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

Examiner's comments:
This was a relatively straightforward bookwork question which candidates should have handled better. However, candidates waffled and wrote too many answers for the number of marks on offer. Though (ii) only required the major advantage and disadvantage, most candidates provided bullet lists of a number of advantages and disadvantages. In addition, most candidates gave identical answers of advantages and disadvantages of a mutual insurer in both part (i) and (ii) of the question.

(i) A mutual insurer has no shareholders and so the profits belong entirely to the policyholders.

(ii) Advantage: No shareholders so profits belong to policyholders so this should mean better benefits for policyholders.
Disadvantage: Cannot raise capital easily in the financial markets as you have no shareholders.

QUESTION 2

Examiner's comments:
Overall, this question was poorly answered. Students who structured their questions well by outlining the action that could be taken and then providing the advantages and disadvantage did better.

Most students did not write enough points to get the full marks. And also wasted time explaining the underwriting cycle which earned them no marks as this did not answer the question. The question required a logical thought process on the different actions that could be taken from the mildest action of doing nothing to the most aggressive of pulling out of the market.

Students also did not seem to use the information that the problem was an industry wide and provided a number of different answers which would not work, such as changing distribution channels and conduct more underwriting. Additionally, many students suggested that the insurer should decrease premiums which would not solve the problem of making substantial losses on the motor book but worsen it. No claims discount was another popular incorrect answer and students did not consider the additional cost to offer these benefits.

Continue to cover motor segment without a change of price
Adv: You maintain your market share
Disadv: You continue to lose money

Continue to cover motor segment but increase your price / introduce an excess (or increase excess)
Adv: You move back toward making money (or at least breaking even) because claims cost goes down relative to price
Disadv: You start to lose market share if the other insurers don't follow suit

Continue to cover motor segment but cross-subsidise against other lines of business
Adv: You maintain relationships with customers who do business with you on other lines and hopefully the cross-subsidy brings in sufficient income/profits from other lines

Disadv: You are using profitable lines to cover losses on motor business which might not be sustainable in long term

Withdraw from the market segment entirely
Adv: You cut your losses and keep the profitable business only
Disadv: You lose premium and therefore your costs are spread over a small premium base **or** Loss of market reputation

QUESTION 3

Examiner's comments:
Most candidates answered this question well and was the easiest question on either paper. The most common mistake in part (ii) was where candidates didn't give a description of the process they will follow to identify the risks but rather speculated about what the specific risks might be. Many candidates further tried to identify mitigating options for these risks and some even suggested not to continue with the project as it is too risky.

(i)

- A clear definition of the aim of the project which reflects the needs of the customer
- Full planning
- Thorough risk analysis
- Monitoring of development
- Measurement of performance and quality standards
- Thorough testing at all phases
- Care in managing different strands of the project to ensure that there are no unnecessary delays in one part of the project which depends on the outcome of another (critical path analysis)
- To move along at the appropriate pace so that the right things are done at the right time
- Stable but challenging relationships with suppliers of external components of the project
- A supportive environment
- Excellent communication between those involved
- Positive conflict management, which uses conflict as source of ideas and a tool for development
- A schedule of what needs to be considered at each milestone review point

(ii)

- A **high-level preliminary risk analysis** will confirm that the project will have major implications to all financial and related systems.
- A **brainstorming session with relevant and experienced colleagues** who are used to thinking strategically about the long term. This session will aim to:
  - Identify project risks, both likely and unlikely
  - Discuss these risks and their interdependency
  - To attempt to place a broad initial evaluation on each risk, both for frequency or occurrence
  - To generate initial mitigation options
- Carry out **desktop analysis** to supplement the results from the brainstorming session.

- Identify further risks and mitigation options
- Research similar projects undertaken
- Obtaining considered opinions of experts

- Carefully **set out all the identified risks in a risk register**, with cross-references to other risks where there is interdependency.

[Max 6 marks]

QUESTION 4

Examiner's comments:
Given the bookwork nature of the question most candidates scored enough points to pass the question, but missed out on maximising the potential number of points here. In many cases candidates simply wrote a single word - for example "diversification", or "tax differences" without expanding on the point - and were not awarded marks.

In other cases students wrote a lot, but made the same point over and over in different ways. Students seem to think that markers won't pick this up it seems! For the offshore investments question many candidates raised points applicable to emerging market investments - such as liquidity, quality of information, language issues, accounting standards - which would not be relevant to a general US equity investment. This showed they were just regurgitating book work without thinking.

Certain points were consistently missed being (a) issues around valuation of fixed property vs listed, (b) regulatory limits to offshore investments and (c) the fact that listed property shares may be associated with higher risk.

Many candidates explained that an advantage of the US investment is to act as a "hedge" against currency movements. But a local insurer would not need to specifically hedge this risk as it is not one they are directly exposed to because their liabilities would be in ZAR.

(i)

Advantages:

You might be able to get a better overall return on the office building than the property shares given the building is 'competitively priced'.

The shares might be quite volatile whereas the value of the property should be relatively stable.

The shares are correlated with the general equity market and by investing in a fixed property you may actually achieve greater diversification (at least from the equity market).

You will control the office building and so you can influence the performance of the investment whereas you have little or no control over property shares.

You might not know what the property shares are actually invested in or they might be invested in more risky property schemes (eg. Construction) and so owning a building might actually be a less risky approach.

Disadvantages:

The office building will not be as marketable as the property shares and thus if you need funds for cash flow purposes you will not easily be able to get access to the funds.

There is no easy way to get a market value for the property whereas the share price is available daily. This means it is a lot harder to know what the real performance is of the office building as an investment.

The office building will require more work from you than the property shares where no involvement is required. Someone will need to manage the building, find tenants, maintain etc. Given you are a small company this expertise might not be available. This would also be an extra cost for the company.

Lack of diversification - particularly within property sector as you would now own one building rather than have risks spread across a portfolio of buildings.

[Max 7 marks]

(ii)

Advantages:

You may be able to get greater returns especially if the exchange rate continues to fall against foreign currencies.

You should achieve diversification from the local market

Disadvantages:

There will be a currency mismatch.

Currency volatility could introduce additional volatility into the portfolio

If the currency strengthens again at some point you could achieve very poor returns.

There might be withholding taxes imposed on overseas investments by the foreign tax authority that may not be able to be recovered.

You will need expertise to invest overseas which you may not have available in your company

There might be increased costs of investment as you will most likely have to appoint an overseas custodian to deal with settlement, voting rights issues, holding share certificates etc.

Local regulator may restrict how much you're allowed to invest overseas

[Max 4 marks]

QUESTION 5

Examiner's comments:

The students did not do well on a simple combined application and bookwork question. On part (i) of the question students that used information provided in the question did well. Some students decided to complicate their answer by using more of the general SA information ignoring specific information in the question.

On part (ii) most students did not do well because they were not answering the question. The question required discussion on factors that affect strategy. Students that did well focused their answer on how the liabilities, funding and structure of the scheme would impact on investment strategy. Those students built up their answer by starting on the nature of liabilities and building up to the funding and free asset position of the fund. Students who did not do well did not properly build up their answers and strayed away by commenting on the current fiscal status of SA. Students should use information in the question & re-read the question to ensure their answer is focused on the question.

(i)

You could:

Increase the qualifying age from 60 to 65 (or any high age) as it will reduce the number of people entitled to getting the benefit.
Only allow SA citizen's or permanent residents to get the benefit and exclude refugees.
Increase the means test requirement so that less people qualify for the benefit
Give below inflation increases to the benefit thereby reducing the real cost.
Require employers to contribute to the cost of grant i.e. a form of taxation to fund the benefit in future.
Reduce the current benefit to a lower amount (likely to be quite unpopular though)
Put legislation in place to require companies to provide pension schemes for their employees thereby ensuring they are over the means test level

(ii)

It will be assumed that the pension benefits are funded as unfunded and just-in-time funded strategies will not require a long-term investment strategy.

The main drivers of the investment strategy will be the <u>nature, term, currency and certainty</u> of the benefits.

- It is assumed that all benefits are due in the local currency.
- The benefit payments will likely be monthly (or regular) payments to all qualifying beneficiaries. It will be expected that the benefits should be increasing over time to at least keep up with inflation. It is unlikely that increases in excess of inflation will be expected.
- The term should be fairly long-term, although it will depend on the demographics of the qualifying beneficiaries.
- The population profile should be fairly predictable over time, although some form of uncertainty regarding longevity might need to be considered.

These facts imply that some form of real investments will be required to produce the real benefits over time. The nature of the benefits (regular payments for life) implies that some bond structure might be required, but real assets (equities, property) might therefore also need to be considered.

The funding method and frequency will also have an influence on the investment strategy - will regular funding flows (inflows) be used to fund benefits, or will existing assets have to be liquidated in order to fund the benefits? If the latter, then this might require more liquid assets to be held within the portfolio.

The ability to provide additional funding/contributions in the event of a shortfall should also be considered - will the government be in a position to raise further capital? This might affect the risk tolerance that should be considered.

Any regulatory or tax restrictions should be taken into account.

The size of the assets will likely be quite a large fund.

The relative size to the liabilities (funding level) will play a role in the level of investment freedom that can be considered.

Furthermore, the large size of the assets will be unlikely to put any restrictions on the types of assets that can be held in the portfolio.

Any existing assets in the investment portfolio should be considered. It might not be feasible to exit illiquid assets.

One can also refer to the investment strategies of other similar (commercial) funds in order to obtain some form of benchmark for an investment strategy.

One should also ensure that a well-diversified portfolio is considered.

[Max 11 marks]

QUESTION 6

Examiner's comments:

This question was generally poorly answered by a large number of candidates. The majority of candidates did not know the core reading well enough which suggests candidates were not adequately prepared. As a result of this, these candidates generally scored very poorly.

(i)

Term

The distinctive feature of money market investments is that they are short-term. The term is generally less than one year and is often very much shorter. It can be as short as overnight money.

Security

This security of money market investments is mainly dependent on the issuer. In most cases, the security will be very good due to the short-term nature of the instruments, and default is very rare. It is, however, by no means impossible as African Bank has clearly indicated.

Marketability
With the exception of call and term deposits, most money market instruments are highly marketable. However, they are unquoted – they typically do not trade through a stock exchange, but rather directly with banks or intrabank.

[Max 4 marks]

(ii)

Generally, money market investments will only be held for reasonably short periods of time, or for needs of a short-term nature.

It is unlikely that this will form a large portion of their long-term investment strategy as a life insurer has long-term liabilities (by nature and term), and cash-type investments do not provide a reasonable match for these liabilities.

Typical short-term needs:
An insurer might hold money market investments in order to meet short-term commitments. These could have originated from premium income, or from realizing other investments (or investment proceeds) which is earmarked for benefit payments, salary or other regular expenses.

Outgo is uncertain. The above commitments (benefit payments, expenses, etc) might not be predictable, or the variance might be high, and excess cash might be held in order to avoid liquidity constraints should the outgo be higher than anticipated.

To be ready to take advantage of other investment opportunities. This might be relevant where excess capital might be parked until a suitable investment opportunity is identified, or a new venture is identified within the company itself.

Funds which are awaiting investment in some other asset category. Investments earmarked for long-term investments might be parked in money markets until the opportune time is identified to purchase longer-term instruments. This might be due to short-term volatility in the markets (which leads to uncertainty), or when investments are considered expensive or overvalued.

Needs to protect the monetary value of assets. Where surplus assets are low or non-existent, a risk-averse board or shareholder might want to protect the available assets by investing in low-risk and hence cash-type investments. As mentioned above, it is unlikely that a large portion of life insurer assets will however be in cash.

If outlook on other assets are pessimistic. This might be the case in a rising interest rate environment (typically results in other assets value falling), economic recession, weakening in domestic currency, economic uncertainty, etc.

[½ mark for each reason provided (Core Reading indicated in bold). 1 mark for a clear application or example of the reason provided]

QUESTION 7

Examiner's comments:

Candidates generally performed well with this question. Stronger candidates commented on the likely impact of each of the listed factors and assumptions.

Part (i) was mostly bookwork and students generally did well with this part of the question.

Many students lost marks in part (ii) for listing risk and rating factors instead of assumptions.

(i)

Some comments relating to generic annuities also acceptable

Customer needs
The product will be required to meet the needs of the target market.
In this case the primary need is to provide for a guaranteed income in retirement
It is likely that this product is mainly aimed at impaired lives.

Underwriting & pricing
What data is available to help with setting the pricing
Does the company have the skills to u/w this product?

Level and form of benefits
The main purpose of the product is to provide income for life – the benefits is therefore likely to be a stream of income payments.
The customer's expectation would be that the level of benefits should be higher than those of an ordinary annuity if they are in poor health.

Guarantees
By definition, the annuity is guaranteed to be payable for life.
The life office would have to consider the cost of providing this guarantee as well as the availability of investments to match this liability.
To improve marketability, there may be a guaranteed annual increase in the benefit amount…
…perhaps to keep up with inflation.

Discretionary benefits
The product can potentially be structured as a with-profits product which allows for discretionary increases in benefits.
The life office can consider whether there is any room to allow for discretionary benefits such as higher than inflation increases or additional annual payments ("13^{th} cheque" type benefit) when the underlying performance of the investments warrant this.
It would need to be careful to not create a reasonable expectation on the side of the policyholder, which may require the discretionary benefits to almost be priced in, in which case the level of upfront annuity may actually be lower.

Discontinuance benefits
By its very nature, most annuities cannot be cancelled or cashed in (although this is possible, usually on a very conservative basis in lieu of anti-selection.
It would however be required for this to be included in the contract design and communicated well to the client.

Contract terms and conditions
A contract wording with terms and conditions would need to be drawn up that is both fair to the policyholder and protects the life office from moral hazard and anti-selection.
Consideration would need to be given for what to do in instances where the policyholder provided wrong or fraudulent information by overstating their illnesses.

Profitability
Annuity rate would be required to be set so that the company meets its required profit criteria.
Additional expenses might be incurred in underwriting that would need to be factored in

Marketability/Distribution
On the one hand, the fact that the annuity takes into account the individual's health, makes it more marketable to those that are expected to live shorter than what is implied by the rest of the market's annuity rates.
On the other hand though, healthy lives may find the product unattractive.
One also faces the challenge of possible major unhappiness from existing clients having bought a "regular" annuity just before Grey Life launched this new improved product.
Consideration would need to be given as to the size of the potential target market…
…and whether this would be sufficient for the company to meet its required sales targets to meet profit and expense requirements.
Are there distributors interested and able to sell this product?

Competition
It is clear that Grey Life might have a first mover advantage, but one needs to consider how quickly the competition might be able to respond and how that would affect the success of the product if they were to launch similar products.

Regulatory requirements
Any regulatory requirements relating to the sale and providing of annuities would need to be taken into account…
…especially given the fact that this is a new product locally, care needs to be taken to make sure the environment will allow for this.

Financing requirements
Capital would be required to cover the guarantees given to the policyholder.
Grey Life would need to assess how onerous the capital requirements are and how that would affect their existing capital position.

Cross-subsidies
The life office would need to decide whether it will allow cross subsidies between annuitants.
This is a non-trivial exercise, as the office may decide to offer slightly lower benefit levels to ill annuitants (but still better that the rest of the market), in order to enhance the benefits of clients who are only marginally worse off in health.

Administration systems
Since the company is already providing retirement benefits, they should have a lot of systems in place already.
The administration system would be required to store the health details disclosed though, as this may be required for future experience analysis or audits.

Professional/Ethical considerations

One contentious issue on Enhanced annuities is that it potentially encourages prospective clients to change lifestyle behaviour in order to appear 'unhealthy' during the underwriting process.
For example, it is possible that a smoker will receive higher annuity payments, and it might therefore encourages prospective clients to start smoking.

Reinsurance – availability, extent and price

Consistency with other similar products the company currently offers

(ii)

Mortality curve for annuitant's mortality
Unlike regular annuities, this curve is not the same for everyone with the same age and gender.
With the help of medical specialists and underwriters, a set of rules would be required to be set up that that moves the mortality curve up or down (and possible change the shape too) in response to disclosures made about the client's health.
A reinsurer can possibly help with such a set of rules.

A yield curve / term structure of interest rates
This should be easy to find in the investment markets or from the department/company handling the current investments of Grey Life.
The overall term may possibly be shorter and this may affect some of the assumptions made here.

Expense and profit assumptions
Upfront expenses:
commission payable similar to the current product
cost of underwriting will be higher than the current product
Set up costs will be similar or marginally higher that the current product
Ongoing expenses
Cost of administration should be similar to current product
Profit requirement likely to be higher to compensate for uncertainty in the new market

QUESTION 8

Examiner's comments:
Part (i) was generally answered very well.

A lot of students focused only on the generic parts of stochastic model building in their responses to question (ii) and lost some easy marks as a result. A surprisingly large number of students indicated that they would model the retention limits as a stochastic variable, instead of the underlying claims process. Very few students managed to clearly specify what the purpose or output of the model should be. To state "choose appropriate retention limits", didn't score anything, since that is the instruction in the question itself. Also, the question didn't require the student to outline the requirements of a good model, and although there is some overlap, this generally scored poorly.

Part (iii) was generally answered quite well with most students correctly expanding on the reasons for reinsurance to generate sufficient ideas. Quite a few neglected to incorporate how the model may help with the decision, or just made a passing remark on this.
(i)

Stochastic Model – Advantages

- A large number of simulations can be run to create a distribution of results that can help to understand the risks/dynamics inherent to a process.
-A stochastic model takes into account the variability of the model parameters and the covariance between them
- A stochastic model may be useful to model options and guarantees, since the likelihood of guarantees biting can be explicitly allowed for.

Stochastic Model – Disadvantages

- Can be longer and more expensive to run.
- More complex to design and test, which may lead to increased operational risk.
- Output may be difficult to interpret and communicate to senior management.
- Model output heavily dependent on choices of probability distributions for its parameters.

Scenario Analysis – Advantages

- It is easy to explain to a non-technical audience, since it doesn't involve probability distributions etc.
- It is easy to understand what scenarios have been examined.
- Simpler than stochastic models, and hence less time consuming and costly.

Scenario Analysis – Disadvantages

- It may be difficult to determine which economic scenarios to test.
- May not cover a sufficient range of outcomes to base a decision on.
- Does not explicitly allow for all possible interactions between variables.

(ii)

[around 12.5 marks are available, but in lieu of the difficulty of the question, it is kept at 9 marks]

- It will be necessary to collect, group and modify data about the business that is being modelled.
    - It may be necessary to interact with the actuaries who have developed the various products…
    - …to obtain and understand the rates used in the products' pricing
    - …and to get expert opinion on some of the assumptions underlying the rates
    - It will also be necessary to get information on the structure and likely terms of the potential reinsurance arrangements available to LifeCover
- It will be necessary to choose statistical distributions for both the frequency and severity of claims being modelled.
    - Which may have to be done by product type…
    - …since the claims behaviour of say life insurance should be significantly different to say disability cover
- It will be necessary to assign correlation factors between the variables being modelled…
    - e.g. increases in critical illness claims claims may also give rise to increases in mortality
    - any rider/accelerator benefits may also be taking in

- Construct a model that can stochastically simulate claims per policy/benefit per risk
- …as well as the reinsurance recovery, if any, on each claim.
- The model should also be able to calculate the reinsurance premium expense per time period.
    - Which may require that the likely exposure (insured amounts etc.) will also need to be modelled
    - With an assumed reinsurance pricing structure being overlaid…
    - …to generate the expected spend on reinsurance premiums.
- A very detailed model may also include estimates of the insurer's future income statement and balance sheet after each time period.
- Check that the goodness of fit is acceptable…
- …perhaps by running the model through a recent year and comparing actual with expected results
- … preferably a year that has not been used to calibrate the model.
- Modify the model if the initial model doesn't fit well.
- Perform some sensitivity testing on the model by varying some of the parameters of the distributions.
- Run the model many times, each time sampling randomly from the chosen density functions.
- Produce a summary of results that shows the distribution of outcomes

(iii)

- The choice of retention limit will involve achieving a balance between the benefit of reinsurance and cost of the reinsurance…
    - …which will inevitably lead to some profit being passed to the reinsurer
    - …because the value of the reinsurance is likely to be less than the premiums charged, because of the reinsurer's loadings for expenses and profit.

- The potential benefits of an appropriate retention limit to take into account include:
    - Reduced volatility in claims…
    - and hence more stable financial results.
    - Reduced exposure to very large claims…
    - Which many protect the company from insolvency with more certainty
    - …or protect the insurer's profit margin/criterion
- The model may be used to assign probabilities to various financial outcomes (positive and negative) that may of interest to management…
    - …and may possibly be used to identify other adverse scenarios that were not initially considered
- Management and shareholders' attitude to risk should be taken into account in the light of the modelling results.
- Shareholders may prefer lower retention limits as this will give more stable results and hence stable dividends.
- The company should also take into account their current capital position (free assets etc)…

- … to ensure that the reinsurance arrangements address any realistic threats to their capital.
- The choice of retention limits may also be driven by the need for any arrangements to be simple and practical.
- It may be useful to enquire from the reinsurer to understand what the rest of the market is doing.
- The reinsurer may insist on a minimum level of business…
- ..Especially if they are offering technical assistance in return.
- How will the market, i.e. customers, investment analysts, brokers etc react to a significant change in the reinsurance arrangements.