gap) cover…
- …or personal accident cover.

(ii)

- To meet benefits before sufficient premiums/contributions are received
- To meet development expenses
- To hold as a cushion against unexpected events
- To meet statutory/solvency requirements
- To be able to invest more freely (mismatch)
- To sell products with guarantees
- To demonstrate financial strength to attract business
- To smooth reported profits
- To achieve strategic aims

QUESTION 4

<u>Examiner's comments:</u>

Question was reasonably well-answered overall. Candidates tended to score better in part (i). Weaker candidates tended to give related as opposed to distinct risks, and to not state which general insurance products can be used. Some candidates recommended the farmer purchase derivatives or that the insurance company focuses on educating the farmers to mitigate risk, which was not awarded credit. Weaker candidates focused too narrowly on one category of risk/insurance products, e.g. various types of liability risks/cover options, missing out on other key risks, e.g. property, vehicles/equipment and contents loss/damage and insurance coverage for these. Many candidates struggled with part (ii) where some practical application was required. There were many points to be made, but it was necessary for candidates to link these to product design/sales. Many went into detail about the aims and costs of regulations and the regulation of investments which were not linked back to product design and sales processes.

(i)

- Risk of damaging/losing a vehicle/tractor/trailer in an accident, fire or due to theft.
- **Vehicle insurance** can indemnify the farmer against such a peril.

- Risk of fire/flood/storm damage to farmer and/or workers' residences
- **Residential buildings insurance** will cover the cost of repairs or replacement in the event of fire/flood damaging/destroying the building.

- Risk of theft of contents of warehouses/workshops/sheds.
- **Movable contents insurance** will provide cover in the event of goods being stolen.

- Risk of an employee suffering death or injury at work and the famer is held legally liable.
- **Employers liability policy** can provide cover for legal costs and any compensation due to the injured worker or their family.

- Risk of the business not being able to generate an income in the event a fire, flood etc. damaging property or equipment.
- A **business interruption insurance policy** can make payment in the event of the business being interrupted due to an insured peril

(ii)

- The insurer may need to provide detailed information about its products in an understandable form to the regulator upfront.
- Brokers may need to be approved by the regulator…
- …e.g. passing certain fit and proper tests.
- At sales stage, the broker may need to provide certain disclosures to the client…
- …as well as abide by standards for giving advice…
- …that clearly takes into account each prospective policyholder's circumstances and needs.
- Regulator may require certain compulsory covers…
- …e.g. compulsory motor third party insurance on vehicles.
- There might be a cooling-off period…
- …allowing a new client to cancel his product with no penalty.
- There may be treating customer fairly principles to adhere to in the market, which might have an impact on:
    - The contract wording to make sure it is clear and understandable…
    - …and not having contract terms that are unfair.
    - Processes involved to cancel/amend the policy or switch providers

- The regulator may have a standardised policy design, with insurers only competing on price.

QUESTION 5

Examiner's comments:

Candidates did struggle somewhat with this question as it required a lot of application around the canons of lending and was not tightly linked to a piece of bookwork. Especially part (i) required candidates to generate a lot of comments across a wide variety of themes. Many candidates would go into a lot of detail on one or two parts of the potential risk, missing out on other obvious content to include in the report. Part 2 saw most candidates identifying that there might be other factors at play, but few could elaborate sufficiently for the marks available.

(i)

- Regulatory requirements around knowing the customer (e.g. FICA etc.)
- Historic financial performance/profitability of TyreCo…
- …including key financial ratios.
- Current balance sheet position…
- …including size of assets relative to liabilities…
- …as well as types of assets the company has.
- Makeup of shareholders and their potential ability to also provide financing
- Quality/experience/credentials of management
- Credit rating, if available
- Existing credit facilities with other banks and/or other debt
- The nature of the client's business, including:
  - Products that they offer
  - Target market
  - Major competitors
  - Prospects/challenges in this industry
  - Historical performance of industry as a whole
- Detailed description of the proposed new plant…
- …along with a high-level view of potential risks.
- The terms and structure of the loan, including considerations such as:
  - Potential size of facility required – compared to size of company?
  - What will be provided as security, if any?
  - Will the loan only be repaid after the completion of the new plant?
  - Will financing be provided as one lump sum…
  - …or will it be provided as certain project milestones are reached?
  - Whether TyreCo shareholders are also providing part of the construction costs,
  - Expected term of the financing.
  - Any options provided (e.g. early repayment etc.)

(ii)

- It is true of course that BankCo might know TyreCo's business better than ACME at present…
- …and that ACME should be careful when considering this proposition.
- However, there may be several reasons why TyreCo is approaching ACME, which might have nothing to do with underlying trouble at TyreCo. These include:
  - TyreCo management may want to diversify their sources of funding…
  - …and/or use different banks for say transactional banking vs. lending.
  - TyreCo management may feel obliged to take more than one financing option to their shareholders for approval.
  - ACME might be specialists in this kind of funding and hence the natural first choice.

- BankCo might have extended terms that were not favourable enough for TyreCo and now they are seeking alternatives.
- Service levels of BankCo may not have been living up to TyreCo's expectation.
- BankCo may feel that they have enough credit exposure already to TyreCo and wish not to extend further credit.
- ACME may have already tried to do business with TyreCo in the past.

QUESTION 6

<u>Examiner's comments:</u>

Many of the answers on part (i) were incomplete, with many candidates failing to explain the concept fully. Many students wrote about mortality differences due to age at taking out policy (i.e. younger lives have better experience than older lives) and that this converges at older ages. This is not the initial selection being asked for. Temporary initial selection occurs at older ages as well if the life is recently underwritten. Many students wrote about policyholders actively changing their behaviour before undergoing underwriting, which is more related to moral hazard. Part (ii) was reasonably well answered with many candidates identifying the key points. Part (iii) required a range of simple ideas and candidates which a surprising number of candidates failed to do well on.

(i)

- It is "initial", since underwriting happens at the start of the policy…
- …and hence the cohort of lives is defined upfront.
- It is "selection" because we expect that a life underwritten at application of a life insurance contract to have better mortality experience on average…
- …than a life that did not undergo underwriting.
- This is because lives that do not meet underwriting requirements will not be issued policies…
- …or will be issued policies on special terms, exclusions or with loaded rates/premiums.
- It is "temporary" since the selection effect of underwriting is expected to wear off over time.
- Stated differently, the mortality of a group underwritten lives might be better in the first few years…
- …but over time the difference in mortality will become smaller and smaller.

(ii)

Occupation
- Occupation determines a person's environment for 40 or more hours a week.
- The environment may give rise to exposure to harmful substances, chemical etc….
- …or involve more travelling that increases risk of accidents
- Occupations that involve manual labour often give rise to higher risks of accidents…
- …than say occupations that are less labour intensive or more desk bound.
- In some cases, one can also argue that stress levels associated with some occupations are higher than others…
- …which might give rise to stress related illnesses down the line.

Education
- Education influences the awareness of components of a healthy lifestyle…
- …which will reduce mortality rates…
- ..or reduce likelihood of getting certain illnesses.

The effect can be apparent in aspects such as:
- Increased income
- Choice of a better diet

- Regular exercise
- Personal health care
- Moderation in alcohol consumption
- Awareness of the dangers of drug abuse.
- Awareness of a safe sexual lifestyle

- Education and/or occupation can also be seen as a proxy for income/wealth…
- …and with more income/wealth comes better access to healthcare…
- …which may lead to earlier diagnoses of serious illness and/or better treatments/outcomes.

(iii)

Medical evidence
- Proposal form…
- …along with any disclosed information on the policyholders medical history.
- Reports from applicant's doctor
- Results from standard medical examination done by the life company
- Laboratory tests
- Specialist tests done on the applicant

Lifestyle considerations
- Applicant's occupation
- Applicant's education
- Leisure pursuits, hobbies etc.
- Normal country of residence.

Financial information
- Current income/payslip
- Tax return

QUESTION 7

Examiner's comments:

A longer, more difficult question where the majority of candidates did not generate enough points for the marks required. Quite a lot of info was given in the question which should have been used to generate new ideas but were missed. For example, they did not extend their discussion of the US allocation to the features of liquidity and security and only considered currency mismatch. Similarly, that the company is large and well established and therefore has fairly predictable liabilities could have been incorporated into the comments. Many did not consider the solvency position of the company for the most part.

Liabilities

- The liabilities are mostly short term with the exception of the liability cover
- The liabilities are real (linked to inflation)
- …but their short-term nature means that this is not usually realized
- The liabilities are currently in ZAR but will extend to other (African?) currencies should the expansion succeed
- The frequency and size of liabilities are quite variable,
- …however the size and maturity of the company may suggest the liability profile is more predictable
- Due to the nature of the liabilities described above there is a high need for liquidity.
- Need to decide to what extent they can rely on future premiums for this liquidity…
- … especially considering the near-term costs of expanding the business and new business strain

Medium dated corporate bonds with low credit rating

- This introduces significant credit risk since the bonds have a high risk of default
- The term of the bonds is medium dated which is not a good match for the liabilities (aside from the longer-term liabilities)
- Corporate bonds will not be as liquid as government bonds…
- …and may be hard to realise for value should an unexpected claims event arise (for example the pandemic has caused significant business interruption claims)
- These bonds are expected to provide a higher return than government bond due to their
    - Longer term
    - Poor liquidity
    - Higher credit risk
- This would potentially enhance profits
- The bonds are a currency match for the local book of business
- Bond values are usually quite stable (depending on term) which is good for demonstrating solvency
    - However corporate bonds may have more volatile values as credit conditions change

US money market instruments such as treasury bills

- US treasury bills are highly secure as they are issued by a developing country government
- They are highly liquid which is suitable for the company
- They are short dated (one year or less) which is a good match in terms of term of the liabilities
- Most of the existing liabilities are in ZAR, yet the money market instruments are in USD. This represents a currency mismatch
- This is a significant risk as currencies are highly volatile (especially the ZAR vs USD)
- While some offshore exposure is appropriate for the new liabilities to be written in African countries, the USD currency may again represent a mismatch…
- …unless the African country liabilities are pegged to the USD.
- Interest rates are very low in the US compared to RSA (so returns should be lower)
- But higher return could be earned if CoverU believes that the ZAR is expected to weaken against the dollar – this is a highly speculative strategy however.
- Currency risk could be hedged using derivatives.

Other considerations

- The proposed allocation to the new investment classes is quite large and represent a significant departure from a more matched strategy.
- This introduces significant investment risk to the company against which any potential rewards from higher returns should be assessed.
- The solvency level of CoverU will be important when considering the strategy. If CoverU is highly solvent (has large surplus assets) then a less closely matched strategy including some of the asset classes listed above can be considered
- The risk appetite of the board as well as the shareholder should be considered when adopting a riskier investment strategy such as this.
- The proposed strategy will need to be assessed against any regulatory limits to investment classes…
- … as well as the extent to which certain assets can be used to demonstrate solvency
- There may be increased costs arising from the proposed strategy as expertise on these asset classes may not be available at CoverU.
- Transaction costs for example for overseas assets are also higher.

QUESTION 8

Examiner's comments:

Candidates did not read the question for part (i) and covered the issues of where risk is borne for the two types of funds rather than benefit and contribution features. Discussion of benefits was usually limited to retirement benefits, and contributions from employer vs member perspective for both types of funds were poorly understood.

For part (ii) the discussion of stakeholders was usually limited to the members and sponsor – other significant parties not being considered for extra marks. Many also did not read the question carefully, namely that pensioners did not transfer out.

For part (iii) candidates in general were not able to clearly distinguish between the 3 strategies and this carried over to part (iv) where the performance was also quite poor. The practical issues associated with the change were, for the most part, not considered.

(i)

- A DB scheme offers a fixed benefit at retirement which is related to final salary and years of employment
- A DC scheme accumulates an investment portfolio on behalf of a member…
- …and the value of this portfolio is then used at retirement to secure an income
- The value of the retirement benefit and income in retirement is therefore far more predictable for a DB fund
- Both funds will offer some form of cover for death-in-service and disability benefits to members and the dependents of employees who pass away before retirement and while working for the company
- This benefit may be insured by the fund in the case of the DB fund, whereas the DC fund will purchase this cover outside of the fund on a group basis
- DC members will receive the accumulated value of their fund account when leaving the employer before retirement.
- In the case of a DB fund the withdrawal benefit may be limited to a return of member contributions (plus some interest)
- Contributions made by members are fixed in the case of both DB and DC funds (although members may have a choice in a DC fund)
- Contributions made by employers are also fixed for a DC fund, but are variable for a DB fund depending on the solvency position of the fund
- The expenses associated with a DB fund are likely to be higher as a valuator needs to be appointed and actuarial valuations regularly undertaken.

(ii)

Active members

- Active members will now assume the investment risk associated with their retirement provision in the new fund
- They will carry a starting fund credit transferred from the old DB fund.
- They will no longer be able to plan based on a predictable income in retirement.
- They will assume the mortality risk for themselves after retirement.
- They will have more flexibility around where their contributions are invested and how their retirement benefits are paid out and invested.
- Their benefit will be more portable.

Pensioners and Deferred members

- These members have accrued benefits which are defined (deferred) or are already receiving a DB pension (pensioners)
- There will therefore be no direct impact on their benefits
- The pensioners may be impacted in terms of future pension increases should the change impact the solvency of the scheme at a later date

Scheme Actuary

- The scheme actuary will still need to assess the solvency of the remaining assets and liabilities on respect of the pensioners and deferred members.
- She will no longer be required to value the benefits of active members as liabilities are set equal to assets.

Employer

- The employer will now have a fixed contribution rate which it pays for the active members in the new fund
- The employer will no longer assume the investment risk associated with providing the benefits
- The employer must still ensure that the fund is managed appropriately
- The employer still carries a liability in respect of the pensioners in the old fund

Fund management/Board of trustees (both old and new funds)

- The fund management and board of trustees must ensure that all changes are clearly communicated and that decisions are taken in the best interest of members
- They must continue to manage the old fund assets and liabilities on an ongoing basis until all pensioner liabilities are exhausted (or bought out).

Regulator

- will need to ensure that member and pensioners are treated fairly…
- …and that the transfer to the new scheme is in line with regulation.

(iii)

- The actuary would produce a set of expected liability cashflows by projecting the expected pension payments into the future using mortality assumptions.
- The actuary could produce both nominal cashflows (using an inflation assumption)
- Or real cashflows
- The value of the liability could then be calculated by discounting these cashflows at nominal or real yields respectively

Pure matching

- Under this strategy a flow of income and maturity proceeds could be constructed using a portfolio of bonds and other fixed income assets (money market instruments)

- These income and maturity proceeds would coincide perfectly with the expected liability cashflows
- One could use nominal bonds to construct a profile which matches nominal liability cashflows generated by the actuary
- Or inflation-linked bonds to match the real cashflows
- In the former case the fund would only be able to afford to award increases to pensions in line with the actuary's assumptions
- In the latter case CPI increases could be awarded every year, but no higher increase than inflation could be afforded.

Liability hedging
- Liability hedging involves simply choosing assets which behave in the same way as the liabilities.
- These liabilities are real (pensioners expectations is for increases at least as high as CPI)
- And known in terms of timing and amount
- Hence a liability hedging strategy would likely involve investing in a portfolio of inflation linked bonds of different maturities
- In this way the assets and liabilities should be impacted in the same way (but not to the same degree) by movements in interest rates and inflation

Immunisation
- This involves investing in a portfolio of assets in such a way that the PV of the assets proceeds and the PV of the liabilities are immune to small changes in the interest rate
- This is normally used where pure matching is not possible
- It involves setting up a portfolio of bonds of different maturities
- …such that the PV of the liability outgo, calculated at the discounted value of the actuary's liability projection, and the PV of the asset proceeds (calculated by discounting the coupons and maturity amounts) from the constructed portfolio of bonds are equal
- The discounted mean term of the asset proceeds must equal the DMT of the liability outgo
- The convexity of the asset proceeds should be greater than the convexity of the liability outgo
- Ideally one would use inflation-linked bonds, and calculate the discounted value of the real liabilities using a real yield curve.

(iv)

- These strategies could be quite expensive in terms of direct management costs and restructuring costs
- The fund may not be able to afford the cost of such a strategy – especially for a pure matched strategy
- The matching strategy will need to be monitored and constantly rebalanced
- The strategies all involve switching from a multi-asset class strategy to a fixed income type strategy which is expected to earn lower returns – this may not align with pensioners' expectations for future increases.
    - The fund has a large surplus which can act as a buffer against asset volatility and it may be preferable to adopt an unmatched strategy in order to earn higher returns and afford bigger increases
- There may not be available assets to implement such a strategy
    - For example, bonds of a long enough term
    - Or swap counterparties willing to implement a cashflow matching strategy (at a reasonable cost)
- It is very important to get the timing of the strategy switch right – both in terms of realizing equities and other assets and purchasing bonds – particularly if the amounts to be traded are large
    - derivatives could be used to reduce these risks
- Certain strategies such as approximate matching and liability hedging do not provide perfect hedge and will leave residual risk on the table
- The theory of immunization relies on certain assumptions such as small interest rate changes and a flat yield curve with the same changes at all terms. These are unrealistic in practice.
- The estimates of the expected liability cashflows are just that and actual experience may turn out to be quite different (due to mortality for example)
- None of these strategies provide a hedge against mortality risk