EXAMINERS' REPORT

June 2018 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 clause that may be included in a non-proportional reinsurance treaty, providing for the indexation of monetary limits (that is, the excess point and/or the upper limit) in line with a specified index of inflation.

ii. The inclusion of a stability clause will reduce the premium, since:
   - fewer claims will reach the excess point; and
   - of those which do a smaller recovery will be made.

iii. Let the initial value of the stability index be s.

   (a) XL recovery = $0.8 \times (\$2m - \$1m \times (250/s)) = \$0.6m$
   Hence $\$1m = \$1m \times (200/s)$, and so s = 200

   (b) As there is no XL recover we know that:
   $0.8 \times (\$2m - \$1m \times (250/s)) \leq 0$
   Hence $250/s \geq 2$, i.e. $0 < s \leq 125$

iv. Loss 1 (R6m):
   Recovery = R6m – R2m = R4m
   Reinstatement Premium = $(R4m/R6m) \times 9/12 \times R1m \times 200\%$
   $= R1m$
   Cover remaining: R6m XS R2m

   Loss 2 (R5m):
   Recovery = R5m – R2m = R3m
   As only one reinstatement is permitted, the insurer is only able to reinstate an additional R2m of cover at this point.
   Reinstatement Premium = $(R2m/R6m) \times 3/12 \times R1m \times 200\%$
   $= R0.167m$
   Cover remaining: R5m XS R3m

   Loss 3 (R7m):
   Recovery = min(R7m – R2m, R5m) = R5m
   Reinstatement Premium = R0 (as only one reinstatement of R6m is provided)
   Cover remaining: R0

Part (i), a straightforward definition question, was not answered as well as it should have been by most candidates.

Part (ii) was very poorly answered by most candidates, illustrating a lack of understanding of a stability clause.

Parts (iii) & (iv) which involved calculations, were not answered particularly well by most candidates. Many candidates failed to show sufficient calculations. Some candidates did not even understand how a basic excess of loss claim operates.

QUESTION 2

i. Experience rating is where the risk premium is calculated using the insurer's internal data. There are two main approaches to assessing the cost of non-proportional reinsurance using the cedant's loss experience. The first is a basic burning cost calculation. The second is to construct a stochastic frequency / severity model.

Exposure rating is where the risk premium rates are derived from benchmarks or external data. The main principle of exposure rating is to not use historic claims experience at all, but instead to base premium rates on the amount of risk (i.e. exposure) that policies bring to the portfolio. There are two common forms are ILFs and exposure curves (first loss scales).

The main circumstance when exposure rating has the advantage is when data is scarce, for example in high excess layers. In exposure rating we use a benchmark to represent a market severity distribution for the line of business and territory being covered. The benchmark may even be directly derived from the market severity distribution.

ii. Where possible and statistically relevant, we split the data into risk cells; that is, we subdivide the total available data into homogeneous subsets based on factors that contribute to higher or lower claims experience (for example, age, gender, car model, etc.).

This will enable us to understand better the risks being handled and will help us to avoid cross-subsidies. Hence, profitability will not depend on a particular cross section of risks, and so the company will be less exposed to changes in the business mix.

Competition encourages insurers to refine their classification systems. This refinement will generally continue to the point where the credibility of the data becomes minimal. Credibility techniques can be used to make sure that there is enough data in each cell.

As a general rule, we analyse the data with as many subdivisions as possible and regroup with care when calculating premiums.

It is very important to match the historical claims cost with a suitable exposure measure for the in-force business, which might simply be the number of policies exposed or an alternative measure, e.g. sum insured years. The exposure measure used must be consistent with the claim amounts i.e. the claims that we analyse must have arisen as a result of the exposure that we are using in our analysis.

When calculating exposure in each cell, care must be taken where the rating factors for an individual policy have changed over the period of investigation. The exposure should be split correctly between the risk cell before the change and the risk cell after the change.

The claims data included in the subdivisions must be recent. It should include up-to-date case estimates or other accurate information, projected amounts and/or reserves in order to reflect the true ultimate cost of the claims as closely as possible.

In addition, the claims data should be based on consistent approaches to claims recording, claims payment and claims settlement. It should include at least the claims amounts, but possibly number of claims too if we decide to estimate claim frequency and severity separately.

iii. A loading may be applied for catastrophe or large loss claims. This can be estimated using own data, external data or a sophisticated catastrophe model.

Further loadings would be applied for:

- the cost of reinsurance, including trends in this cost;
- expenses (including commission), e.g. by applying a simple overall loading or a more detailed approach allowing for the different expense types (such as fixed or variable);
- the cost of capital (or profit loading), reflecting the underlying variability of the class of business (net of reinsurance) and shareholder risk appetite.

The premium may also be reduced to allow for investment income on the premiums for the period until claims and expenses are paid out. This is more important for long-tailed business.

Overall, the better prepared candidates did well on the question, which is to be expected on such a largely bookwork question. The main problem was that candidates did not provide enough points to score full marks.

In part (i) many candidates did not provide enough detail and therefore missed out on some marks. Some did not answer all of the question.

In part (ii) some candidates made the mistake of explaining the factors required for adjusting data rather than factors to be considered for subdividing data.

In part (iii) some candidates made the mistake of simply listing the main loadings instead of outlining them briefly as instructed.

QUESTION 3

i.   The main elements of claims risk and uncertainty are:

- Variability in the size of claims at any time, and from one period to another.
- The lengths of delays between the incidents giving rise to claims and the reporting and ultimate settlement of the claims.
- Crime rates – the rates of fidelity crimes can show considerable variation from year to year.
- Economic conditions – fidelity guarantee insurance gives rise to claims that are influenced by economic conditions, whose changes are difficult to predict as regards both timing and extent.

- Judicial decisions – "Court award inflation" poses great uncertainty to insurers.
- Attitudes of policyholders to claiming.
- Reinsurance risks – failure to comprehend the true coverage/limits of a reinsurance arrangement and therefore being exposed to risk in areas that were thought to be reinsured.
- Accumulation of risk – could be by sector, geographical area.
- Interpretation of wording in the policy document, potentially leading to additional claims needing to be paid.
- Inflation and the consequential rates of escalation of claims.
- Legislation / regulation – changes in the law which increase the amount of cover being provided, such as the removal of a legal limit on compensation levels.
- Currency risks – relating to business transacted in a currency other than that of the country in which the insurer is based.

ii. A policy is said to have lapsed if the policyholder was invited to renew the policy but chose not to do so.
Hence:

$$\text{Lapse rate} \ = \ \frac{\text{no. of lapses for period } x}{\text{no. of renewals invited for period } x}$$

As the acquisition of new business is generally more expensive than the renewal of existing business, new business expenses are usually spread over the expected loyalty period of customers.

Hence the insurer faces the risk that there are more lapses than expected, and hence it will fail to recoup initial expenses.

Higher than expected lapse rates could cause the insurer to struggle to recoup fixed expenses as these are spread over the expected number of policies. This is made worse by the fact that the insurer is closed to new business and cannot write new policies to recoup the expenses.

iii. The insurer will want to monitor its loss experience as this will allow it to more accurately price its risks through experience rating.

In addition the insurer will want to renew its more profitable policies. The insurer will need to ensure that it offers competitive rates on renewal to those policyholders that it wants to keep.

Since the insurer is not writing new business it will be concerned with maintaining adequate business volumes to cover operating costs. If business volumes reduce too much the company will struggle to meet fixed expenses.

Monitoring loss experience will also allow the insurer to set up more accurate reserves.

In part (i) candidates generally provided too few points and too much detail per topic/point. The candidates who managed to generate a sufficient number and a diverse set of answers scored fairly well.

In part (ii) the candidates who knew the bookwork scored reasonably well.

Part (iii) required some insight. In general, candidates struggled to produce enough points to score well.

QUESTION 4

i. Trade credit insurance provides cover to a creditor against the risk that debtors will not pay their obligations i.e. it provides cover for uncollectible debts. While cover is usually on an annual basis (i.e. covering goods delivered to customers during the year), cover may also be for the length of a project e.g. a ship built for a customer who does not pay for it at the end of construction.

ii. The nature of the claim liabilities is real – the value of goods sold by a creditor is likely to increase with inflation and outstanding debts accrue with interest (usually linked to inflation) up to claim settlement.

    This suggests that real assets are a suitable match e.g. index-linked stocks. Claims are likely to be short tailed- a few months, requiring short-dated assets.

    As short-term interest rates tend to keep up with inflation, money-market instruments and very short-term bonds can be suitable for matching short-dated real liabilities.

    Insurer expenses are real, requiring inflation-protected assets such as index-linked securities. Money market instruments may also be suitable to the extent that short-term rates keep up with inflation.

    Claim uncertainty may be very high (as it depends on economic circumstances) requiring assets of high liquidity. Money market instruments and government bonds usually meet this requirement.

    Assets should be invested in the same currency as the claims. Cover provided to an exporter may require assets in different currencies to match the liabilities.

iii. The factors to consider include:

     - The size of current free reserves: Greater free reserves allow the company to mismatch assets and liabilities.
     - Business plans: As the company is experiencing rapid growth and probably declining free reserves in future years, the scope for mismatching will reduce over time. Excess free assets are more likely to be used to fund business growth rather than be used as a buffer for mismatch risks.

- The extent to which the insurer can rely on premium income to meet short-term expenses and claims may allow it to mismatch. There is likely a high degree of uncertainty for a new insurer, and hence a need for close matching.
- The need for diversification to reduce specific risks from overexposure to a particular asset or asset class.
- The extent to which liabilities have been reinsured may increase investment freedom.
- The company's attitude to risk and access to parent company resources may influence investment freedom.
- The outlook for returns for various asset classes may lead to short term tactical decisions leading to mismatching.
- Any regulatory requirements, including admissibility rules, may force the insurer to mismatch.

iv. ALM would be particularly useful to this insurer since:

- By projecting the assets and liabilities consistently, an ALM allows the insurer to investigate the relationship between the assets and the liabilities to give a better understanding of the risk of insolvency.
- Credit insurance claims – frequency and amount – are very dependent on the economy:
  - Declining business conditions (e.g. due to higher interest rates) would lead to greater instances of default.
  - Higher inflation (and interest rates) would lead to larger claims.
- Where cover is offered to export companies, the impact of currency fluctuations can be assessed on both assets and liabilities.
- As the company is growing rapidly, it will need capital for expansion rather than supporting a mismatched investment position, and ALM can assist with achieving the best matched position possible.
- If the insurer is using reinsurance, the risk of default (sometimes linked to economic conditions) can be incorporated into the ALM.
- While a stochastic ALM is better for providing probabilities of outcomes, a deterministic ALM is useful for investigating particular economic scenarios that are of concern to the company.

This question was a straightforward application of bookwork, which could have been answered better by most candidates.

Part (i) was bookwork and generally answered well, although a significant number of candidates gave the incorrect cover description – instead of outlining trade credit cover, a number of candidates outlined creditor insurance or mortgage indemnity cover. These candidates were not penalised in subsequent parts for basing their answers on an incorrect cover.

Parts (ii) and (iii) were answered reasonably well by most candidates. In part (iii) some candidates repeated similar points e.g. "the size of free reserves" and "impact of mismatching on solvency capital requirements" are effectively the same point.

Part (iv) was generally not answered well. A significant number of candidates provided a general description of the ALM process and outputs, without providing any points explaining why ALM would be "particularly useful to this insurer".

QUESTION 5

i. Key considerations:

Range within which diagnostic falls:
Consider whether diagnostic falls within an expected range
If diagnostic lies outside the expected range then this may indicate a concern or identify a feature of the experience that has previously not been taken into account.

Once-off movements:
Changes in diagnostics over time or unusually high or low figures, may result from unexpected emerging experience that is considered to be once-off.
For example changes to the terms and conditions may preclude the unexpected once-off movements from happening again, thus no change in methodology may be warranted.

Materiality:
It is necessary to consider materiality when addressing features revealed in the diagnostics.
For example changes in diagnostics may not lead to a change in methodology if the class of business where the change occurs is not material.

Treatment of large losses:
Exceptional items such as large losses should be excluded, the end reserve should however allow these.

Underlying reasons for the results:
It is critical to understand the underlying reasons for movements in diagnostics.

Other possible considerations include:

- The strength of the reserving bases.
- The purpose for which the reserves are calculated.
- Comparing diagnostics to industry benchmarks.
- The accuracy and quality of the data.
- The stages of the underwriting and reserving cycles, together with general economic factors.
- Any changes to the mix of business.

ii. Ultimate loss ratios per accident year:

Accident Year	Ultimate Loss Ratio (ULR)
2013	55%
2014	52%
2015	53%
2016	70%
2017	80%

This information can be used as follows when reviewing claims reserves:

- The ULRs show an increasing trend in the 2016 and 2017 accident years, the reason for this trend should be understood.
- The ULRs could be compared to industry loss ratios and any differences understood.
- The ULRs could be compared to the pricing loss ratios, however some adjustment will be needed as accident years comprise policies sold in different periods.
- The ULRs could be compared to last year and any differences understood.
- Further investigation is required to determine the reason(s) for the significant increase in the 2016 and 2018 ULRs. This could be due to a genuine increase in the claims cost per unit of exposure, lower premium rates, an error in the calculation, or large/catastrophic claims.
- The ULRs could be compared to incurred loss ratios to assess the extent of future claims development resulting from IBNR claims.

iii. Other diagnostics which could be used:

- IBNR/earned premium
- IBNR/case estimates
- Average outstanding case estimates
- Paid/Incurred claims
- Net to gross of reinsurance ratios

iv. Calculation of discounted claims reserves:

Total undiscounted claims reserve	Total Selected Ultimate *less* Total paid claims to date
Figure in R'000	90 383 – 42 128 = 48 256

Assume the claims are paid at the end of the year or halfway through the year.

Calendar year	2018	2019	2020	2021	2022
Percentage paid	30%	25%	20%	15%	10%
Undiscounted payments (R'000)	14 477	12 064	9 651	7 238	4 826
n	1	2	3	4	5

1.08^{-n}	92.59%	85.73%	79.38%	73.50%	68.06%
Discounted payments (R'000)	13 404	10 343	7 661	5 320	3 284
∑ Discounted payments (R'000)	40 013				

v. Likely effect of discounting

- Discounting will reduce the claims reserves. The impact of discounting on the claims reserves will depend on the discounted mean term ("DMT"). A higher DMT will increase the impact of discounting.
- Discounting reduces the Commercial Liability claims provisions by 17%, which is material for this class. The impact of discounting on the company's total claims provisions is likely to be less than this, as the DMT for the company's total claims provisions is likely to be less than that for Commercial Liability since the company writes a diverse range of business.

Part (i) was bookwork, and was generally well answered. Some candidates, however, went into too much detail on certain points and so did not focus on the key considerations as required.

In part (ii) most candidates scored full marks for the calculation of ultimate loss ratios. However, most did not focus on how the calculated ultimate loss ratios could be used to review the claims reserves as asked.

Part (iii) was generally well answered with a large number of candidates scoring full marks. Candidates performed relatively well in part (iv), which was an application question.

Part (v) was generally very poorly answered. A large number of candidates did not answer the question, which asked for the effect of discounting on the total claims reserves. A surprising number of candidates discussed the impact on capital requirements, which did not answer the question.

QUESTION 6

i. A suitable exposure measure is the overall value of the contract as this will be linked to the value of what needs to be replaced, including the materials and services. It also satisfies the other requirements of being objectively measurable and easily obtainable, verifiable and not open to manipulation.

ii. The exposure will become progressively greater as the project nears completion, due to the value of what has been built being higher, tending to the replacement value.

iii. Claim frequency:

- Frequency of claims will likely be higher than for general buildings insurance as completed buildings are likely to be more resilient than incomplete buildings.
- The frequency will depend on the risk management implemented by the contracting firm, the materials used, and factors relating to the location e.g. weather-related risks such as heavy rainfall.

Claim size:

- Claim size depends on the stage of the project. The closer the project is to completion, the more potential for claims near to the full rebuild value of the property. In the case of the mall, it is a very large risk, so claims later on can be very high.
- There is also the potential for smaller claims where minor incidents occur.

Accumulations of risk:

- The main accumulations are likely to be due to weather-related incidents, occurring in a certain geographical region where many construction projects are in operation. Even within one project which is very large (such as the shopping mall), damage may occur at multiple points on the project site due to one storm, say.

Delays:

- Property claims can generally be reported and settled quickly, although as with other classes serious damage may take a relatively long time to repair.
- Liability claims will take longer to settle as liability needs to be established before amounts of loss can be determined.
- However, the claims from a single underwriting year can take many years to emerge because of the long-term nature of the policies and the fact that policies may cover a multi-year contract period.
- The policy for such a large project may continue for some years after its completion to cover the late discovery of construction faults.

Parts (i) and (ii) were fairly well-answered by most candidates.

Part (iii) was generally poorly answered, with candidates either not covering all aspects of claim characteristics, or not applying their minds adequately to the scenario.

QUESTION 7

i.   The most obvious solution would be to work with the taxi-app administrator as a tied agent as all the taxi drivers will need to work through the service provider. The taxi-service provider will also have access to all the required data for rating purposes.

   If the taxi-service provider can make the insurance compulsory, it will allow the company to benefit from economies of scale, leading to lower premiums for all drivers. It would also reduce the risk of anti-selection.

   If this is not possible, the insurer may be able to leverage off existing distribution channels, but with a different marketing campaign to cater for this market as opposed to drivers who merely use their cars for non-business purposes.

ii. For a risk to be insurable:

   - the policyholder must have an interest in the risk being insured, to distinguish between insurance and gambling;
   - a risk must be of a financial and reasonably quantifiable nature;
   - the amount payable by the insurance policy in the event of a claim must bear some relationship to the financial loss incurred.

iii. If the drivers are the owners of the vehicles, then they will directly stand to lose if the vehicle was to be damaged or stolen – hence would have insurable interest.

   If the drivers are not the owners of the vehicles, they may not lose directly as they would not need to replace the vehicle. However, losing or damaging the vehicle would affect their income and job security – hence would still have an insurable interest.

   Furthermore, they could also suffer losses resulting from liability claims – and hence have insurable interest in this regard too.

iv. An exclusion is an event, peril or cause defined within the policy document as being beyond the scope of the insurance cover.

v.   Exclusions are used to avoid payment by the insurer in situations where:

Reason	Example / Relevance
The policyholder is at an advantage through possessing greater personal information about the likelihood of a claim.	Drivers will know their driving characteristics, however the insurer will be able to estimate this from consumer reviews and driving metrics.
The claim event is largely under the control of the policyholder.	To a degree this is true. However, the policyholders will want to avoid accidents for safety and business

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	reasons as they need the car to earn an income.
The claim event may be difficult to verify.	This is not true in this case. An accident will be obvious and needs to be reported to the police to obtain a case number.
The loss occurs as part of the normal course of events and could be considered to be depreciation.	Things such as tyres on a car wearing down as the car is driven would be excluded.
There may be a very high probability of a claim.	This is not the case here. Claim frequencies may be higher than in normal motor insurance, but not prohibitively high.
It may not be possible to accurately estimate the risk associated with a particular policy.	This is not the case, as there should be enough existing motor data, which when combined with the user rating and driving metrics should be enough to allow a reasonable risk assessment to be carried out.
Exclusions are also used where the risk is covered by a third party such as the government so as to avoid "double insuring".	This would be the case. For example in South Africa for SASRIA risks and third party bodily injury claims which are covered by the RAF.

vi. Data:

- As this is a new product there will be a lack of data.
- The company may be able to use its data from its current motor book of business as a starting point, but recognising that professional taxi-drivers will have different driving behaviours (more driving and so perhaps better drivers due to practice).

Fitting distributions:

- In the early stages business volumes would be particularly uncertain, unless the insurer secures a deal to insure all taxi drivers using the service. Testing different scenarios would be important: insufficient policies would mean low profit, while high volumes would increase capital requirements as there is more exposure.
- Credit risk: If receiving premiums indirectly from the taxi-service there is a risk that premiums are not passed on.
- Attritional: The loss ratio starting point can be as per the company's current motor insurance book, particularly commercial policies. Model using a single positively skewed aggregate distribution such as LogNormal.
- With a taxi-service there are unlikely to be particularly large property claims. Though there may be an option for luxury accommodation, in which case claims could be higher than typical motor claims. However, liability claims could potentially be high. Can be modelled using a frequency-severity approach e.g. Poisson Frequency, LogNormal severity.

- Catastrophe claims. Similar to traditional motor e.g. hail storms. Taxi drivers may be more affected by such catastrophes as they are less flexible about driving times, so not able to avoid storms. Therefore, possibly increase frequency.

Correlations with motor book:

- It is important to model consistently with existing motor book, for example:
  - attritional claims trends will be similar
  - same events affecting all vehicles e.g. hail

Sensitivity testing: It is important to test various parameters as there is more uncertainty in the early stages of the product. The actuary will need to ensure that the company has enough capital to write the business if it achieves the desired business volumes.

Reinsurance: given a new product, the company will likely reinsure much of the business in the early stages. Therefore reinsurance is important to incorporate into the model, including some sensitivity testing on reinsurance strategy to aid in determining optimal reinsurance strategy.

Diversification: overall, the diversification benefit is unlikely to be very great as this is the same class as the insurer currently offers. However, there should at least be a greater pooling effect. However, it is debatable if this will reduce capital requirements relative to premium volumes as capital is affected by tail events, where a large portion of the portfolio is affected.

Practical considerations:

- Consistency with existing model. It should be built using the same systems.
- Proportionality and practicability. Aim to model with as little detail as is sufficient for the analysis and decisions required,
- Documentation. Document the process and key assumptions made, to help future users update and refine the model.

Control cycle: monitoring to feed back into assumptions. This is particularly important with this new block of business as there is not much to base initial assumptions on.

In part (i) most candidates identified the app provider as the ideal distribution strategy. Some candidates mentioned a number of different possibilities, which was not asked for. When suggesting any strategy other than tied agent, it was important to consider the insurer's circumstances and any existing setup it may have had based on their existing products.

Part (ii) was straight bookwork. While most candidates had the gist of the definition, very few were precise.

Part (iii) was generally well-answered. Some candidates failed to consider the two cases of the driver being the owner or not.

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Part (iv) was bookwork. As in part (ii) most candidates had the gist of the definition, though very few were precise.

In part (v) most candidates managed to generate a number of reasons for why exclusions could be used. A common shortcoming was that candidates were only able to express the reasons by using examples, rather than outlining the reasons first and then providing appropriate examples for each reason.

Part (vi) was poorly answered by most candidates. Candidates required a structured approach to score well. Common mistakes included: answer being too general without application to scenario; merely working through a list of risks to include in an internal model; and not covering all stages of implementation (data, parameterisation, etc.).

END OF EXAMINERS' REPORT

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