Actuarial Society of South Africa

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Subject A301 — 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

Nature, term, currency and uncertainty of their liabilities and assets
Cash flow requirements
Variability of market values
Return from different asset classes (net of expenses & tax)
Level of free assets
Risk aversion and dislike of volatility
Diversification
Cost of investment especially when investing small amounts

QUESTION 2

(i)

Defined benefit

A defined benefit scheme is a scheme where the scheme rules define the benefits independently of the contributions payable and benefits are not directly related to the investments of the scheme

Defined contribution

A defined contribution scheme is a scheme providing benefits where the amount of an individual member's benefits depends on the contributions paid into the scheme in respect of that member, increased by the investment return earned on those contributions

(ii)

Members/Employees

In a DC scheme, the members will take on both the investment and longevity risk. Expense risk may be present.

Investment risk: if the fund's investment performance is poor, then members will have to live with the shortfall.

Longevity risk: generally the member takes on the risk of outliving his/her retirement savings . If an annuity is purchased at retirement, then this risk is transferred to the annuity provider, otherwise it remains the risk of the retiree.

Expense risk: the presence of expense risk depends on whether the expenses are paid for by the employer or not.

Employer/Sponsor

Neither longevity nor investment risk is carried by the employer. Therefore, the main (potential) risk is expense risk if this is paid for by the employer. If expenses are higher than expected (or budgeted for), then the employer will have to stand in for this.

QUESTION 3

Examiner's comments:
This was a theory question that was reasonably well handled by most candidates. However, a lot of candidates struggled to give appropriate examples of situations in which each type of advice might be given. A handful of candidates:

- *Failed to appreciate that giving an opinion constitutes giving indicative advice i.e. assumed the two were different types of advice*
- *Indicated areas in which actuaries practice e.g. investments, as types of advice*

- **Indicative advice**
  - which is giving an opinion without fully investigating the issue.
- **Example:** responding to an oral question where your opinion is asked in a meeting

- **Factual advice**
  - which is based on researching facts (or because you know the answer due to prior research or learning).
- **Example:** a client asks you to summarise the capital requirements of the local life insurance market

- **Recommendations**
  - research and modelling is performed
  - forecasts made
  - alternatives evaluated and recommendations made.
- **Example:** Performing a rating review for a motor insurance company

Other examples are also acceptable so long as they clearly demonstrate the type of advice.

QUESTION 4

Examiner's comments:
The students did not do well in this standard risk application question. Students that did not do well concentrated on investment risks only without following an overall risk assessment that covered operational and business related risks. Some people also focused on insignificant risks. In addition some students mentioned a mismatch risk when the question said the head office will be part of the shareholder

not policyholder fund. Students that did well described the risk and then immediately gave how the risk could be mitigated (as laid out below).

Project might not be completed in time

This will result in either a new lease contract, or an increase in rental expense as short-term contracts will be required.

Possible mitigation: A project timeline should be established to determine the likelihood of this outcome. Consider to arrange in advance with owner of current property to extend the lease beyond 18 months. Introduce contractual penalties if service providers do not deliver on time.

Expense overrun

If expenses are not properly managed, then it might cause an overrun.

Possible mitigation: Risk can be transferred by making use of outsourced project manager/sub-contractor with fixed expense agreement.

Fraudulent activities

A large project like this can potentially result in fraudulent activity – e.g. tender processes allocation.

Possible mitigation: Risk can again be transferred to outsourced manager, or can be transferred via insurance.

Natural hazards can affect delivery of the project

Severe natural hazards can potentially impact both the costs and timelines of the project.

Possible mitigation: Sufficient timelines (margin) can be built in for this, or risk can be transferred via insurance.

Financial risk for shareholders

Since this will property will become part of shareholders' portfolio, the return achieved on the property will direct impact shareholders return. Therefore, this not only introduces a potential opportunity cost (is this the best deployment of capital?), but worse than expected return will also negatively impact shareholder returns.

Possible mitigation: The risk should be reduced by ensuring the decision is well informed. Proper research regarding location, quality of building and design, etc. should be conducted to minimise this risk.

Logistical risks – business continuity

The moving of all staff from the old building to the new building also introduces risk. If not properly planned and executed, business continuity might be at risk.

Possible mitigation: This risk will probably be accepted and needs to be well managed and monitored.

[This is not a complete set of possible risks. The examiner was looking for any valid, well-motivated major risk.]

QUESTION 5

Examiner's comments:

i. *This question was straight bookwork and should have been easy marks. Students did not provide enough detail to get full marks, however it was good to see that majority of students did know what Fidelity guarantee insurance is.*
ii. *Again this question was bookwork with most students not providing enough points to get full marks. Students need to ensure that they consider how many marks the question is for and answer accordingly.*
iii. *This was not answered well. Most students did not think carefully about what rating factors could be used. This was disappointing.*

(i)

- Fidelity guarantee is a type of general (non-life / short term) insurance contract…
- …that covers the insured against financial losses caused by dishonest actions by its employees
- …including fraud or embezzlement.
- This will include loss of money or goods owned by the insured or for which the insured is responsible…
- … as well as reasonable fees incurred in establishing the size of the loss (e.g. auditors)

(ii)

- A factor used to determine the premium rate for a policy...
- …which is measurable in an objective way…
- …and related to the likelihood and/or severity (or expected risk cost) of the risk.
- It must therefore be a risk factor as well, or a proxy for one or more risk factors.
- It should be relatively easy to measure/obtain…
- …and not be open to easy manipulation…
- …or used by the policyholder to anti-select against the insurer

(iii)

Turnover of the company
- Possible indication of the likely exposure and how much money goes around

Number of employees
- Directly relates to the possibility that one or more of them may become involved in fraudulent activity

Average amount of cash on hand at any time
- More cash equates to more exposure for theft and possibly less (or more?) controls in place.

Type of industry
Some industries, where there are large quantities of very portable, easily stolen valuable items involved (e.g. a cellphone shop), might be more expensive to insure than another industry where items are not that easy to steal

Amount of cover required
- Obviously directly related to the insurance companies exposure and as such will be fundamental the price quoted.

Duration of the cover and whether multiple events are covered
- Is the cover for specific periods of the year/month/week only
- …and can the policyholder claim more than once per period?

Past claims experience

QUESTION 6

Examiner's comments:

This question was generally poorly handled by the students. The essence of the question was for students to recognise that losses arise from the formula

$$claims + expenses - premiums - investment\ income$$

and then to identify the probable explanations for adverse variances in each element, in the circumstances described in the paper.

Most students adopted a completely haphazard approach to this problem, and wrote down possible explanations without giving any thought to their validity to disability income insurance. Many students for example, suggested that surrenders and new business strain could be the problem, which would be valid for an endowment product, but is hardly relevant in disability income insurance.

Many students suggested that the losses could relate to a catastrophe event, but most failed to appreciate that the only catastrophe that significantly impacts disability income cover is a pandemic.

Many showed no understanding of how disability income is usually priced (inception rate multiplied by a disabled annuity). Most of the answers spent a lot of time suggesting that the problem lay squarely at the foot of underwriting and proposed a raft of recommendations that could already be expected to be in place.

(i)

The product can only be making losses if the claims + expenses > premiums + investment income. The reasons this might occur is therefore:

Actual claims > expected claims

- your pricing assumption might have been too low i.e. you miscalculated expected claims
- there might have been a once-off effect that caused claims to spike in last 12 months eg. pandemic
- there could be a systemic effect in that general claims levels have risen due to the economy being in poor shape
  or this could be framed as (only award marks for one approach not both)
- problem with incidence of claims being higher than priced eg. due to a pandemic or some other cause
- problem of termination rates being lower than expected due to economy being in poor shape and therefore people not keen to return to work or unable to find an alternative job
- or it could be both issues

Actual expenses > expected expenses

- if the allowance you made for expenses in the pricing assumptions is insufficient eg. because inflation is higher than expected
- sales volumes are lower than expected thus not allowing sufficient spreading of the expenses across the policies i.e. higher per policy expenses incurred than allowed for in pricing
- acquisition expenses might be higher than allowed for in the pricing assumptions
- however these are unlikely to cause the product to make substantial losses but might be a contributing factor to the losses

Investment return lower than allowed for in the pricing

- could be due to poor investment decisions made eg investing into higher risk/more volatile assets
- might be due to unrealised losses due to market movements (eg. bond prices have fallen because yields have risen)

Other possible reasons

- Inability to manage claims due to loss of experienced claims staff or not having sufficiently experienced claims staff. This could result in higher incidence than expected and/or lower termination rates than expected.
- The company has decided to aggressively pursue market share at the expense of profitability
- Underwriting was not sufficiently stringent

(ii)

Re-price the product

You could correct the assumptions that might be out of line with experience. You would need to consider if the reason is because it is a once off effect or whether the assumption needs to be adjusted for the long term.

Reduce expenses

If expenses are greater than allowed for in pricing you might need to review whether it is possible to reduce expenses. You could possibly try to reduce acquisition expenses but this could affect the sales volumes and push the per policy expenses up.

Review investments

If the investment return is too low versus pricing assumptions then you might either have to adjust the assumption downward or try to ensure the assets are invested in such a way as to match the pricing assumption.

Review underwriting

Look to improve on initial underwriting or make the underwriting criteria more stringent.

Move stringent claims management

QUESTION 7

Examiner's comments:
i.   *Quiet a straightforward question. However, it seems that most students didn't understand the question. Many students put the answers for part ii in part i. Given that the answer forms the framework for most actuarial work it was answered surprisingly poorly.*
ii.   *In general students failed to put in enough points to generate a high mark. Most students fell well short of the 16 points required. Perhaps time management was a problem with this question. Many students failed to understand the basic approach to this sort of calculation and so failed to put in appropriate data and assumptions.*
iii.   *Generally answered quite well.*

(i)

- It is likely that a **deterministic model**…
- …calculating the **expected future long service cashflows**…
- …and **discounting** them to the present will be built
- It is likely expected that the liability will **be calculated per person** currently employed

(ii)

Details of each individual staff member:
- Date that they joined
- Age and gender
- Current salary
- Contracted retirement age
- This information can easily be obtained from the HR department of BestCo.
- It may be useful to perhaps just compare it to published accounts to make sure the numbers are in line

An assumption of the rate at which employees resign
- One can possibly look at historic staff turnover…

- …and perhaps have different assumptions by age or years of service…
- …since older people or those with more service may be less likely to resign

Assumption of the assumed rate of future salary inflation
- Historic growth in payroll relative to inflation may be used as an approximation
- It may be considered to adjust this assumption based on age and…
- …the type of function the individual performs…
- …as some jobs e.g. accountants may have different salary growth.

One can possibly also allow for mortality
- Although this is unlikely to have a major effect…
- …as these are people pre-retirement and in full employment (actively at work) and so should have reasonably low mortality
- If allowed for, one might consider breaking up the group into homogenous sub-groups
- Leaving it out can possibly be justified as an implicit margin…
- …as allowing for mortality is expected to decrease the liability slightly.

A discount rate
- This is likely to be set equal to a risk free rate, as anything higher is not prudent.
- Since they have never calculated it before…
- …it is unlikely that they have assets specifically backing these payments…
- …so hence it won't make sense to set the rate relative to this.
- One can consider a margin for prudence, by reducing the discount rate.

(iii)

- Don't offer the benefit for new employees
- Remove the benefit altogether
- Change the formula of the benefit, so that it doesn't increase over time
- Make the duration between awards longer

QUESTION 8

Examiner's comments:
Disappointing results overall given such a relatively bookwork/standard question.

The first two parts of the question asked to "List" the answers – many students wrote a lot of detail rather than listing items. This was not marked down but does speak to lack of reading the question properly. It also means time was wasted.

i. This was a bookwork question and many students scored well. Marks were given for valid points made for main uses of data or for where terms were synonymous (Eg. pricing and premium setting).

ii. Surprisingly poorly answered, with many students mistaking the question for asking for sources of data (National Statistics etc). It was evident that poorer attempts did not know what is involved in an

(i)

1. Administration of policies
2. Accounting
3. Statutory returns and reporting
4. Investment management
5. Financial control (eg. Payment of claims)
6. Management information
7. Risk management / Underwriting
8. Setting provisions / Valuation
9. Experience analysis/statistics
10. Premium setting

(ii)

Internal data

- premiums received
- claims details including incurred, notification and payment dates
- in-force policy data (two sets – at start and end of investigation period)
- lapses
- an analysis of trends
- any details of product changes over time

(iii)

1. Reconcile the total number of policies (using previous data and movement data)
2. Reconcile the claim payments and premiums received (against accounting data or previous data and movement data)
3. Checks for an unreasonable or unusual values for example impossible dates of birth or death
4. Check the two sets of policy data (at start and end) against each other to ensure there are no substantial changes to records
5. Consistency between the averages of the data sets for example the average sum assured or average premium received
6. Random spot checks of the data for individual policies for reasonableness
7. Check against another data set eg. compare claim amounts to the accounting data
8. Reconcile against the premium analysis

QUESTION 9

Legislation and regulations

- Any compulsory cover e.g. third party vehicle insurance
- Any restrictions or regulations around the sales process…
- …such as restrictions on certain rating factors
- Expensive / laborious compliance requirements…
- …which may make it difficult to build a sales force.
- What are the requirements for setting up an insurance company.

State benefits

- Government funds available e.g. RAF equivalents

Tax

- How are profits taxed in the country…
- …and what are the implications of repatriating funds if need be.

Capital adequacy and solvency

- What are the requirements for capitalising a new insurance company
- What are the solvency requirements and what type of regime is it
- …e.g. risk based or older formula / ratio types requirements

Risk management requirements

- How should balance sheet risk be measured / monitored and reported on
- …and does this differ significantly from what we are currently doing…
- …which may necessitate expensive process alterations

Corporate governance

- What is the expectation in terms of how the company's management structure should look
- …and are there any specific local requirements as to what constitute fit and proper for example…
- …and whether the governance requirements would necessitate either expensive relocations or local hires?
- Would the skills needed be available to hire in the local market?

Corporate structure

- What form will the company take – listed vs. unlisted
- Are there any restrictions on foreign ownership
- What will the implications be of a local partner…
- …and can we perhaps identify any local partners?

Commercial environment

- How has the local market performed historically?
- Where are they in the underwriting cycle…
- …and how long has this cycle lasted?
- How much competition is there likely to be…
- …and what may be needed to differentiate yourself from them
- What is the nature of their overall economic growth and what is the expectation in the medium to long term future.
- Size of the potential market / maturity of market (is it untapped or saturated)
- Geographical spread of the clients / policyholders / risks

Technological landscape

- What is the penetration and usage of internet like in that market
- How do clients currently engage with financial service providers i.e. do clients have preferred distribution or sales channels

QUESTION 10

Examiner's comments:

i.

Most students passed this section but missed some of the easy points which could have given a high score for this bookwork. Specifically, surprisingly few mentioned that the method should be consistent with the valuation of the liabilities. Some struggled to clearly define what market value meant and omitted to state that this required some market mechanism such as an exchange.

ii.

Many students did not consider the context of the question (a life office performing a valuation for sensitivity analyses) when providing their answers and failed (again) to mention consistency with the liability valuation. Students also often did not separate the discussion between government and corporate bonds and did not explain how the liabilities and assets could be valued consistently using the chosen method (ie using the yield curve to value the bonds and to discount the liability cash flows).

Some students just listed all the methods above (part(i)) and did not state which was the MOST appropriate – very few marks were awarded for this approach.

Most neglected to add which methods were NOT appropriate, and why. The marks awarded (7) suggested a more fully developed discussion than was often given.

iii.

This was generally not well answered. Some recognized that the key was the different assumptions and timeframes used to arrive at the different valuations. A common point picked up was the supply and demand distortions that could characterize the market

(i)

(a) Written up (or written down) book value is the historic book value (the price originally paid for the asset), adjusted periodically for movements in value. Main shortcoming(s):
- The value might be subjective
- The book value method does not lend itself to the use of a consistent liability valuation.

(b) The market value is the value determined by some market mechanism. The market value of an asset varies constantly and can only be known with certainty at the date a transaction in the asset takes place. Even in an open market more than one figure may be quoted at any time. Main shortcoming(s):

- Subject to wide fluctuations in the short term. Hence valuation might be too dependent on the date of valuation.
- Difficult to value liabilities in a consistent manner.
- Market value is not always practical for unlisted investments.

(c) In accounting terms, fair value is the amount for which an asset could be exchanged or a liability settled between knowledgeable, willing parties at arm's length. Main shortcoming(s):
- The definition/approach does not specify how such a value is calculated.

- Difficult to value liabilities in a consistent manner

(d) This method involves discounting each expected future cash flow from an investment using an appropriate discount rate. Main shortcoming(s):
- It relies on the assessment of a suitable discount rate. This is straightforward where the assets are, for example, high-quality fixed interest stocks, but less so otherwise.
- It requires information on the cash flows which may not be known or require further assumptions

(ii)

Since the purpose of the valuation is to compare it to the liabilities, it is critical that the valuation process will ensure that both assets and liabilities are valued on a consistent basis. This almost automatically rules out the written up book value and the market value methods.

Bonds

Government bonds (or high-quality bonds) can typically be valued using a discounted cash flow model using a discount rate that reflects the market spot rate yield curve. This will also provide a basis for the discounting of the relevant liability profile.

Corporate bonds will be valued in a similar fashion, although the discount rate will need to be adjusted for the additional risk involved (lower security and lower marketability) .

{Note to marker: If a candidate says market value could be used you can award 1 mark for it as the oversight examiner pointed out that DCF using a market yield is basically the MV. Another mark could be awarded if the candidate points out that MV is often mandated for use for bonds in many markets for statutory valuations.}

Property

Property can be valued using an explicit discounted cash flow approach. The cash flows valued should be net of all outgoings and should make explicit allowances for the expected rate of rental increases.

The discount rate used should depend on the riskiness of the investment and could be based on the yield on a bond of suitable term, plus margins for risk and lack of marketability. Factors that will affect this include the location (poor or not), prospects of rental growth, potential vacancy rates (volatility thereof), quality of buildings, other macro-economic factors that can affect default risk, etc.

Fair Value for valuing any of these assets is not generally appropriate due to its main shortcoming being that the definition/approach does not specify how such a value is calculated.

(iii)

- The discounted cash flow method is mainly driven by assumptions. These could be different to the general market views/sentiment that drives the market value.
- Examples of assumptions:
- A current economic downturn might influence the market participants, and they might therefore discount the level of rental income.
- Similar scenarios could affect the vacancy rates , potential rental increases, etc.
- Since you are the owner (directly or indirectly) of the property investment, you could possibly have access to more information than the wider market.
- There could be a short term supply/demand distortion in the mark