EXAMINERS' REPORT

June 2020 examinations

Subject F103 — *General Insurance*
Fellowship Principles

INTRODUCTION

The attached report has been prepared by the subject's Principle Examiner. General comments are provided on the performance of candidates on each question. The solutions provided are an indication of the points sought by the examiners, and should not be taken as model solutions.

QUESTION 1

i. a. Cover: R50m XS R30m
        Recovery: R70m – R30m = R40m
        Reinst. Prem.: $4/5 \times (150\% \ (R10m)) \times 9/12$
                        $= R(0.8 \times 15 \times 0.75)m$
                        $= R9m$

    b. Cover has been fully reinstated to R50m XS R30m for the remaining 9 months.
        Recovery: Full R50m in layer
        Reinst. Prem.: $1/5 \times (150\% \ (R10m) \times 6/12$
                        $= R(0.2 \times R15m \times 0.5)$
                        $= R1.5m$

    c. Cover: R10m XS R30m for the remaining 6 months.
        Recovery: R10m, the remainder in the layer
        No reinstatement premium as no further reinstatement is available.

ii. Net premiums   = R2000m – R400m = R1600m
    Expected claims   = 75% of R1600m = R1200m
    Actual net claims = R2600m – R600m = R2000m
    Stop Loss cover: 80% of net claims between 125% & 175% of expected claims
                      = 80% of net claims between R1500m & R2100m
    Stop Loss recovery = 80% of (R2000m – R1500m)
                       = R400m

iii. UGO's type of business can be deduced as follows:

   - UGO has experienced several claims in the range R70m to R100m in the first year considered.
   - UGO is considering a surplus treaty with a retention limit of R100m, suggesting it plans to write significant business with sums insured in excess of R100m.
   - The 9 line Surplus treaty means that UGO can write business with sums insured up to R1000m.
   - Surplus reinsurance suggests potentially large claims from heterogeneous risks.
   - Surplus cover is better suited to property insurance as opposed to liability insurance, as it does not cap large losses. As UGO will have no excess of loss cover it is not likely to be specialising in liability insurance.
   - The presence of the Stop Loss suggests that cover is required to protect against things such as accumulations or risk on the portfolio.
   - Stop Loss (being expensive) is only sensible for an insurer whose claims outcomes are highly uncertain.
   - A reinsurer would only offer large stop loss cover if it believed the poor experience was not due to poor underwriting, but due to unusual events.
   - Based on the above UGO may specialise in something such as crop insurance.
   - Marine or aviation property (but not liability) cover is also a possibility.
   - Commercial property is possible, but less likely owing to the Stop Loss cover.

Overall this question was reasonably well answered by the majority of candidates.

Parts (i) and (ii) were relatively straightforward and standard calculations. Many candidates scored full marks for these parts. Some candidates, however, showed a poor understanding of the concepts. Some candidates failed to show sufficient details in their calculations. Some lost marks for omitting currency or units.

Part (iii) was not answered in sufficient detail by most candidates.

QUESTION 2

Criteria for a risk to be insurable:

- The policyholder should have an interest in the risk being insured.
  This is to distinguish between insurance and gambling.
- The risk should be of a financial and reasonably quantifiable nature.
  This means the insurer can determine how much to pay out in the event of a claim and how much risk is being accepted so as to determine a price.
- The amount payable by the insurance policy in the event of a claim should bear some relationship to the financial loss incurred.
  This is so that the principle of indemnity holds.
- Individual risk events should be independent of each other.
  This is so that there is a spread of risk and to limit concentrations.
  This will also make the estimation of the extent of the risk easier.
- The probability of the event should be relatively small.
  This is because an event that is nearly certain to occur is not conducive to insurance.
- There should be a large number of similar risks which can be pooled.
  This is to reduce the variance of the average claim size and hence achieve more certainty.
- There should be an ultimate limit on the liability undertaken by the insurer.
  This would help the risk event meet the above criteria that it must be of a reasonably quantifiable nature i.e. so the insurer knows what they are liable to pay out in claims.
- Moral hazards should be eliminated as far as possible.
  These situations are difficult to quantify, result in selection against the insurer and lead to unfairness in treatment between one policyholder and another.
- There should be sufficient statistical data/information available.
  This will enable the insurer to estimate the extent of the risk and its likelihood of occurrence.

Overall, as was anticipated, this bookwork question was answered well by most candidates.

QUESTION 3

Key factors to monitor:

- The rate change that was adopted on renewal of policies, allowing for changes in:
  - ➢ Exposure;
  - ➢ Policy conditions; and
  - ➢ Cover provided.

- Portfolio movements.
  - ➢ These can be split by class, policy cover or risk group.
  - ➢ The following movements can be monitored:
    - ▪ Lapse rates / Renewal rates;
    - ▪ New business;
    - ▪ Not taken up / Strike rates;
    - ▪ Mid-term cancelations; and
    - ▪ Endorsements.

- Business mix in its portfolio, which is important for cross subsidy assumptions.

- Quote volumes as an indication of the effectiveness of:
  - ➢ Marketing;
  - ➢ Sales staff training;
  - ➢ New intermediaries; and
  - ➢ Systems.

- Profitability and persistency by source (distribution channel). Sources could include:
  - ➢ Direct sales;
  - ➢ Salaried staff;
  - ➢ Brokers;
  - ➢ Banks or other intermediaries; or
  - ➢ Other insurers (e.g. reciprocal arrangements).

- Any assumptions made in pricing policies such that assumptions can be updated if necessary (as part of the actuarial control cycle), for example:
  - ➢ Expenses;
  - ➢ Reinsurance premiums and recoveries.

- Other relevant points:
  - ➢ Loss ratio monitoring.
  - ➢ Profit margin, to monitor adequacy of premium rates.
  - ➢ Competitor/market comparison.

This question was generally not well answered. Several candidates focused on claims experience monitoring rather than policy experience monitoring, resulting in low marks. Some candidates provided lengthy definitions and detailed descriptions of terms, which were not asked for. Candidates who provided the widest range of points scored best.

QUESTION 4

i. Employers' liability benefits:

- This insurance indemnifies the insured employer against legal liability to compensate an employee or his/her estate for bodily injury, disease or death suffered, owing to negligence of the employer in the course of employment.
- Loss of or damage to employees' property is usually also covered.
- The benefit can be in the form of regular payments (to compensate for disabilities) or lump sum payments (to compensate for permanent injuries).
- Legal costs will be covered, and other costs (e.g. care costs) may be included.

ii. Suitability of current assets:

- The nature of liabilities is a key determinant of whether assets are suitable for matching:
  - ➢ Employers' liability claims are linked to various forms of inflation:
    - ▪ Claims for loss of earnings are linked to wages inflation;
    - ▪ Claims for medical and nursing costs are linked to medical inflation;
    - ▪ Claims for pain and suffering are linked to judicial inflation;
    - ▪ Property damage claims are linked to CPI and wages inflation;
    - ▪ Inflation of legal costs.
  - ➢ Claim term can vary depending on the type of claim:
    - ▪ Small injury and property damage claims are likely to be reported and settled quickly (a few weeks to a few months).
    - ▪ Large claims involving death, disability and serious illness be much longer tailed (i.e. several years):
      - • Some claims may not be reported for many years if the illness/disease develops over a long time;
      - • Settlement may take long due to the need to establish the impact of the illness and the legal process may be lengthy.
  - ➢ Claims are likely to be settled in local currency.
  - ➢ Claim uncertainty and variability depends on the type of claim:
    - ▪ Small injury and property damage claims are likely to have a higher claim frequency and claim amounts are more certain;
    - ▪ Large claims involving death, disability and illness are less frequent and amounts can be highly uncertain;
    - ▪ Claim frequency and amounts can be more uncertain if there is a possibility of accumulations;
    - ▪ The absence of reinsurance increases uncertainty and hence the need for matching to eliminate mismatch risk.
- Characteristics of cash:
  - ➢ Cash returns are loosely linked to CPI, however there is no guarantee of a positive real return.
  - ➢ Cash returns are expected to be lowest of all of the asset classes.
    - ▪ As most instruments are government-issued, risk of default should be low but this will result in a low expected return;

- - This makes cash unsuitable for matching long-tailed claims linked to higher-than-CPI inflation.
  - ➢ Cash is highly liquid and offers stable market values.
    - - This makes cash suitable for meeting short-term claims and other short-term outgo (e.g. expenses).
- The solvency level of the insurer is also a determinant of whether cash is suitable:
  - ➢ Small free assets (relative to required capital requirements) generally requires a reduction of risks:
    - - Closer matching of assets and liabilities (which is not the case here);
    - - Depending on statutory solvency rules, it may require greater investment in assets with stable asset values (such as in this case);
    - - Being unlisted, the insurer may struggle to raise capital after adverse experience, requiring prudence and protection of solvency and close matching.
- While cash may be suitable for matching a portion of the liabilities (mainly short-term liabilities) it is unsuitable for longer-tailed claims.

iii. How the insurer could use an ALM:

- The insurer will need to define its objectives very clearly, specifically:
  - ➢ How is solvency to be measured:
    - - Based on the value of assets and liabilities and statutory vs realistic basis, or
    - - Based on not having liquidity to meet outgo.
  - ➢ What level of solvency is regarded as insolvency (breach of statutory solvency margin, minimum capital margin, or when liabilities exceed assets).
  - ➢ The period over which solvency is to be measured, and frequency of measurement.
  - ➢ The acceptable risk tolerance, which could be measured in terms of probability of insolvency, average shortfall given insolvency, etc.
  - ➢ Whether to include new business or not.
- Model parameters will need to be selected:
  - ➢ For assets these include moments of return distributions and correlations between asset returns.
  - ➢ For the liabilities these include various forms of inflation.
  - ➢ Liability model should include claim distributions for attritional, large and catastrophe claims.
  - ➢ Model inputs include the level of premium rates, volumes, expenses, taxes.
- Projections will need to be made using the ALM and outputs measured:
  - ➢ Future pseudo income statements and balance sheets are projected from which solvency level can be measured.
  - ➢ Start with the current position of no reinsurance and cash.
    - - Run the model to create many scenarios thus measuring the proportion of scenarios that lead to insolvency and expected solvency level.

- Run the model again after altering the reinsurance arrangements and investment strategy and measure the probability of insolvency and expected solvency levels associated with each combination of reinsurance and investment strategy.
- This process is repeated until an optimal combination of reinsurance and investment strategy are found that produces the same insolvency risk as the current arrangement but with higher expected solvency.
- The cost of reinsurance may be too high (e.g. due to the reinsurance cycle being in a hardening phase) to find a combined reinsurance and investment strategy that meets the requirement; the insurer then needs to find a combined reinsurance and investment strategy that either maximises the projected mean solvency level for an acceptable risk of insolvency, or minimises the risk of insolvency for an acceptable mean solvency level.
- Model output should be tested for robustness:
  - Output should be tested by varying input parameters.

Part (i) was bookwork and was generally answered well.

Part (ii) was a standard investment application question, and this too was answered well in general. Almost all candidates summarised the characteristics of the liabilities quite well, but then some candidates did not link these to the characteristics of cash, and discuss the suitability or otherwise of cash for employers' liability insurance.

Part (iii) was not answered well, with most candidates not answering the question asked and many instead wrote about what ALM is. Most candidates were not able to explain how both reinsurance and investment strategies could be tested together in a stochastic ALM exercise.

QUESTION 5

i. The effective burning cost premium is defined as the actual cost of claims during a past period of years expressed as an annual rate per unit of exposure.

Method 1: using number of policies as exposures

$$EBCP = \text{(Total Claims) / (Total Exposed to Risk, i.e. total no. of policies)}$$
$$= R164m / 41100$$
$$= R3990 \text{ per policy}$$

Method 2: using Sums Insured as exposures

$$EBCP = \text{(Total Claims) / (Total Exposed to Risk)}$$
$$= R164m / R19350m$$
$$= R0.008475 \text{ per R1 sum insured}$$

ii. The indexed burning cost premium is defined as the actual cost of claims allowing for past inflation and IBNR during a past period of years expressed as an annual rate per unit of exposure.

Method 1: using number of policies as exposures

$$
\begin{aligned}
\text{IBCP} &= \text{(Total inflated Claims + IBNR) / (Total Exposed to Risk)} \\
&= \text{R}(195 + 80)\text{m} / 41100 \\
&= \text{R}275\text{m} / 41100 \\
&= \text{R}6691 \text{ per policy}
\end{aligned}
$$

Method 2: using Sums Insured as exposures

$$
\begin{aligned}
\text{IBCP} &= \text{(Total inflated Claims + IBNR) / (Total Exposed to Risk)} \\
&= \text{R}(195 + 80)\text{m} / \text{R}19350\text{m} \\
&= \text{R}275\text{m} / \text{R}19350\text{m} \\
&= \text{R}0.014212 \text{ per R1 sum insured}
\end{aligned}
$$

iii.
$$
\begin{aligned}
\text{Credibility Premium} &= Z \times \text{IBCP} + (1\text{-}Z) \times \text{Book Rates} \\
&= 0.8 \times 14212 + 0.2 \times 16500 \\
&= \text{R}14670 \text{ per R1m SI}
\end{aligned}
$$

Adjusting for the 50% quota share, adding the profit and expense margin and multiplying by the new sum insured for 2020 gives:

$$
\begin{aligned}
\text{Reins. Premium} &= (0.5 \times \text{R}14670 \times (1 + 10\% + 5\%)) \text{ per R1m} \times 4500\text{m} \\
&= \text{R}37.959\text{m}
\end{aligned}
$$

iv. In addition to the attritional claims experience, the premium should also reflect the expected loss due to catastrophes and other large claims.

We often remove these claims from the base attritional data to enable a reliable analysis. However, we should still reflect the actual (expected) cost of these claims in the premium. We can estimate the required loading from the insurers own data, provided sufficient experience is available. Alternatively, we can use external data for such claims, or a catastrophe model.

Unless the particular class of business is new, we would have a "feel" for the relative frequency of unusually large claims or catastrophes. If we know that we generally experience a few freak claims each year, our premiums need to allow for these. Such claims should not be removed from the base values (although they should perhaps be truncated and the excess re-spread over the whole portfolio).

Similarly, if there were no exceptional events in our base period, we might decide to load the base values to allow for the fact that such events do tend to occur every n years or so.

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If using a catastrophe model, the insurer can submit its risk profile (the specific risks, sizes, locations *etc*. of policies on its books) and for the model to assess the loss to the insurer's portfolio if catastrophe events occur. The model output will include catastrophe events of different severity with their associated probabilities and loss to the insurer. Thus, we usually omit catastrophe claims from the premium analysis because they are modelled separately, and an explicit loading is then applied to the premium.

Several approaches are possible for large individual (non-catastrophe losses):

- We can omit them from the analysis and allow for them separately in the risk premium (basic loading percentage)
- We can truncate large claims at a set point and spread any cost above this level across the larger portfolio of risks
- We can leave large claims in the data, although we rarely do this because this would implicitly assume that future occurrences will replicate those seen in the past.

Parts (i) and (ii) were generally well answered by most candidates. Some candidates confused IBCP and EBCP and included IBNR as part of EBCP. There were two parts to the question, namely define and calculate. Some candidates left out the define part.

Part (iii) was not well answered by the majority of candidates. A number of candidates simply left this question out or did not apply the credibility premium formula correctly. The question also asked for the reinsurance premium, and a number of candidates did not apply the 50% quota share factor correctly.

Part (iv) was answered well by the better prepared candidates. Several candidates did not attempt this question and some focused on other factors to consider rather than what needs to be considered with respect to catastrophe and other large claims and how these could be dealt with as asked in the question.

QUESTION 6

i. Risks faced and appropriate insurance products:

Loss of business income:

- This is due to the stores being forcefully closed by the local governments which would result in loss of income as All In Suppliers would not be able to conduct its business as usual. (Or from having to destroy perishable product that cannot be distributed before sell-by dates.)
- Business interruption cover could have been purchased to mitigate this risk.

Financial loss due to travel cancellations:

- As all flights have been cancelled, there is a risk that the flight cancellations result in loss of money paid on travel arrangements to the affected countries.
- Travel insurance cover could have been purchased to cover cancelled travel.

Financial loss resulting from default of debtors:

- Owing to the retailers being shut down, they would be expected to experience a loss in revenue and consequently losses in profits. The risk of default of these retailers on goods purchased on credit is likely to increase.
- Trade Credit insurance could mitigate such losses.

Financial loss from claims of third parties:

- As All In Suppliers is a large supplier of chocolates, many of its staff would have contact with employees at the retailers that it supplies to. Consequently there is a risk that the employees of All In Suppliers act as carriers of the pandemic.
- Public Liability insurance could mitigate the risk.

Financial Loss from claims of Employees:

- Converse to the above, All In Suppliers employees could also increase their risk to infection as a consequence of exposure to their customers.
- Employers' Liability insurance would mitigate this risk.

Financial loss due to event cancellations:

- Due to the possibility of the introduction of other stringent measures of local authorities, any events such as marketing campaigns may need to be cancelled with losses incurred as a result.
- Events Cancellation cover could mitigate this risk.

For each of the above, Legal Expense insurance could also have been purchased, where the policy will pay any legal expenses as a result of legal proceeding being initiated against All In Suppliers or All In Suppliers needing to initiate legal action against another party.

ii. Appropriate mitigation actions

a. Higher claims than expected:

- Insurer Inc. can reduce future exposure to the pandemic for new business written by reducing new business volumes.
- It could also do this by imposing policy limits on new business.

- Insurer Inc. can increase exposure to lines of business that are expected to perform better in light of the pandemic.
  - For example, Property products are expected to have a lower claims experience given many businesses would be closed.
- Sponsor awareness campaigns and prevention treatments to assist in reducing the spread and hence impact of the pandemic.
  - This may feed through to lower insurance claims payments.
- Insurer Inc. can impose stricter claims handling procedures at claims stage to critically assess whether it is liable for payment.

b. Falling equity markets:

- Invest in hedging strategies by means of derivatives or cash to offset exposure to the falling equity market.
- Invest in alternative investment classes that are expected to increase in light of falling equity markets such as government bonds and gold.
- Reduce exposure to equities that are likely to be more affected by the pandemic, for example airline companies, and increase exposure to those that would be expected to increase, for example, pharmaceutical companies.
- Improve matching to foreign currency exposures by ensuring assets in foreign currency are held to match liabilities that may be due.

c. Interruption to business as usual:

- Set up systems that would enable staff to work remotely where possible and that are capable of monitoring productivity, to ensure that operations and development (e.g. new products, new systems) continues uninterrupted.
- Taking out Cyber insurance would be essential.
- Set up and create awareness of online distribution channels and increase sales through that platform.
- Where possible, redirect staff into alternative roles to brainstorm and execute on areas of the business where expenses can be reduced or sales could be increased once business as usual commences.

Part (i) was not well answered. Many candidates speculated and implied restrictive measures that were not present in the question. Most candidates identified the financial loss owing to loss of business income and consequential purchase of business interruption cover to mitigate this risk. A few candidates did not understand the difference between debtors and creditors when identifying the risk of default of All In Suppliers' debtors.

Part (ii) was poorly answered. Many candidates did not answer the question posed, while others provided impractical risk mitigation actions. Specifically, the interruption to business as usual part of the question was only looked at from the perspective of setting up work from home procedures for employees.

QUESTION 7

i. Adequacy of the claims reserves (amounts in Rm):

Insurance class	IBNR %	Published IBNR	Published Claims reserve (1)	Claims reserve at 75th percentile (2)	Adequacy of claims reserves
Household Contents	10%	13	21	14	7
Motor	15%	37.5	217.5	214	3.5
Total		50.5	238.5	228	10.5
		IBNR % × 2019 earned premium	IBNR + case estimates	Ultimate claims at 75th – claims paid to date	(1) – (2)

Claims reserves for Household Contents have a surplus of R7m and Motor has a surplus of R3.5m relative to the 75th percentile.

ii. Reasons why reserving policy may result in excessively prudent reserves:

Holding claims reserves at the 75th percentile for each class of business separately ignores any diversification benefit between classes of business. Allowing for a diversification benefit will reduce the level of claims reserves

Third party recoveries represent positive cash flows from an insurer's perspective, thus allowing for these will reduce the claims reserves.

The claims reserves are booked at least at the 75th percentile, which could be seen as too conservative. This depends on the general level of prudency seen in the market taking into account any applicable legislation.

The reserving percentages are based on the previous year's actuarial exercise and so may be out of date. Reserves could be too prudent if the average run-off decreased compared to the previous year.

iii. Three key issues to consider when performing stochastic reserving:

Model Forms:

- There could be mismatches between the types of model and the data to be used.
- For example, for lognormal models negative increments should be ignored.
- For the ODP model the development factor across all development periods needs to be greater than 1.
- Data adjustments can be made to overcome these challenges, alternatively different models should be used for example the Mack model.

Sparse data and particularities:

- Data issues such as sparse data, erroneous or missing data can be problematic for stochastic reserving. This is especially relevant given that the company only has 5 years of historical claims data for reserving.
- Small changes in numbers can lead to significant changes in the distribution of outcomes.
- Actuarial judgement is required when coping with peculiarities in the data.
- Ensure all data is reconciled to independent sources.

Determining extreme values in the tail:

- Parametrising the claims distribution is based on a finite amount of historical data. This may not be sufficient to parametrise the tail of the distribution.
- Approximate assumptions made for the bulk of the distribution may not be valid in the extremes of the distributions.
- Actuarial judgement may overcome these challenges, together with the views of the underwriters.

Claims not in the reserving data:

- Stochastic reserving uses past data to derive predictive claims distributions. Latent claims and other unexpected claims not included in the data will thus not be allowed for in the calibration of the predictive claims distribution, even though these may occur in reality. This may underestimate the true level of volatility.
- Subjective judgement, which may include explicit margins or benchmarking exercises, may be required to adjust for claims experience not included in the data.

Correlation between reserving classes:

- In order to derive an aggregate claims reserve correlation assumptions between reserving classes need to be made.
- Subjective judgement is required when selecting appropriate correlation coefficients between reserving classes.

Availability of expertise and software:

- Stochastic reserving requires the appropriate skill and understanding. It also requires appropriate software.
- The appropriate skill and understanding could be acquired by hiring the staff with the necessary expertise or providing existing staff with the necessary training. Alternatively, a consultant could be used. The right software for the company's needs should be bought from a reputable provider.

Communication of results:

- A key challenge is how to communicate the results of the reserving exercise to your intended audience. The audience's technical understanding of stochastic claims reserving may be limited, which may lead to a false sense of security.
- Appropriate graphs and tables could be used to communicate the results in a way that may be easier to understand. It is also crucial that any material assumptions, limitations and areas of uncertainty are made clear to the audience.

iv. Reasons for possible correlation:

- Claims inflation is linked to the CPI.
- Claims are subject to similar stages in the reserving cycle.
- Claims handled by the same claims handling team.
- Claims incidence may be linked to the economic environment.
- Similar distribution channels used to sell household and motor policies.
- Same legislation may affect both household and motor policies.
- Common social factors e.g. propensity to claims may affect both household and motor policies.
- Household and motor covers may be sold as one package, so the same claim event could lead to claims on both covers.

Part (i) was generally not answered well. This was not a difficult question, testing a basic understanding of claims reserving. The question specifically referred to the claims reserves i.e. IBNR plus case estimates. However, marks were awarded to candidates who only considered the sufficiency of the IBNR.

Part (ii) was an application question with a fair number of candidates scoring full marks. The candidates who scored best made use of the information provided in the question relating to the reserving policy and provided clear explanations of the impact of the policy on the claims reserves.

Part (iii) was a bookwork question and was generally well answered.

Part (iv) was reasonably well answered. Most candidates generated many relevant examples. Some candidates, however, gave too much detail given that the question asked to "state".

QUESTION 8

i. Available capital is the excess of an insurer's resources over the value of its liabilities.

Required capital is how much capital an insurer needs. This will depend on the purpose of the exercise. There are two types of required capital:

- The amount of capital an insurer is required to hold for regulatory purposes. A fundamental purpose of solvency capital from the regulator's perspective is to protect policyholders' interests.
- Economic capital is the amount of capital that a provider determines is appropriate to hold given its assets, its liabilities, and its business objectives.

ii. Operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. Operational risks include risks relating to administration, compliance, fraud, governance and strategy.

iii. Independence of risks. It does not diversify away with other insurance or market risks.

iv. Allowance for operational risk is set to an average charge as estimated over the prior 3 years and not a 1 in 100 year event. Thus it may be severely understating the capital requirement.

v. Regulatory capital requirement:

$$IRC = 250 \times 7\% + 750 \times 15\% = 130.$$
$$MRC = 800 \times 5\% = 40.$$
$$ORR = 1000 \times 1\% = 10.$$
$$SCR = \sqrt{130^2 + 40^2} + 10 = 146.$$
Regulatory Capital Requirement = R146m

Economic Capital Requirement:

1-in-100 year event corresponds to 1st percentile.
If $P = 1\%, Z = -2.3263$.
Since $Z = \frac{X-\mu}{\sigma}, X = \sigma Z + \mu$.
Therefore $X = (60) \times (-2.3263) + (50) = -89.578m$
Operational risk capital loading of R3m.
Economic Capital Requirement = R92.578m

Other reasonable interpretations of the Economic Capital Requirement were accepted

vi. The tails of the distribution may be too narrow to accurately capture the 1 in 100 year event. This is supported by the vast difference between the regulatory and economic capital requirements. Suggestions include:

- Model attritional, large and CAT losses separately.
- Use an alternative distribution with a fatter tail.
- Use a separate distribution for the tails.
- Use Extreme Value Theory.
- Look to the underlying calibrations of the Regulatory Capital Requirement model to understand how it differs and why. A capital buffer can then be estimated.

Parts (i) and (ii) were bookwork, and candidates generally scored well. Several, however, confused available capital with free capital.

In part (iii) many candidates focused on the method of calculation rather than answering the question of why it was a simple add on.

In part (iv) almost all candidates missed that this question focused on why a three year average was insufficient to allow for a 1 in 100 year total loss event.

Part (v) was generally answered poorly, often due to basic arithmetic errors.

In part (vi), given the capital-centric nature of the question, many candidates failed to link their answers to the tails of the distribution or extreme events.

END OF EXAMINERS' REPORT