Actuarial Society of South Africa

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Subject A301 — 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.

GENERAL COMMENTS

Students generally performed much better on this paper than Paper 1.

QUESTION 1

Examiner's comments:

Many students missed the crux of the question – share price depends upon expectations of future profits. The question was thus answered very poorly. Many students failed to realise that the company in question was a retailer. Many students clearly did not even understand what a retailer is (the question even provided an explanation though students really should know this!). There were a lot of general comments about demand and supply which did not relate to the specifics of the question.

Essentially it is investors' expectations of future corporate profitability and the value of those profits which largely determines the general level of the equity market.

Potential reasons therefore include:

- Future profitability is uncertain (both level and riskiness) given the fraudulent activity, and hence might be lower than previously reported.
- Credibility of top management has been lost, and the market might take a negative view on future profitability as a consequence.
- Overall reputation of the company has been affected, which might impact the future sales and growth of the company.
- Dealing with the consequences of the allegations, investigations, media publicity, etc. might increase or introduce unforeseen expenses for the company.
- Fraudulent activity might result in regulatory or other penalties, and hence reducing future profitability levels.
- Dependent on the extent of the fraudulent activity, the company might become insolvent.
- Given the credibility (and impact on riskiness of company), the cost of raising capital or cost of borrowing might increase in future, which will negatively impact future profitability.
- Credit rating downgrade may follow which might increase the borrowing costs or might influence investor's decisions to buy the shares

QUESTION 2

Examiner's comments:

This was a bookwork question which was handled well by well-prepared candidates.

i.   Corporate governance refers to the high level framework within which managerial decisions are made in a company.

ii. The aim of good corporate governance is that a company should be managed in order to best meet appropriate requirements of its stakeholders – the shareholders, employees, pensioners, customers, suppliers and others who may be affected by the company's operations whilst not having any contractual relationship with the company at any time.

Good corporate governance therefore aims to avoid that management might make decisions based more on their own personal interests than on those of relevant stakeholders.

iii. The role of the non-executives in corporate governance is to:
– provide an impartial view and represent the shareholders' interests;
– play a leading role in setting the remuneration for executive directors' pay; and play a leading role in the audit committee, e.g. in relations with external auditors with no members of the executive present.

QUESTION 3

Examiner's comments:

This question was purely book-work and overall, candidates scored well.

(i)

- *Many candidates included decisions of the underwriting process, which was required in (ii), in this question*
- *Many candidates missed out risk-classification, which is needed to form a homogenous group of lives on which to price and offer cover to.*
- *Credit was given where candidates mentioned either identification of unhealthy/substandard risks or offering special terms (ideally, both were required, for a half-mark)*

(ii)

- *Many candidates mentioned secondary uses of underwriting data e.g. marketing information, experience investigations etc.*
  Marks were not given for these.
  The question specifically needed uses of underwriting related to issuing a policy
- *Marks were awarded for candidates who mentioned risk-sharing arrangements*

i.

1. Risk classification – you want to get a homogeneous group of policyholders

2. Reduce anti-selection

3. Ensure the pricing reflects the risk you're taking on

4. To offer terms to unhealthy lives (who you might have declined otherwise)

ii.

1. Issue the policy at standard rates
2. Decline the risk
3. Defer a decision (for instance to get more medical information or for a period of time)
4. Load the premium that the policyholder will pay
5. Place an exclusion on the policy for one or more reasons
6. Offer a reduced amount of benefit (or offer a different policy type)

QUESTION 4

Examiner's comments:

This was a pure bookwork question with a generous amount of points available. Not well answered with only a few students knowing the topic well enough to score highly. Most students were able to state the three stages but offered unclear or unrelated points for each stage. Many students went into detail of how assumptions are derived, or how to identify and quantify risks, which was not asked for. In monitoring experience, a lot of students did not appear to have a firm grasp of the iterative nature of the control cycle.

Define the problem

- analyse the risks of the various stakeholders
- set out the problem from the point of view of each stakeholder
- consider strategic courses of action that could be used to handle the particular risks in question
- assess the risks faced and how they can be managed, mitigated or transferred
- analysis of the options for design of plans that could be considered

Develop the solution

- examination of the major actuarial models in use and how they could be adjusted to solve the particular problem
- selection of an appropriate model to use for the problem (or construct a new one)
- consider and select the assumptions to be used
- understand the sensitivity of the results to the assumptions
- interpreting the results of the modelling process
- consider the implications of the model results on the overall problem
- consider the implications of the results for stakeholders
- determining a proposed solution to the problem
- consider alternative solutions
- formalize a proposal

Monitor the experience

- monitor the experience and feedback into the problem specification and solution development stages
- identify any causes of any departure from the targeted outcome from the model and whether such departures are likely to recur

QUESTION 5

i.

Liability hedging is where the assets are chosen in such a way as to perform in the same way as the liabilities.

ii.

- a) A single cashflow is payable upon the policy maturity date, and the value is known with certainty in advance.
- b) Full liability hedging is possible as the liability is fixed and certain.
- c) The liability can be backed with a zero coupon bond as a single cashflow (certain in timing and size) is known upfront

iii.

- a) The liability payment is not known in timing (surrender can occur at any time), but the amount is well-defined to be in line with the index. A lump sum payment is therefore payable upon surrender or maturity date equal to the premiums received increased in line with the relevant index.
- b) Full liability hedging should be possible as one can either invest in the index (if available), or utilise replicating techniques to replicate the index.
- c) The backing assets would either be the index itself, or a range of equity assets that replicate the relevant index.

iv.

- a) A series of income payments are payable as long as at least one of the lives insured are alive. There is typically a minimum income payable, and this regular income can increase depending on the profits that emerge (and dependent on whether investment, mortality and/or expense profits are shared).
- b) Full liability hedging will not be feasible given the uncertainty of the cash flows, and hence approximate liability hedging will be more appropriate.

    OR

    One can potentially utilise full liability hedging for the minimum income payments, and incorporate approximate liability hedging for the remaining portion of liabilities.
- c) Given the minimum income profile, one would expect fixed income assets to back this portion of the liability. Policyholders can reasonably expect a real increase over time, and the remaining assets might therefore be invested in real assets (equities, property, or combination) in order to establish a real expected return over time.

QUESTION 6

Examiner's comments:

This was a book work question which students did well on. There were a few students that did not perform well because they had limited book work understanding. In general students that followed a structured approach of a heading plus an example for part ii did well. Some students tended to forget to use practical examples using the information in the question.

i.

- A general insurer takes on risks in return for a premium…
- …because in doing so they can combine or pool many risks together…
- …which means that there is greater certainty in the future payments they are likely to have to make on the occurrence of an insured event.
- …they also can pool with other risks and therefore get the benefit of diversification
- … they may also just have a much better understanding of the risk
- Combined with the availability of capital…
- …an insurer is much less exposed to the financial loss from a single risk event happening…
- …than an individual would be facing it without insurance.
- Another way of viewing it is that the perceived cost to the individual of the risk event…
- …is more than the cost at which the insurer will accept it.
- …hence creating a market satisfying both parties.
- They will also be able to pass on risks to other markets (eg. Reinsurers) which individuals will not be able to access

ii.

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

- Only the owner of the livestock can be a policyholder
- Cannot insure your neighbour's livestock!

A risk must be of a financial and reasonably quantifiable nature

- The insurance company may insist on attaching an insured amount to each animal, as opposed to replacing it
- Only cover the animal and not the value of its future offspring

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

- The insured amount can be limited to what the farmer paid for the livestock
- The use of market (or auction) prices when settling claims

Individual risk events should be independent of each other.

- Accumulations of risk such as national pandemics can be excluded

– Certain illnesses can be excluded

The probability of the event should be relatively small

- Only animals below a certain age are insured
- Death due to slaughter excluded

Large numbers of potentially similar risks should be pooled in order to reduce the variance and hence achieve more certainty

- Minimum number of animals to be insured on the policy
- Discounts for larger policies

There should be an ultimate limit on the liability undertaken by the insurer

- Limits on maximum insured amounts and/or claim payouts

Moral hazards should be eliminated as far as possible because these are difficult to quantify

- Exclude any intentional harm done to the animal by the policyholder
- Impose a waiting period before cover commences

There should be sufficient existing statistical data / information to enable the insurer to estimate the extent of the risk and its likelihood of occurrence

- Only cover / event perils for which reliable statistics are available / published

QUESTION 7

Examiner's comments:

Overall: The question was not a difficult one, but many students failed to tailor their solutions to the scenario given and, as a result, lost marks. There were also a surprising number of students who disregarded the questions' verbs and mark allocations, either writing too much or far too little. There is some very clear exam technique issues which cost the students dearly. Overall, scores were average on this question, but below what I had expected.

Part (i): Applied bookwork, with a wide range of possible answers that were awarded marks, so students tended to score well. Many wrote long sentences and paragraphs, squandering precious time they would have certainly needed elsewhere in the paper.

Part (ii): This question was not as well-answered as part (i) with a poor to average mark range. There were some easy pickings related to the canons of lending (Character & ability, purpose and amount, etc.) and most students got these marks. However, most candidates failed to apply these and to expand on them and make sufficient distinct points under each heading to score well. Other students disregarded the "outline" verb and merely listed items (many irrelevant or requiring a brief explanation to show understanding), thus losing marks.

i.

- To alleviate new business strain
- To improve the solvency position of the company
- To fund additional marketing
- To fund the launch of a new product
- To enter/expand into new markets/territories etc.
- Employ additional staff
- Finance capital expenditure such as systems
- To buy another company
- Cushion against unexpected events
- Invest more freely

ii.

- Research the character and ability of the company
    - The experience/competence of management
    - Company credit rating
- Consider whether your firm would want to be associated with Delta Life.
- Consider the level of risk associated with this company…
- …especially since it is *small*, there might be capital constraints in the company…
- …or a lack of diversification.
- How much is your firm expected to finance relative to other firms in the market?
- Is the amount being borrowed commensurate with the purpose for which it will be used?
- What is the current solvency position of the company?
- What is their current gearing position?
- What are their growth prospects?
- Consider the robustness of their current strategy
- If any past credit defaults have taken place
- Where will this debt rank relative to existing obligations?
- How likely is the finance to be repaid?
- Will the debt be secured by any assets…
- …or will any security or guarantees be provided?
- How does the proposed yield compare to any other opportunities in the market?
- Is the risk commensurate with the expected yield?
- Will this investment add to the diversification of your firm's existing assets?
- The placement is private, so hence the debt may not be very marketable

QUESTION 8

i.

Advantages:
1. Reduces claims volatility (which leads to smoother profits)
2. Reduces capital requirements
3. Can write more business for the same capital
4. Increased capacity to write larger risk
5. Reduces the risk of insolvency
6. Get access to the reinsurers expertise

Disadvantages:
1. Reinsurer wants to make a profit and hence there is a cost to reinsure
2. Adds administration complexity
3. Introduces legal risk / operational risk
4. Reinsurer might place restrictions on what you can write
5. Introduces credit / default risk

ii.

a.   An insurance or reinsurance company that passes (or cedes) a risk to a reinsurer.

b.   A company's retention is the amount of any particular risk that it wishes to retain for itself.

c.   A type of proportional reinsurance where the cedant retains the risk up to its retention level and reinsures the excess.

iii.

ART is a means to transferring risk other than using traditional reinsurance. It produces tailor-made solutions for risk transfer that the conventional market (such as reinsurance) would regard as uninsurable.

iv.

Discounted Covers

- general insurance companies usually calculate the value of liabilities (for instance outstanding claims) without allowing for discounting
- discounted covers is therefore a form of reinsurance where the premiums are calculated based on the discounted value of the outstanding claims
- it means the insurer can remove the undiscounted liability from their balance sheet but it only costs them the discounted value + reinsurers margin to do so
- it thus releases capital and improves solvency

Integrated Risk Covers

- these are generally multi-year, multi-line reinsurance covers
- they are typically still arranged between insurers and reinsurers
- it saves significant time and effort as the terms don't need to be renegotiated each year
- the main value is that they give greater stability of results over a long time

Securitisation

- this is the transfer of insurance risk to the banking and capital markets
- it is often used to managing the risks associated with catastrophes as the financial markets are large and capable of absorbing catastrophe risk
- the rationale is that insurance catastrophe risk is not correlated with market risk

- the main reason insurers consider it is because there is limited capacity for cat risk in the insurance/reinsurance market

Post Loss Funding

- this is a way of raising capital to cover losses from a risk after the risk event has happened (generally causing losses)
- it is usually negotiated in advance of a loss occurring but is done on a guaranteed basis
- a commitment fee is paid to ensure that funding will be available post a loss being incurred
- the main benefit is that the commitment fee is lower than the cost of insuring and therefore it appears cheaper

Insurance derivatives

- these are derivatives set up with underlying catastrophe or weather options
- they are used particularly in sectors such as energy or utility which have a real risk of being adversely affected by natural disasters
- the majority of the market for such derivatives is over the counter
- the main benefit is to get cover for events that might not be available in the open insurance market

Swaps

- organisations with matching but negatively correlated risks can swap packages of risk so that each organization has a greater risk diversification
- they can be set up between non-insurance organisations with opposite risks
- they could also swap uncorrelated risks as that does provide some diversification benefit

QUESTION 9

Examiner's comments:

Part (i) was generally well answered, although some candidates had difficulty in isolating investments risks and focussed too many comments on issue surrounding longevity related risks. Students generated many valid ideas under part (ii) and received credit. Many students made the comment that the company cannot afford the liability and hence need to pass it on, but this had to be framed carefully, because any transfer to a life company would involve a fair cost to be paid, which may also then be unaffordable.

Part (iii) was well answered, but a lot of candidates still just wrote down theory that was either not applicable or needed to be applied to the situation at hand. The main focus was around how one could construct a discounted cash flow model of expected future benefits. A lot of comments around assessing goodness of fit or sourcing a model were of little relevance here. The fact that the question alluded to a "few hundred" pensioners should have made it clear that it would be feasible to calculate individual liabilities and the better candidates recognised this. A large proportion of candidates missed the fact that the life company would also incur expenses as well as make a profit and hence need to include margins for this. There was a requirement to articulate the important basics of this model itself well, before getting into too many peripheral comments on models in general.

Part (iv) saw most candidates recognising the inflation, investment and longevity risk, but some did not elaborate on the direction of the movement which was required since the question did indicate

"downside" risk specifically. In order to evaluate downside risk, you also need to compare any scenario to the one used for pricing, likely a realistic, best estimate scenario.

i.

- Uncertainty over the level and incidence of income
- Uncertainty over the level and incidence of capital
- Reinvestment risk…
- …arising from mismatching of assets and liabilities
- Default risk
- Tax and expenses risk
- Opportunity cost of capital
- Inflation erosion of value
- Liquidity risk
- Lack of diversification

ii.

- Simplify the administration of the pension fund
- …and hence reduce the costs/expertise required to administer these benefits…
- Remove the uncertainty around longevity risk
- Remove the uncertainty around the investment risk
- Possibly reduce / simplify the liabilities of the company…
- …perhaps with a takeover or public listing in view.
- Allow Zeta to focus on their core business
- There might be an opportunity to transfer the liabilities for less than the current assets backing them…
- …and hence unlock some capital, especially if the scheme was valued conservatively.
- May have been an instruction from the trustees to investigate such a transfer.

iii.

The purpose of the exercise would be to derive the amount at which the life office **can profitably assume** responsibility for the existing future obligations.

Collect, group and modify the membership data, both active and deferred.

- Age and gender
- Current level of income benefit…
- …as well as information on the medical scheme premium / plan
- Current % medical scheme premium subsidy
- Possibly marital status of the pensioner
- Information on the timing, level and nature of the deferred members' benefits

Assumptions to be made include

- A mortality basis for annuitant/pensioner mortality would be required
- …ideally one would like to have some idea of the historic experience of the scheme itself…
- …and use this to perhaps make adjustments to a standard / industry table
- Mortality of the deferred members pre-retirement
- Possibly include a mortality improvement assumption if required
- % married might be required (as well as other assumptions around the joint life dynamics)
- A discount rate will be required (possibly even a term structure of interest rates)
- …which may be informed by the types of assets the company intends to invest in to back these liabilities.
- Given the inflation linked benefits a view of inflation is also required…
- …or alternatively a real discount rate may be used.
- An assumption is also required around the future increases of the medical scheme contribution.
- An assumption around the cost of upfront expenses to take over the liabilities as well as…
- …recurring expenses in administering the benefits.
- One would need to include a margin for profit…
- …as well as margins for uncertainty in some of the assumptions.

The model

- The form of the model is most likely an expected cashflow model…
- …that assigns a probability to each payment being made using the mortality assumption…
- …as well as estimates the expected amount to be paid at that time…
- …and then discounts it back to the date of the valuation.
- The frequency of payments modelled should correspond to the contractual obligation itself.
- Given the number of members is not excessive…
- …one can calculate a EPV for each member on its own as opposed to model points…
- …and aggregate all the members' EPV at the end to arrive at a value.
- It would be good to test for sensitivities around the most important assumptions.

iv.

- One would first need the base, best estimate scenario to use as a reference point…
- …in other words, one would require the most likely amount required to take over the arrangements.
- Other scenarios would then be measured against this to show potential losses or profits.

Likely scenarios to consider include

- Lower than expected mortality
- Low nominal rates of return on investment

- Low real rates of return on investment
- High medical scheme premium inflation
- High inflation rates impacting expenses etc.
- Significant underestimation of expenses.