

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:

Part (i) was a bookwork question which was generally well-handled by the majority of candidates. Candidates that struggled to gain marks in the question provided actions that regulators take in regulating the industry, without providing the associated benefits of the actions. Part (ii) of the question was well-handled by most candidates.

(i)

The main benefits produced by regulation arise from the successful achievement of its aims, which are primarily to:

- *correct perceived market inefficiencies and promote efficient and orderly markets...*
- ...in which investors can trade confidently and fairly...
- ...such as by ensuring investors have adequate information

- *protect consumers of financial products ...*
- ... against losses due to fraud or mismanagement...
- ... but not against losses arising purely from market movements.

- *maintain confidence in the financial system*
- ... so that it continues to operate effectively for the greater good of society.

- *help reduce financial crime...*
- ... by vetting firms and individuals authorised to conduct certain activities
- ... and by enforcing regulations,...
- ... investigating suspected breaches...
- ... and imposing sanctions.

- Regulation may also aim to *limit the likelihood of failure of major financial institutions...*
- ... and to reduce the likelihood of the government or central bank having to step in as lender of last resort.

(ii)

The main costs involved are:

- the direct costs that arise from administering the regulation
- complying with it.
- These will normally be passed on ultimately to the end investor/policyholder...
- ... in the form of higher charges / dealing costs.

There are numerous indirect costs, such as:

- an alteration in the behaviour of consumers, ...
- ... who may be given a false sense of security ...
- ... and a reduced sense of responsibility for their own actions
- an undermining of the sense of professional responsibility among intermediaries and advisors ...
- ... who may have less incentive to provide the best advice for the investor/policyholder
- a reduction in consumer protection mechanisms developed by the market itself...
- ... as the providers of financial services know that consumers are protected by regulation against mismanagement or insolvency
- reduced product innovation...
- ... due to the additional costs of complying with the regulatory requirements
- reduced competition...

- ... again, due to the additional constraints imposed by the regulations on the providers of financial services.

QUESTION 2

Examiner's comments:

The performance on this question was average. Many students correctly identified how put and call options can be used in this case. However, few managed to say enough about the suitability of the strategy given how the share price is likely to perform and to discuss the scenario that may lead to a loss for the hedge fund.

- If the drug trial is successful we expect the share price to move up significantly and if not successful we expect the share price to drop significantly
- If the drug trial is successful and the company share price moves up by a large amount, you will exercise the call option
- This gives you the right to buy the shares at the strike price
- You can then immediately sell the shares at market price and make a profit of :
 - Share price at expiry – call premium – put premium – strike price
- If the drug trial is unsuccessful and the share price falls by a large amount, you will exercise the put option
- This gives you the right to sell the shares at the strike price
- You can therefore buy the shares at the (low) market price and sell at the higher (strike) price and make a profit of :
 - Strike price – share price at expiry – call premium – put premium
- Since we are purchasing both put and call options, we have the option to walk away from either contract should the share price not move in our favour
- Yet we could make unlimited profits should the share price move significantly up or down after the results of the trial are released
- The maximum loss we could make from this strategy would be the sum of the premiums payable for each contract
- The expiration dates of the contracts would need to take cognizance of the date of release of the trial results.
- An investor will often use this strategy when they believe the price of the underlying asset will move significantly out of a specific range...
- ...but they are unsure of which direction the move will take.

QUESTION 3

Examiner's comments:

Part (i) of the question was well answered by most students although a lot of students did not provide enough points to get all the marks. Part (ii) was focusing on the benefits of Risk XL and most students could motivate well why a company may want reinsure on this basis.

Part (iii) was poorly answered as most students did not answer what was asked by the question. Most students did not realise the stochastic nature of the model and the need to apply the XL to determine Kappa Re's portion of the risk for pricing. This question required students to think practically, and a lot of students were not able to. Very few students noted that various limits of the risk XL could be tested and provided to InsCo for decision. A lot of students went through the list of what to do with a model (eg goodness of Fit testing, data testing) which was not what the question asked as the setting implied that the data and models have been testing already and been found to be accurate.

(i)

- Risk XL is a non-proportional reinsurance cover
- It applies to individual losses...
- ...or, alternative, can be viewed as affecting one insured risk at any one time.
- When a claim happens and it is higher than a specified limit then claims above this limit will be passed to the reinsurer...
- ...but only up to the upper limit.
- Above the upper limit claims may revert back to the insurer...
- ...or enter another layer of a separate Risk XL agreement.

(ii)

- Requires a reduction in claims volatility...
- ...and hence smoother profits...
- ...reduced capital requirements.
- Allows them to write larger risks...
- ...which may improve diversification.
- Limit their exposure from single large losses.
- Reduce their risk of insolvency.
- Access to reinsurer support.

(iii)

- From the information provided it is clear that a stochastic approach might be feasible.
- We can start by first taking the most recent exposure provided...
- ...and simulating claim events as well as claim amounts using the models provided.
- We would run 1000s of simulations...
- ...to obtain a distribution of results without any reinsurance.
- We can then proceed and apply a variety of potential Risk XL structures to the simulations.
- These could include different attachment points as well as layer sizes.
- For each structure, one can generate a new distribution of claims...
- ...perhaps with some metrics on expected loss, percentiles etc....
- ...and how these were improved by the presence of the reinsurance.
- For each structure it will also show Kappa Re the distribution of the reinsurance payments they may need to make...
- ...which can be used as the basis to come up with the reinsurance premium to charge the client.
- Allowances would need to be made for expenses and commission...
- ...as well as a profit margin.
- It might also be necessary to add some margins for uncertainty.
- The client can hence be provided with a number of options of Risk XL structures...
- ...along with their cost and benefit to inform their decision making.

QUESTION 4

Examiner's comments:

The question was generally well answered, especially part (iii). In part (ii) some candidates confused economic and demographic factors, and, in many cases, not enough points were raised.

(i)

Pay-as-you-go

- An arrangement under which benefits are paid out of revenue...
- ...and no funding is made for future liabilities

(ii)

The demographic factors that will affect the cost of the State pension are:

- falling birth rates which reduce the size of the younger working population
- previous “baby booms” have led to an increase in the size of the retired population
- people are living longer and so collecting retirement benefits for much longer
- retirement patterns are changing with more people leaving the working population through early retirement.
- working patterns are changing with more people starting work later, e.g. following a longer education.
- The combination of these will affect the ratio of retired population (receiving the benefits) to those in work (that are financing benefits).
- Many countries anticipate a demographic “time bomb” where this ratio is increasing significantly.

(iii)

The total level of State pension outgo can be reduced by:

- increasing the age at which benefits can be drawn perhaps from 60 to 65, or higher ...
- ... this will reduce the ratio of retired to working populations and benefits will be paid for less time overall.
- reducing the level at which the benefits increase, ...
- ... for example, to be in line with price inflation rather than earnings increases.
- Reducing the starting level of the benefit
- ... but this may be politically unacceptable.
- Toughening the eligibility requirements for the benefit to reduce the number of people who receive the benefit ...
- ... for example, by increasing the number of years required to qualify for a full pension.
- Excluding people who do not meet the citizenship requirements of the country.
- Introducing means-testing...
- ...where the benefit is only paid to those who need it or who have other income below some threshold.
- Increasing the contribution required by all citizenships to social security.

QUESTION 5

Examiner's comments:

This was a relatively straightforward question on investments which one would've expected most students to do well in. It appeared several students struggled with investment concepts of active & passive and how they compared to each other. Part (iii) was poorly answered and a lot of students failed to generate practical points that would generate marks. Part (iv) was also particularly challenging to the students as they did not seem to apply information provided in the question.

It was surprising in part (v) that several students failed to understand the basic differences between MWRR and TWRR. This was a sign that a lot of students were not well prepared for the exam.

(i)

- An *active approach* involves actively seeking out under- or over-priced SHARES which can be traded in an attempt to enhance investment returns (no marks if they don't say shares etc.)
- This involves taking short term deviations away from the BENCHMARK INDEX
- The manager has few restrictions on the choice of shares
- This enables the manager to make judgements regarding the future performance of individual SHARES in both the long and short term.
- *Passive management* is the holding of SHARES that closely reflect those underlying a certain INDEX.
- The manager has little freedom to choose investments.

(ii)

Active advantages

- Opportunity for higher returns
- May be able to construct a portfolio taking liabilities into account

Active disadvantages

- Additional costs
- Fund manager may get it very wrong

Passive advantages

- Predictable performance relative to the index
- Cheaper – lower asset manager fees and no research costs

Passive disadvantages

- Will always underperform benchmark after fees
- Loss of upside potential (if you believe in market inefficiency)

(iii)

- Portfolio management fees are deducted from returns
- The timing of re-investment of dividends may differ between the index and the portfolio
- The portfolio may not be able to trade illiquid small cap shares in order perfectly mirror the index
- Rebalancing may take time whereas index changes are made instantly

- The manager may have poor tracking skills
- or be using approximate tracking methods instead of holding the whole index portfolio
- Trading and transaction costs will need to be deducted from the portfolio but are not in the index
- The portfolio may have to pay tax on crystallised capital gains and derivatives whereas the index is gross of tax

(iv)

- Therefore portfolio A has beaten the benchmark by a much higher margin than portfolio B on a TWRR basis
- Portfolio A has a much higher tracking error than portfolio B
- Tracking error measures the standard deviation of the difference between the portfolio return and the benchmark return
- Therefore portfolio A's returns are very different to the benchmark compared to those of portfolio B
- This suggests that portfolio A employs a higher degree of ACTIVE RISK when constructing his/her portfolio
- In this case it has paid off and produced superior returns when compared to the benchmark.

(v)

- The MWRR factors in all cashflows, including cashflows and withdrawals.
- Assuming the MWRR is calculated over many periods, the formula will place a greater weight on performance in periods where the account size is the highest.
- In this case, if the investor deposits large funds at the beginning of a quarter of under-performance, the MWRR would produce a much lower return...
- ...even if the performance was good over long periods where the funds invested was small.
- Investor deposits and withdrawals are usually beyond a portfolio manager's control.
- Since TWRR is defined as the compound growth rate of 1 over the period being measured...
- ...TWRR isolates the investment actions/decisions of manager...
- ...and does not reward/penalise deposit/withdrawal activity.

QUESTION 6

Examiner's comments:

This was a difficult question, which was generally not well answered. Several mistakes were made by students, in particular, in two important areas:

1. *Not reading the question properly:*
 - a. *The first part of the question referred specifically to the regulator's role in mitigating the risk of insurance company insolvency, and many students strayed from this question.*
 - b. *The second part of the question specifically asked about the impact of closure to new business on key metrics of the company. Many students speculated on how the insurer was going to exit from the restriction, even though that was not in the question.*
2. *Critical lack of understanding of how an insurer operates:*
 - a. *An insurer that has solvency below the minimum required level is not insolvent (which means assets are less than its liabilities).*
 - b. *New business strain is a capital cost that arises from expenses in excess of income. You cannot "use" new business strain to "cover" expenses.*
 - c. *The best way for an insurer to exit a low solvency position cannot be to add more risk to their investment portfolio, which would push up their capital requirement.*
 - d. *Closure to new business does not mean there is no more premium income coming in, as the premium income from in force business will normally substantially exceed the premium income from new business.*

(i)

Role of the regulator

- Insurance companies are normally subject to a requirement by the regulator to maintain a specified level of solvency capital.
- There are also regular reporting requirements ...
- ... that enable the regulator to monitor the financial position of companies.
- Intervene in the running of a company...
- ... before it reaches a position of technical insolvency
- Require insurance company to close to new business if its financial position is serious
- Require insurance company to establish a recovery plan for less serious problems...
- ... and for this to be monitored closely by the regulator.
- In some jurisdictions, ...
- ... when these courses of action fail and an insurance company cannot meet its liabilities, there may be a statutory scheme set up from which some or all of the benefit payments are paid...
- ... funded by a levy on all other providers.
- Perform background checks and vetting of new prospective insurance companies to ensure that they have access to enough capital before they are awarded an insurance license.

(ii).a

Closing to new business will have *a major impact on the operations and expenses* of a life insurance company.

Shorter term

- Short-term, most operations relating to the acquisition of business can be dispensed with immediately, such as
 - sales and marketing staff
 - branch offices
 - some head office functions (e.g. new business customer support)

- new business systems (e.g. new business illustrations).
- It might also be possible to sell any direct salesforce (and so raise capital).
- These expense reductions will be offset by additional costs associated with the closure including:
 - redundancies
 - disposal of marketing literature
 - notifying policyholders
 - early termination of office buildings' leases.
- All product development and most systems development work can be stopped ...
- ... although some systems development is likely to have to continue to comply with changing legislation and replacing obsolete technology.
- The company might decide to cut back on its administration function, ...
- ... as it no longer needs to attract new business.
- However, business retention may be important to keep per-policy fixed expenses at an acceptable level.

Longer term

- In the longer term there will be further redundancies, as the number of staff required to administer a decreasing number of policies falls.
- As the number of policies in-force decreases, fixed expenses will be split between an ever-decreasing number of policies.
- This effect will increase per-policy fixed expenses.

(ii).b

Short term

- Withdrawal experience (surrenders and lapses) will vary by investment type.
- Withdrawal rates may increase as a result of the bad publicity and concerns of policyholders ...
- ...regarding the security of their benefits.
- Higher withdrawals will increase the rate at which the fund becomes too small to be practically managed as a separate entity.
- Salespeople may encourage customers to transfer their existing policies to other providers.

Longer term

- Some of these withdrawals may be selective...
- ..., leading to a worsening of the mortality and sickness experience
- If service standards decline over time, withdrawals may increase.

(ii).c

Short-term

- The removal of new business strain will have a positive impact on the supervisory solvency position ...
- ... which might suggest a less constrained investment policy...
- ...and likely also improve liquidity.

Longer-term

- When the average term outstanding becomes much shorter...
- ... the asset portfolio should be moved more towards shorter-dated, fixed-interest type investments...
- ... to reduce the volatility of payouts...,
- ...but will reduce expected returns...
- ...and not offer inflation protection.
- Volatility will increase relative to the size of the fund as the size of the fund reduces.
- The need for liquidity may increase as the fund runs off ...
- ...and if withdrawals increase.

- The company may be forced to dispose of illiquid assets at an unfavourable time.
- To prevent this, it could undertake a gradual move into more liquid assets
- As the funds under management decrease, the dealing costs will increase relative to the size of the fund, reducing net returns.
- It will become harder to attract and retain good fund managers...
- ... and investment return might be negatively affected.
- The tax position of the company may change as a result of contracting rather than expanding funds.
- Depending on solvency level a more fully matched strategy could be adopted

(ii).d

Short-term

- Bonuses may have to be reduced to maintain the solvency of the company.

Longer-term

- The company may wish to use more deferral of distribution of surplus...
- ... to provide some working capital to demonstrate solvency ...
- ...and as a cushion against adverse future experience.
- The company should be conscious of policyholder expectations and the need to communicate with policyholders.

QUESTION 7

Examiner's comments:

Part (i) was answered well, but it was clear in many responses that candidates do not quite understand group life insurance business. The preamble in the question explicitly stated that the company sells annually renewable, risk benefits. A large number of candidates would mention products such as pure endowment assurances and annuities in their responses, which are not the most obvious products in this setting. Most candidates could give reasonable examples under part (ii), but in many cases could not define the concept succinctly. We still see many candidates confusing blatant non-disclosure with anti-selection. Part (iii) required some practical thinking and while many could come up with some valid ideas, there were few candidates that got the maximum marks available here.

Part (iv) and (v) required some practical thinking about exposure, pricing and claims information that would be required to do this analysis as well as how this data may be used. Better candidates would focus on the fact that it would not just be mortality information that is required and would include the most obvious rating factors (e.g. occupation, income etc.) in their responses. The best candidates could recognize that they should comment on the potential for IBNR, but it was still possible to do very well without this insight. Part (vi) often saw too few reasons listed.

(i)

Group life insurance

- This would provide a lump sum pay-out on the death of an employee.
- It is essentially a one year term assurance.
- The lump sum may be a function of the income/salary of the employee.
- Premium might be expressed as a percentage of salary or as a rate on the cover provided.
- In some cases employers will also give a smaller, separate, amount as funeral cover.

Group critical illness

- Provides a cash lump sum on the diagnosis of a “critical illness”...
- ...such as heart attack, cancer, stroke or some other serious illness/condition/diagnosis.
- In some cases it may accelerate (reduce) any death benefits that might become payable later.

Group income protection insurance

- This provides an income for the employee...
- ...in the event that he/she suffers an event/illness that renders them unable to work.
- Income will be provided up until the employee recovers and can return to work...
- ...or until retirement.
- In some cases a waiting period at the beginning of any claim may apply...
- ...since an employee might have access to paid sick leave (for example)

Group lump sum disability (TPD)

- This provides a lump sum on becoming disabled and unable to work.
- Can be defined with reference to the insured’s ability to perform their occupation...
- ...or with reference to standardised functional impairment criteria.

(ii)

Definition and examples

- Anti-selection is the action of an insured taking out a contract (or selecting certain benefits)...
- ...when they believe their risk is higher than the insurance company has allowed for in its premiums.
- Example: a smoker buying cover from an insurer that does not differentiate on smoker status.
- Example: a male buying cover from an insurer that does not differentiate on gender.
- Example: buying cover below a certain threshold that would trigger medical tests you suspect might show up a problem.

(iii)

Why lower anti-selection

- Membership of group schemes is often compulsory...
- ...or a high proportion of those eligible will join.
- Usually, all members of the scheme receive benefits that are the same...
- ...or are determined by a fixed formula.
- There should be less opportunity then for good risks to decide not to join,...
- ...or for poorer risks to buy more cover.
- Group membership is hence expected to be a mixture of good and bad risks...
- ...which will also be fairly constant over the course of the, usually annual, contract.
- Generally we expect people that are able to work (or start a new job) to be in reasonable health.

(iv)

- Exposure data on all the schemes insured would be required, including:
 - Type of industry
 - Benefits offered, how they are calculated.
 - Age and gender details per scheme
 - ...preferably obtained from full membership lists...
 - Salary details in case benefits are a function of salary
 - Size of scheme
 - Benefits offered
 - Membership profiles such as age and gender mix...
 - ...possibly even full membership lists

- Size of scheme
- Data on all claims made, including:
 - Claimant data to be able to link it back up to the scheme
 - What benefit was being claimed for.
 - Cause of claim/death/disability
 - Date of claim events...
 - ...as well as date of notification of claims event.
 - These dates are required to calculate IBNR provisions
 - Whether there are any outstanding claims provisions
- One would at least require the data above for the past year...
- ...but preferably for a few years prior as well to be able to spot trends etc.
- The pricing bases assumed would be required...
- ...for all the different products offered e.g. mortality rates, morbidity rates, disability rates...
- ...which might be different by age, gender, industry, region.
- Reinsurance structures in place.
- Changes, if any, to the claims processes of BetaLife.
- Any previous investigations done.

(v)

- For each scheme, one would attempt to calculate the expected claims...
- ...using the membership and exposure information combined with the pricing bases provided.
- Following this, one can allocate the actual claims to the scheme.
- One would need to allow for claims that might still be outstanding...
- ...and would hence need to make some assumptions for IBNR...
- ...perhaps by using run-off triangle methods or another method to gross up the claims to date.
- Different benefits will be treated separately...
- ...i.e. we want to show expected and actual claims separately for death, CI, disability etc.
- It will be useful to consider the expected claim counts...
- ...as well as the expected claim amounts separately.
- In the case of income protection, it may be necessary to look at actual vs. expected claim termination rates.
- For each scheme we want to make sure that we have as much detail as possible on the likely rating factors...
- ...such as age, gender, industry, average salary etc.
- One can then aggregate the experience and start looking at where the deviations from expected claims are the largest.

(v)

- Some issues to consider would be:
 - Whether the poor experience was across all benefit types or just one e.g. disability.
 - If only one of the benefits performed worse than expected it would be worthwhile to focus on that type of risk?
 - Was the adverse deviation the result of a relatively small combination of schemes and/or rating factors...
 - ...,or was the experience poor across the board?
 - Did some industries fare consistently worse...
 - ...blue vs. white collar workers for example?
 - Were there any accumulations of claims...
 - ...e.g. a number of people dying as a result of the same event...
 - ...or perhaps as a result of a pandemic (think about Covid19)?
 - If retrenchment cover claims are excessive, was it perhaps as a result of a downturn in the economy?
 - Were there any single large claims...
 - ...e.g. an executive dying in an accident?

- If there were very large claims, were these subject to underwriting at inception?
- Has there been a significant change in mix of claims causes that might signal an emerging trend...
- ...or indicate a risk of fraud?
- Were there any adjustments made to reserves on disability claims in payment from previous years?
- Did any changes in the reinsurance structure have an effect?
- Perhaps BetaLife paid large claims that would previously have been reinsured.
- Has there been any changes to the claims underwriting process that is causing fraudulent claims to pass through?
- Investigating whether there is any reason to believe that this is just random fluctuation.