

Actuarial Society of South Africa

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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:

Even though this was a standard bookwork question many of the students struggled to articulate their answers clearly. In certain instances, students loosely used the word changes without speaking to structure or key factors that describe the make-up liabilities.

In the second part it was clear students had challenges connecting the ACC to the context. It appeared students do not really understand this fundamental actuarial concept enough to apply it to a real-life situation. It was surprising that several students could not follow through on lists that they provided to ensure they meet the standard of a descriptive answer.

For both parts some students tended to state rather than describe through providing explanations and connecting to the context in the question.

i.

- the liability structure may have changed significantly (for example following the writing of a new class of business, a takeover, benefit improvements or legislation).
- the funding or free asset position may have changed significantly (free assets or surplus may have reduced).
- the manager's (or the vehicle's) performance may be significantly out of line with that of other funds.

ii.

- Monitoring of experience is fundamental to effective implementation of the ACC or the risk management control cycle.
- The environment in which a provider operates is constantly changing and monitoring the effect of past actions and related performance can help in revising its strategy for risk management and in reassessing the risks that it faces.
- The actuary will use the results of analysing the experience and the differences of actual vs expected performance to reassess his or her view of the future with regard to the ACC process or the provider.
- This may result in changes to the assumptions or models used for setting the investment strategy, or for the decision around implementing the investment strategy.
- In essence, this is an iterative process. The actuary is trying to estimate how the investments will progress in the future (possibly relative to liabilities), based on what has happened in the past as well as his/her view of the future.
- As time goes by, the actuary will have more information. The assumptions and models resulting from this should get closer to mimicking reality, or can continuously be updated as new information that will affect the future becomes available.

QUESTION 2

Examiner's comments:

This was a bookwork question that most students handled very well. The second part of the question required students to give examples of conflicts of interests and describe ways of handling the conflict. Candidates were not always able to apply their knowledge to this question; the examples were at times not good enough gain full marks.

i.

- Whether, in his or her opinion, proper records have been kept for the purpose of the valuation of the liabilities.
- Whether adequate provision for the liabilities has been made.
- Whether liabilities have been valued in accordance with any legislative rules setting out the method and assumptions for their valuation.
- Whether liabilities have been valued in the context of the assets, which in turn have been valued in accordance with the appropriate rules.
- Whether, in his or her opinion, the premiums / contributions for future years will be sufficient, on reasonable actuarial assumptions, and taking into account the free assets of the provider, to enable it to meet its commitments in respect of the contracts written, or pensions promised.
- A statement of the difference between the value of the provider's assets and its liabilities.
- Whether he or she has complied with professional guidance.

ii.

- Example: An actuary advising an insurance company might provide advice that affects both the insurer (shareholders) as well as the policyholders. Same might apply for benefit schemes where the sponsor and the members might be affected by the advice. Practical examples might include determining pricing of insurance products (balance of profitability versus value for money, or determining of employer contribution levels (affecting sponsor and members).
- In some countries there is legislation or regulation to ensure that providers of financial products consider the interests of their customers.
- Where an actuary has statutory responsibilities, these frequently include the requirement to notify the regulatory authorities if the actuary believes that his client is acting in a way that would prejudice the interests of its customers.
- It is often difficult or impossible to avoid this conflict, and it is therefore important for the actuary to carefully consider the impact thereof.
- Although in the long run interest are generally aligned (it is not in consumers' interests if shareholders don't get an adequate return, nor is it in shareholders' interest if consumers are disadvantaged), the more immediate conflicts needs to be managed – i.e. the impact in short-term on various stakeholders often pull in different directions.
- Since these conflicts are often pulling in different directions, the actuary should ensure that a balance of the stakeholders' needs and impacts should be managed.
- Transparency and clear disclosure of the conflicts to all parties considered and how it is being handled might also be appropriate. The actuary must consult and adhere to any ethical or professional standards that is published and managed by professional bodies.

QUESTION 3

Examiner's comments:

Most candidates included the right types of financial products, but the candidates that performed well with this question also commented on whether it might be difficult to obtain cover as well as the reasons why. Some students included health and general products in their answers, but the question only asked for life insurance and benefit-type products.

Insurance needs

He will need some protection in case he gets injured or disabled, and as a consequence can't earn an income.

- Income protection products will be able to provide him and/or his dependents with an income if some insured event/risk occurs.
- Lump sum disability for a career stopping injury or something that totally and permanently disables him.
- This cover might be difficult to obtain given the high risk nature of his job (high level of probability of the risk materialising). The premiums will either be very high, or he might be declined cover, or some form of exclusion might apply.

He will need some protection if he is diagnosed with a critical illness, and hence need funds to cover the medical costs involved.

- Critical illness cover provides a cash sum on the diagnosis of a "critical" illness, which could be used for nursing and other care.
- Depending on which illnesses are covered, similar issues might arise due to high risk job. However, this should be less of an issue relative to income protection.

He will need some assurance that his family is taken care of if he passes away during this time. This is either to provide them with an income, or to provide for some other benefit (like education funding for children).

- Life assurance (either whole life or term assurance) will provide a benefit on the death of the life insured whenever that might occur during his rugby career.
- Endowment assurance products can also provide for this need, especially for education funding.
- Decreasing term assurance to cover his mortgage costs.
- Similar issues might arise due to high-risk job, although to a materially less extent. However, this should be less of an issue relative to income protection.

Benefit-type needs

He will need to start provisioning for his retirement income needs. Although this is a future need, he will need to start saving for this future need.

- A pension scheme (defined benefit or defined contribution) will allow him to put money aside for his retirement income.
- Generally speaking, these vehicles require low or no level of underwriting as it typically forms part of a group benefit. There should be therefore no major issue to become a member of the scheme.

QUESTION 4

Examiner's comments:

The question was fairly answered, overall.

- i. *Most candidates managed to identify the main stakeholders successfully. However, some candidates identified the regulator, employees of the insurer and/or dependents of policyholders which did not attract marks. The examples given were often extremely vague, i.e. a too high or too low value will be unfair, and candidates were penalised for this. Better candidates linked the surrender value to asset share and/or amount of premiums/maturity value and identified the impact on the stakeholder.*
- ii. *Bookwork – the candidates who knew their bookwork scored well. Many candidates wrote long sentences and wasted time for a question that asked to “list”. Some also gave more than 6 items, but only the first 6 were marked, causing some candidates to lose unnecessary marks.*

i.

Policyholder

- At long durations the surrender value is very low compared to the maturity value

Insurance company / Product provider

- At short durations the surrender value is higher than the asset share OR
- At short durations the surrender value is high compared to the upfront expenses incurred

Other policyholders

- At any duration any shortfall between the asset share and the surrender value is effectively cross-subsidised by the remaining policyholders, meaning they have potentially less profits to share between them

ii.

- Policyholders' reasonable expectations
- Competitive considerations
- What was disclosed at new business stage / sales stage
- Ease/simplicity of calculating terms
- Cost of implementing terms

- Frequency of changes required to terms

QUESTION 5

Examiner's comments:

This question was poorly handled. The question stated quite clearly that the candidate needed to list the functions of the regulator and indicate what was required to be done under the circumstances of the question for each of the functions. Many students confused the functions of the regulator with the aims of regulation, while some not providing either. Well-prepared students did quite well on this question, as half the marks were on offer just for correctly stating the functions.

Influencing and reviewing government policy

- Explain to government the issues relating to exiting from international markets and how they will impact insurance companies
- Try to persuade the government that the approach will be damaging to insurers
- Review any legislation that government might be drafting in relation to the exit and explain the likely impact on insurers

Registration and vetting of firms/individuals to conduct business

- Any foreign firms will likely no longer be allowed to register or will have to deregister

Supervising the prudential management of insurance companies and the way they conduct their business

- Any impact of the exit on the financial security of the insurers will need to be considered
- In particular if they have foreign investments or sell policies to people outside the country there will need to be a plan on what to do with these post the exit date

Enforcing regulations, investigating suspected breaches and imposing sanctions

- Any new laws and regulations post 1 June will need to be enforced and ensure the insurers are operating under them

Providing information to consumers and the public

- Consumers will need to be updated on the likely impact of the exit on the insurance market and their policies
- The regulator would be concerned to ensure the public knows that the insurance companies are still secure post the exit date

QUESTION 6

Examiner's comments:

- i. *Bookmark question with most students scoring well. Answers such as "insurance for insurers" were unfortunately common and did not score any marks*
- ii. *Stronger students were able to generate the required reasons why an insurer might reduce reinsurance coverage. Some students mentioned experience study results showing low loss ratios would result in reducing reinsurance coverage, but this is not necessarily the case – more likely*

that this would cause a realignment of reinsurance rates and not necessarily reduced reinsurance.

iii. *This was a standard bookmark question using “reasons for reinsurance” as the basis for the answer. Most students scored well here.*

iv. *Stronger attempts scored well. A few students misunderstood Cat XL reinsurance to be the same as ART Cat Bonds – this is incorrect. Weaker attempts gave the generic “reasons for reinsurance” as answers – Catastrophe XL cover serves a very different purpose to traditional proportional reinsurance*

i.

An arrangement whereby one party (the reinsurer), in consideration for a premium, agrees to indemnify another party (cedant) against part or all of an insurance liability.

ii.

1. In the long term, the reinsurer will aim for profitable reinsurance contracts, which means that the ceding company will pass on some of its profits to the reinsurer.
2. The company you work for may be very large (or have lots of capital) and therefore doesn't need reinsurance protection.
3. The company may no longer need capital relief.
4. The company might have purchased reinsurance to get technical assistance and may no longer need it.
5. The company may have found alternative risk transfer measures.

iii.

1. Reinsurance provides protection against claims volatility, so by reinsuring less you will be exposing your results to more volatility.
2. Reinsurance reduces capital requirements and removing it will therefore increase your capital requirements.
3. Reinsurance may allow you to write bigger risks and to write more business in general. Removing reinsurance might mean you cannot write certain risks.
4. You may have received technical advice from a reinsurer in the past and you won't continue to get this if you don't reinsure.
5. Reinsurance will limit large losses.
6. Reinsurance reduces the risk of insolvency.

iv.

What it is:

- Reinsurance contract that will pay out if there is a catastrophe
- Form of aggregate excess of loss reinsurance
- Non-proportional reinsurance
- Pays out for high aggregate losses arising from a single event
- Event may be spread over a number of hours
- Usually available for a year and then has to be re-negotiated

- There is no standard definition of what a ‘catastrophe’ is
- Contract will specify how much the reinsurer will pay if a catastrophe occurs
- Reinsurer usually has a maximum liability per claim

Aim:

- Reduce potential losses due to any non-independence of risks insured

QUESTION 7

Examiner’s comments:

- This question was answered well. Most candidates did not identify that a guarantee is usually a product feature and almost all candidates were not able to describe the guarantee.*
- This question was generally well answered. A minority of candidates merely stated the cashflows instead of explaining them in detail.*
- This question was answered well.*

i.

- An immediately annuity provides a series of regular payments $\sqrt{}$ in return for a single premium
- Payments are made as long as the annuitant is alive
- There might be a guaranteed period for which payments will be made regardless of whether the annuitant is alive or not

ii.

For the investor:

- An initial negative cashflow for the purchase of the annuity
- Followed by series of smaller regular positive cash flows throughout the investor’s lifetime

For the life insurer:

- Initial positive cash flow
- Followed by an unknown number of regular known negative cashflows
- These negative cash flows are the payment to the annuitant and also for expenses
- Number of future negative cashflows is dependent on the survival of the annuitant

iii.

1. Other actuaries – for the pricing and/or how you will value the contract and/or for setting of reserves
2. Lawyers – for drafting the contract
3. Accountants – to know how to properly account for the product
4. Administrators – as they will need to administer the product
5. Sales and marketing – as they will need to sell the product
6. IT/Systems – to ensure that the system can handle the

QUESTION 8

Examiner's comments:

Candidates generally did well with this question, especially those that discussed the principles of matching in turn.

i.

Nature of liabilities

- Sum assured is probably fixed in monetary terms so fixed interest bonds would match this
- If the sum assured indexes with inflation, then fixed interest bonds are not appropriate, and index linked bonds would be more appropriate

Currency of liabilities

- Liabilities should be in Rands only if they are selling in SA only then SA government bonds would be an appropriate match
- If they sell in other countries, then only holding Rand denominated bonds would be a mismatch

Term of liabilities

- Policies would be of a fixed term or could be for whole of life
- Buying an appropriate spread of durations of the bonds should enable you to match the term of the liabilities
- Reinvestment risk is possible if you term of the bond doesn't match the term of the liability

Level of uncertainty of liabilities

- Amounts are pretty well known but timing is the unknown
- Bonds should match the amounts well
- Timing could be projected using mortality rates so should be able to closely match

Return

- Insurer might be able to get a higher return in other asset classes
- However, bonds do match the liabilities quite well (as can be seen from the above) and therefore will probably sacrifice close matching for possible higher return

Government requirement

- It might be a requirement of the government to invest in fixed interest only

Diversification

- There is no diversification with current strategy
- Insurer is therefore exposed to risk of default of the SA government
- Small risk and default by government would have other substantial implications so is generally perceived to be low risk

Risk Appetite

- This is a low risk approach to investing the assets and might reflect the insurer has a low risk appetite for investment risk

ii.

Holder/investor of the bond has

- an initial negative cash flow at the start when they purchase the bond
- a single known positive cashflow $\sqrt{\quad}$ on the specified future date
- a series of smaller known positive cashflows $\sqrt{\quad}$ on a regular set of specified future dates

QUESTION 9

Examiner's comments:

Some students did not know the bookwork and lost lots of marks. Some of the students struggled to differentiate between business risks and operational risks. The application parts of the question were not well handled by most of the students.

i.

- Liquidity risk occurs when the market does not have the capacity to handle, at least not without an adverse impact on the price...
- ...the volume of an asset that is to be bought or sold when required.
- In the context of Grey Life, it may also refer to the inability to meet obligations/debt when the fall due...
- ...because of inadequate cash or liquid assets.
- Examples:
- More deaths than expected in a period, resulting in a strain on the cash supply of the company.

ii.

- Market risk is the risk related to changes in investment market values...
- ...or other features correlated with investment markets such as interest rates and inflation rates.
- Examples:
- An asset's value may fall resulting in potential insolvency
- Interest rates may decrease, increasing the present value of future guaranteed annuity payments
- Assets and liabilities may be mismatched, resulting in potentially adverse consequences.

iii.

- Business risk is a financial risk specific to the business being undertaken.

Examples:

- Insurance risk – mortality higher than expected on life policy book
- Longevity risk – mortality lower than expected on annuity book
- Underwriting risk – failure in underwriting process, resulting in risks being taken on at the incorrect terms or not declined.
- Financing risk – capital invested in the business is not generating a sufficient return
- Exposure risk – overexposure to a particular class of business (e.g. annuities vs. mortality products) or industry/area etc.

iv.

- This impact may be on capital and/or solvency...
- ...As well as, market share, profitability, share price, credit rating (any one or more).
- This risk is difficult to quantify numerically, since there is so much subjectivity involved.
- A possible approach might be to use scenario analysis.
- The business will come up with various plausible, adverse scenarios of poor decisions on the part of the CEO...
- ... and then assessing the potential impact the decision has in each scenario.

v.

- One would expect that the liabilities (and assets backing them) relating to the annuity book and to a smaller extent any mortality products will be exposed to movements in interest rates...
- ...which in turn will have an impact on the solvency / capital position of Grey Life.
- Financial stress testing can be used to investigate extreme interest rate movements.
- This will involve looking at the impact of the shock move on both the values of assets and liabilities.
- Correlations would need to be taken into account...
- ...for example, to what extent will the value of the property or share portfolio be impacted by an extreme movement in interest rates.

QUESTION 10

Examiner's comments:

- i. *A mixed bag in terms of response with some candidates having not studied their bookwork. Others did not read the word "outline" and wrote long essays – particularly on dealing with risk. While they got good marks, they wasted valuable time here. Some candidates also did not read that only the "detailed" project appraisal was necessary and included the "initial" appraisal in their response.*

- ii. *Most could define IRR but the marking was strict in requiring them to state that is was the interest rate that set the net present value of project CASHFLOWS equal to zero.*
- iii. *Most scored enough to pass this part of the question but wrote very repetitive answers for each type of project – again wasting valuable time.*
- iv. *Candidates did not, on the whole, write enough to score enough marks here. Many only discussed the main advantages and shortcomings of each method in general (repeating bookwork) and not applying the detail given in the question to the solution. For example, many times a discussion of WACC came up here and candidates spoke about debt and equity – entirely not applicable to a farmer.*
- i.

Project definition and scope

This involves formulating a detailed definition of the project and specifying timescales, budgets and responsibilities.

Evaluation of cashflows and choice of risk discount rate

The principal cashflows involved in any capital project include the initial expenditure, followed by ongoing revenues less running costs. There are various measures for evaluating the cashflows, e.g. NPV, IRR, payback period etc. One of the key decisions is the choice of the risk discount rate to be used to evaluate the cashflows of the project.

Dealing with risks

The other key factor within the appraisal is to consider all the risks that the project faces, as well as those that the project poses to its sponsor. This will include the identification and analysing of the risks as well as the risk mitigation options and plans.

The investment submission

The investment submission is the name of the written document that contains all the information and considerations of the project, and is used as a submission document in order to make a final decision. If the project gets the go ahead, then the appraisal stage is over and the investment planning stage begins.

ii.

The discount rate at which the Net Present Value of a series of cashflows is zero.

iii.

To calculate the IRR will require the amount and timing of all cash flows – for each option considered - so will need to know (or make a reasonable estimate of) the following:

- Initial cost of installation
- Cost of electricity saved
- Expected inflation rate for electricity
- Expected maintenance costs and timings, insurance, etc. for the alternative options
- Expected inflation for maintenance costs
- Expected lifetime of the solar, turbine or generators
- Any residual value (could assume zero residual value)...
- or termination cost for each option
- Any replacement costs after the expected lifetime has exhausted
- Any available grants
- Any favourable tax treatment
- Any possibility of selling any generated electricity over that needed by the farm to neighbours and expected income from this.
- The resultant productivity that each option will enable on the farm, and hence the output/income that can be derived under each alternative option.

iv.

The approach has some potential pitfalls:

- To calculate the IRR, will need the most likely cashflows for capital expenditure, running costs, revenues and termination costs. For specific parts of this project it may be difficult to estimate these costs.
- It is useful to compare the IRR to some targeted hurdle rate: If the IRR of a project is higher than this predetermined hurdle rate then the project may be suitable. The neighbour's approach does not consider this hurdle rate so it is possible that none of the projects is suitable.
- The IRR approach may lead to more than one solution. This is a particular problem when there are negative cashflows involved, which is the case in this scenario.
- It takes no account of the size of the profit involved so the approach could lead to a small profitable project being chosen rather than a larger project with a slightly smaller IRR.
- It doesn't allow for the risk involved in a project so the method could lead to the more risky project being taken on (if this was the reason for the higher IRR). For example, each option is dependent on another energy-source supply – sun, wind or diesel. Each one will have a different risk profile.
- It assumes that the single rate is suitable over the whole term of a project and that any income can be reinvested at the IRR. This may be unrealistic especially for longer projects.
- IRR does not include any information around when profits are actually obtained.

Other potential methods

- Comparing net present values (NPV) of the project may be a more suitable approach.

- This method takes account of the size of the potential profit and the project with the highest NPV would be favoured. The discount rates used can be adjusted to allow for the risk of each approach and can also vary by duration if necessary.
- The payback or discounted payback period could also be calculated. A payback period that is less than a predetermined period set by the farmer would be considered suitable; the lower the period the better.

Other considerations

- The IRR method is, however, relatively simple and easy to understand. It does not involve a decision to determine a suitable discount rate.
- The financial results cannot be considered in isolation. A subjective assessment will also be needed to ascertain whether the projects being assessed. These include:
 - Does the company achieve synergy/compatibility with other projects, or diversification?
 - Does the approach satisfy any political constraints / other stakeholders?
 - Does the approach have sufficient upside potential?
 - Does the company have enough cash/capital in the first place?
- The risk profile over the lifetime of the contract also needs to be considered along with the actual cashflow profile
- Non-financial risks and aspects will also need to be considered before a final informed decision can be made.