

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.

GENERAL COMMENTS

QUESTION 1

Examiner's comments:

Bookwork question which was answered very poorly by most of the candidates. Some candidates were not able to provide the required and expected return definitions, which shows that they were not prepared. Those who were able to recall the definitions often ended mixing them up e.g. stating the expected return definition for required return and vice versa. Those who managed to correctly recall the definitions, were often not able to comment on each of the components resulting in low scoring for the question.

The **required return** of investors on any asset class can be written as:

Required return = required risk-free real rate of return + expected inflation + risk premium.

Therefore, an investor will expect that the value of their investment does not decrease in real terms, and that they are compensated for the risk taken.

Expected return can be analysed as:

Expected return = initial income yield + expected capital growth.

Therefore, the expected return is what the investor expects to achieve on the asset, given the price paid for the asset, the price for which he/she expects to sell/redeem the asset, and the expected income whilst the asset is held.

QUESTION 2

Examiner's comments:

This question was answered surprisingly poorly – especially considering that the answer came directly from the notes. Many candidates seem confused between asset liability matching techniques and asset liability modelling and calculating the value of liabilities.

Pure matching

The pension fund will want to invest so as to ensure that it can meet the guarantees. This means investing in assets which produce a flow of asset proceeds to match the liability outgo. This will involve taking into account the term of the liability outgo and the probability of the payments being made, so as to indicate the term of the corresponding assets.

Approximate matching

It will probably be impossible in practice to find assets with proceeds that exactly match the expected liability outgo. In particular, the terms of available fixed-interest securities may be much shorter than the corresponding liabilities, particularly when very long term pension liabilities are involved. Approximate matching aims to get a 'best matched' outcome within the constraints of available assets.

Immunisation

This is a technically superior, though more complicated approach to assessing what a best match may be. It typically requires the matching of the duration and volatility of assets and liabilities, and requires the convexity of assets to be greater than the convexity of the liability.

QUESTION 3

Examiner's comments:

This was a bookwork question which was handled well by a majority of the candidates.

1. Perception of risk (frequency/severity)
2. Financial consequences
3. Ability to alter/reduce financial consequences
4. Financial resources available
5. Perceived upside
6. Current exposure to risk
7. Regulation

QUESTION 4

Examiner's comments:

This question was answered reasonably well.

Most candidates appreciated that a member of a defined benefit fund does face risks and what those particular risks are.

Many candidates wasted time by putting in unnecessary information e.g. defining a DB Fund, putting in risks that the employer faces.

- Higher than expected inflation, eroding real value of guaranteed benefits...
- ...especially if they are not linked to some sort of inflation index.
- The fund may experience a shortfall...
- ...with an accompanying reduction in benefits
- The sponsor may default on benefits...
- ...or not pay them on time when expected.

- The employer/sponsor may be taken over / merged with another organisation who wishes to alter the terms of the fund, change the benefits or buy the members out.
- The employer / sponsor may go insolvent
- The current structure may not have been communicated properly and in retirement it may function different to what was expected.
- Fraud or mismanagement at the sponsor, asset manager, administrator may lead to a reduction in benefits.
- Changes in regulation, tax laws etc. may have an impact on the real value of the benefits realised in retirement.
- The friend may be far away from retirement and the employer/sponsor may at some point elect to close the DB fund and only offer DC benefits
- The friend may resign and leave the company before reaching retirement age and then only be eligible for part of the guaranteed benefit
- The benefit may be guaranteed, but will it be enough to meet the needs of your friend at retirement...
- ...for example, if he joined the company late in life, he may only be eligible for a small guaranteed benefit and will have to rely on other savings as well.
- His own financial needs situation in retirement is not guaranteed...
- ...e.g. he may require expensive medical care, not anticipated today.

QUESTION 5

Examiner's comments:

This was mostly a straightforward bookwork question. Most candidates did well with part (i) of the question and received all of the marks. Candidates struggled the most with part (ii) and did not identify the core concerns. There was a clear distinction with part (iii) where some students correctly discussed how the regulator could regulate and others discussed different types of regulation (e.g. self regulation).

i.

1. Correct perceived market inefficiencies and to promote efficient/orderly markets
2. Protect consumers of financial markets
3. Maintain confidence in the financial system
4. Help reduce financial crime

ii.

Two main concerns:

1. Conflict of interest
2. Treating customers fairly

Conflict of interest – the tool might end up recommending that a customer should either buy more insurance or save more and this is clearly to the direct benefit of the insurance company. They therefore

have a vested interest in ensuring the tool does actually recommend someone buys more insurance or saves more and this is a clear conflict of interest.

Treating customers fairly – the insurer must consider whether the advice being given by the tool does in fact consider the interests of the customer. To ensure this the tool will need to give very clear advice and state how that advice is derived.

Secondary issues they might be concerned about:

- How securely the data is stored
- Was the user properly informed and/or fully understood the advice (only award this ✓ if you have not awarded anything under TCF above)

iii.

Prescriptive – with detailed rules setting out what may and may not be done.

Freedom of action – freedom of action but with rules on publicity so that third parties are fully informed about what is being provided.

Outcome-based – the regulator can allow freedom of action but prescribe what outcomes will be tolerated.

QUESTION 6

Examiner's comments:

Overall Q6 was poorly answered by the majority of students. Evidence of time pressure where students clearly misread the question, mistaking advantages for disadvantages and insurer for reinsurer.

Many students gave answers relevant for any level of reinsurance rather than thinking about the specifics of this question – 100% reinsurance and its implications and reasons for doing so.

i.

- *This question required students to think outside of the box and was not the traditional 'reasons to utilize reinsurance'. Overall poorly answered.*
- *Many students treated the question as if it was only pertaining to one insurer, and gave unique examples as such. The question clearly states that many insurers reinsure 100%. The question required students to think about the benefits of reinsuring 100% as opposed to only a portion of the risk*
- *A disappointing number of students merely listed the reasons for reinsurance with no reference to why 100% of the risk would be reinsured. Many of these reasons are not specific to 100% reinsurance. For example, access to reinsurance expertise – it is unlikely reinsurers will require 100% of the risk to be reinsured before offering expertise! This scored no marks.*
- *Reduction in claims volatility was not awarded marks – reinsuring 100% of the risk removes volatility in claims altogether.*

ii.

- *A surprising number of students used the words 'reinsurer' when they meant 'insurer' – evidence of time pressure*
- *Reinsuring 100% does not pass on all profits for the business, only the profits related to the mortality and morbidity risk. The insurers could still make guaranteed profits from margins in the office premium – this was a reason listed in (i). Weaker attempts did not make this distinction.*
- *Stronger students realized that the reinsurer may include an additional loading to the risk premium for the potential increase in risk from moral hazard from the insurer for not taking any portion of the risk. This was awarded marks.*

iii.

- *This was better answered than the other parts of question 6 in general*
- *Marks were awarded for additional premium base over which the reinsurer could spread fixed costs/overheads component*

iv.

- *The question clearly states for the main disadvantage rather than listing many minor disadvantages.*
- *Stronger attempts correctly pointed out the misalignment of interests between insurer and reinsurer – this is a key risk specific to 100% reinsurance levels.*
- *Poor experience in the book is not the main disadvantage facing the reinsurer with 100% reinsurance – this would affect the reinsurer for higher retention levels as well.*

i.

1. Removes volatility in experience altogether
2. Lowers the capital needs for insurer
3. Might not have the experience to price the risks themselves (though unlikely that all insurers would have this problem)
4. Cheap – they can get better terms from reinsurers than what they think they should charge for the risk
5. They make a guaranteed margin without having to take any risk themselves

ii.

1. Lose any interest in the risk and therefore might not spend sufficient time looking at the experience
2. Probably giving away long-term profitability as reinsurer is not likely to take on the risk at unprofitable terms
3. Decrease the flexibility of the insurer as reinsurer might insist on certain practices being followed or audits being done
4. Introduces counterparty risk
5. Increases administration burden
6. Introduces an element of legal / dispute risk
7. Cash flow could be impacted if reinsurers take too long to pay recoveries

- iii.
 - 1. They can write a lot of premium volume which might be attractive to their shareholders
 - 2. They should be able to write the business profitably which should be attractive to their shareholders
 - 3. Insurer becomes more dependent on the reinsurer –will make it harder in the long term for insurer not to reinsure

- iv. The insurer retains no interest in the risk and so there is no alignment of interest between the insurer and reinsurer.

QUESTION 7

Examiner's comments:

The bookwork sections of this question were well handled by candidates who had prepared properly for this exam. These represented 8 straightforward and quick marks out of 18, but still tripped up a large number of poorly prepared candidates.

The questions on risk discount rate and mismatching reserves generally answered moderately well, although some candidates mixed up discount rates on liabilities with risk discount rates on cashflows.

Part iv of the question was very poorly handled. The correct answer required candidates to recommend setting up an extra deficiency reserve on the existing book of disability business, and then to explain how they would go about calculating this reserve. Many candidates wasted time discussing management actions that could be taken to improve the experience which was outside the remit of the question, while some candidates suggested arbitrary contingency reserves or increasing (or even reducing) the risk discount rate, which also scored no marks.

- i.
 - 1. Determine liabilities for published accounts
 - 2. Solvency calculations
 - 3. Management accounts
 - 4. Merger or acquisition
 - 5. Discretionary benefit payments
 - 6. Set future contributions for a benefit scheme
 - 7. Value benefit improvements for a benefit scheme
 - 8. Calculating surrender / discontinuance benefits
 - 9. To set an investment strategy
 - 10. Regulatory purposes

ii.

A risk discount rate is a rate at which future uncertain cashflows might be discounted. It typically arises when carrying out a discounted cashflow assessment of the value of a project or set of cashflows. It

represents the risk-free rate of return that the providers of capital demand plus an amount to allow for the risk that the profits may not emerge as expected.

iii.

If the assets of the insurance company are not matched to its liabilities, it may be unable to meet claims as they fall due in the event of adverse future investment conditions. It may be required to set up a mismatching reserve that it can call upon if experience so requires. If there is a mismatch, the regulator and the company's auditors may also require that the reserve be set up and held.

iv.

You will need to set up a deficiency reserve for all the existing policies.

This reserve will need to be the difference between the actual experience versus what is allowed in the pricing (which is the expected experience).

This will need to be calculated over the entire future lifetime of all existing policyholders and discounted back using an appropriate risk discount rate.

The risk discount rate should reflect the likely investment return that could be earned between the date the reserve is set up and when the reserve is likely to be needed to fund the difference between the actual and expected experience.

You should take the effect of likely lapses into account when doing the calculations as well.

v.

1. To see the differences between actual and expected experience
2. To find the main contributors of any surplus
3. To help in the adjustment of expected experience
4. To determine the financial effect of writing new business
5. As a check on the valuation basis
6. To help with decisions around how to distribute the surplus
7. To help with setting bonuses
8. It might be a statutory requirement
9. As a means of assessing / noticing trends

QUESTION 8

Examiner's comments:

- i. *This question was generally well answered.*
- ii. *This question was generally poorly answered, with a many candidates mixing up the definitions of methods of managing risk.*

i.

Definition

- Risk management can be described as the process of identifying/understanding the risks that an organisation is exposed to.
- ...and then ensuring it is prepared to deal with these or manage them.

Typical five steps in risk management

Risk identification

- Recognition of the risks that can threaten the income (or assets/existence/solvency) of an organisation

Risk measurement

- Assigning or estimating the probability of a risk event happening...
- ...and the likely severity thereof.

Risk control

- This refers to the process of putting in place measures to reduce the probability of an event occurring...
- ...or limiting the severity thereof
- ...or reducing the financial impact of an event occurring.

Risk financing

- Determining the likely cost of a risk (or mitigating/transferring a risk)...
- ...and ensuring that adequate financial resources are available to cover the risk

Risk monitoring

- The regular review/assessment/reporting on of all the risks previously identified...
- ...along with a process to identify new or previously missed risks.

ii.

Business unit level

- Managing risk at the business unit level of the company requires that the company divides its overall risk appetite up among the business units.
- Just as each business unit then has its own management team to run the business, the team also manages the risk within the appetite they have been allocated.

Enterprise level

- The group risk management function is established as a major activity at the enterprise level.
- Models/analysis/results from the risk exposures at the business unit level are then combined into an assessment model at the enterprise level.

Business unit level

Positives

- Relatively easy and cheap to implement
- Should be easy to understand

Negatives

- Makes no allowance for diversification of risks across units
- Unlikely to lead to most efficient use of capital

Enterprise level

Positives

- Explicit allowance for diversification across business units
- Better overall understanding of enterprise's risk position

Negatives

- Expensive / complex to establish
- Sometimes difficult to communicate

QUESTION 9

Examiner's comments:

i.

This question was an application of bookwork. The students who scored better in this question were those who defined each criteria of an insurable risk and then discussed whether the cover satisfied the criteria or not. Majority of students did not provide enough points to do well in this question.

Some students knew the criteria points about what an insurable risk is but did not write out the criteria (i.e. students who wrote "data" were not rewarded marks for stating "data" instead of stating that sufficient data is required to exist in order to estimate the extent of the risk nor providing details of the existing data available and if this met the criteria for an insurable risk.

Students also focused on the drought and did not consider that other perils could be included in the cover.

ii.

This question was answered very poorly. Students did not answer the question of how the government could get involved in providing benefit to the farmers. Many students incorrectly discussed the government getting involved as a regulator or forcing farmers to take out the insurance. This does not show how the government gets involved in providing benefits. Overall students scored very badly in this question. Majority of Students also did not answer the second part of the question of how this will impact the product design.

i.

*We are mainly interested in whether crop insurance type risks meet the **requirements for an insurable risk***

The policyholder must have an interest in the risk being insured, as to distinguish between insurance and wager

- Any event that causes a significant reduction in the yield at the end of the season will lead to farmer suffering a reduced income or none at all.

The risk must be of a financial and reasonable quantifiable nature

- A poor harvest will obviously lead to a reduction in turnover (which is quantifiable)...
- ...with the resultant loss of profits (which is quantifiable)
- One can also consider to insure only the costs of actually preparing the land and sowing (input costs), which should also be quantifiable.

The amount payable by the insurance company in the event of a claim must bear some relationship to the financial loss incurred

- Crop prices should be easily obtainable (co-ops etc.)
- The exposure / insured amounts can be set with reference to what the farm yielded in the past

Individual risk events should be independent of each other

- This is potentially problematic as drought or pest related losses are often widespread in nature and many farmers may incur losses.
- Other perils like hail or fire are perhaps more localised in nature and one may assume a measure of independence between risks

The probability of the event should be relatively small

- In the normal run of business, a farmer likely does not expect a failed harvest every season.
- Care needs to be taken however as the success of each harvest may vary from one year to the next...
- ...so one might want the losses in case of adverse events to first exceed a certain threshold before cover kicks in.

Large numbers should be pooled in order to reduce variance

- Given that the company is large, it is foreseeable that they can potentially sell a lot of these policies and achieve some certainty and / or diversification.

Ultimate limit on the liability undertaken by insured

- The nature of the loss is such that the insured can impose limits such as maximum amount of cover provided

Moral hazards should be eliminated as far as possible

- This is a potential risk, as the farmer may neglect farming in the best possible way if it turns out to possibly be a difficult season.
- Some perils e.g. fire can potentially be staged fraudulently and careful claims underwriting would be required.
- Farmer may want to insure for more than reasonably expect to make at harvest time...
- ...but inspections and underwriting can possibly address this
- Careful requirements around the information requirements for claims can also help to reduce moral hazard.
- Limiting cover only to a % of lost income can also reduce moral hazard.

Sufficient existing data to estimate the extent of the risk

- Weather information should be readily available
- Crop production is often of national importance and statistics on these might be available
- The level of detail required may not always be at the required level...
- ...especially since farms and crops can differ significantly from one area / region to the next.
- Reinsurers with expertise can possibly assist with data for pricing.

ii.

- Government may decide to provide subsidies to the farmers to purchase the insurance product...
- ...or government may commit to providing disaster relief to farmers in the event of a failed harvest.
- This may not necessarily change the product design of the product...
- ...but can possibly give rise to an increased (or decreased) demand for it...
- ...which may impact the loading for fixed expenses etc.
- It may also happen that government will only assist in the case of specific perils...
- ...which means farmers are still exposed to other perils, which can then be explicitly allowed for in the product design.
- Government may become actively involved in marketing and distributing the product...
- ...since they see it as a social good...
- ...which may necessitate revisiting the product in terms of how underwriting may happen, who does it and the cost thereof.

QUESTION 10

Examiner's comments:

This question generally scored quite well, with stronger candidates earning the majority of the marks available. Part i was very well answered with the majority of students considering a range of cashflows. Part ii was also answered well with only a few candidates mentioning investment valuation techniques

instead of project appraisal techniques. Stronger candidates performed well with part iii, with weaker candidates spending more effort on discussing the risks that should be considered instead of the factors that will affect and the process of determining an appropriate risk discount rate level. Some candidates discussed the risk discount rate in the context of valuations of investments or valuation of liabilities, instead of focussing on project appraisal as main theme.

i.

- Initial costs involved during the research & concept development phase
- Initial costs involved to acquire the relevant licenses
- Any capital injections required (regulatory or otherwise)
- Setting up of offices and infrastructure in the neighbouring country
- Attracting relevant and skilled staff
- Development of the product offering
 - IT and system costs
 - Setting up of service infrastructure
 - Training and accreditation of staff – service and sales
 - Marketing and distribution costs (including commission)
- Premium income
- Any reinsurance cash flows
- Benefit payments
- Any tax cash flows
- Ongoing expenses
 - Servicing costs
 - Ongoing IT support
 - Finance and reporting
 - Other operational costs
 - License and other regulatory costs
- Emergence of profits
- Setting up of reserves

ii.

- Net present value
- Internal rate of return
- Payback period
- Discounted payback period

iii.

- Use of nominal vs real discount rate : if cash flows are nominal, then a nominal discount rate should be used.
- Projects with inherently high risks which cannot be sufficiently taken into account by specific risk analysis, should usually be appraised on the basis of a higher discount rate than projects having normal degrees of risk.

- Systematic vs specific risk:
 - Systematic risk should be allowed for by varying the risk discount rate used in the model.
 - Specific risk should be investigated using scenario analysis and stochastic modelling.
- For systematic risks that is deemed 'normal':
 - The starting point is the current cost of raising incremental capital for the company in order to carry out the project.
 - The weighted average cost of capital (WACC) can therefore be considered, taking any tax implications into account.
 - The cost of debt capital should be taken as the cost in real terms of new borrowing by the company.
 - The cost of equity capital is the current expected total real return on index-linked bonds plus a suitable margin to allow for the additional return that equity investors seek to compensate them for the risks they run.
- If the company is considering a project with a degree of systematic risk higher than is usual for its projects, the discount rate used should be greater than that which the company normally employs.
- It is not uncommon for companies to use very high discount or hurdle rates when appraising proposed projects. However, the use of a discount rate that is too high distorts the relative weights placed on the short term and on the longer term, thereby leading to mistaken decisions as it does not generate a uniform contingency margin.
- On the other hand, too much precision in setting the risk discount rate is unnecessary since the results of NPV calculations are not usually very sensitive to small changes of, say, 1% pa in the discount rate.