

EXAMINERS' REPORT

June 2012 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. Credibility techniques can be used to determine the pure premium (or risk premium) for the commercial motor insurance covers.

Credibility theory provides tools to deal with the randomness of data that is used for predicting future events or costs.

We would usually use the past history of claims from an insured or a group of insureds (e.g. a fleet of vehicles) in order to estimate the future costs of providing insurance.

But many events are random so we do not know what the true cost of claims will be in the future.

The claims from the last few years may not always be a good estimate of the future, especially if there haven't been many claims, or their final amounts are uncertain. So we might get a better estimate by combining this past data with some other information about commercial motor insurance risks.

This other information is often obtained from a larger pool of claims or from industry data.

The more data we have on the individual risk, and the more stable the experience, the more credible it is.

Rather than relying solely on recent observations, better estimates may be obtained by combining this data with other information such as industry data or data from a larger pool of claims. The basic formula for calculating the credibility premium is:

$$Z\bar{X} + (1 - Z)\mu$$

where Z is a number between zero and one and is known as the credibility factor.

If the body of observed data is large and not likely to vary much from one period to another, then Z will be closer to one. On the other hand, if the observation consists of limited data, then Z will be closer to zero and more weight will be given to other information.

In other words, the more reliable we believe our observed claims experience to be (as a predictor of future experience), the more we weight our estimate towards that data.

As recent experience becomes available, then an updated estimate combining the recent experience and the prior hypothesis can be calculated. Thus, the use of credibility involves a linear estimate of the true expectation derived as a compromise between observation and prior hypothesis.

For example, suppose that recent experience indicates that for a particular company, the commercial motor insurance risk premium should be charged a rate of R150 for R100 000 of motor insurance cover but the normal rate for other risks is R180 (this is the "other information"). The new rate could be R150 or R180 or something in between, and credibility theory helps us to decide.

There are different mathematical models that can be used to come up with the weightings to use e.g. Bühlmann-Straub model or EBCT models.

In order to determine the final premium rates, other elements of premium (e.g. expenses, profit etc) need to be added on to the pure premium that can be determined using credibility techniques.

ii. There are four types of issues that any actuary must consider when choosing the complement of credibility:

- practical issues
- competitive market issues
- regulatory issues and
- statistical issues

Practical Issues:

- The actuary should choose a statistic that is readily available.
- For example, next year's loss cost would be ideal but is obviously not available (otherwise.
- Availability could be related to the ease (and cost) of processing the data.
- Statistics which are easy to compute are often easier to explain to management and customers.
- And there is also less chance of errors.
- The time involved in computing a very accurate statistic should be weighed against the accuracy improvement it generates.

Competitive Market Issues:

- Whatever rate the actuary produces will be subject to market competition.
- If the rate is too high, competitors can undercut the rate and still make a profit. That will cost the actuary's employer customers and profit opportunities.
- If the rate is too low, the employer will lose money.
- So, in mathematical terms, the rate should be:
 - unbiased (neither too high nor too low over a large number of loss cost estimates), and
 - accurate (the rate should have as low an error variance as possible around the future expected losses being estimated).
- Also the difference between unbiasedness and accuracy is important. An unbiased statistic varies randomly about the following year's losses over many successive years, but it may not be close. An accurate statistic may average higher or lower than the following year's losses, but it is always close.
- Ultimately, the complement of the credibility should help make the rate as unbiased and accurate as possible.

Regulatory Issues:

- Rates may require some level of approval from insurance regulators. The classic rate regulatory law requires that rates be “not inadequate, not excessive, and not unfairly discriminatory”.
- The principles of adequacy and non-excessiveness imply that rates should be as unbiased as possible. For most purposes, actuaries interpret “not unfairly discriminatory” in the premium rating context as “unbiased”.
- Inaccurate rates create a much greater risk of insolvency through random inadequacies, suggesting that rates should be as accurate as possible.
- The actuary can mitigate regulatory concerns by choosing a complement that has some logical relationship to the loss costs of the class or individual being rated. That means that it is easier to explain a high rate for a class or individual in light of the related loss costs.

Statistical Issues:

- In producing the most accurate, practical, estimate the actuary must consider all the types of error that make up the prediction error, reducing the accuracy of the prediction.
- There are of course, the natural year-to-year variations in losses about the true mean due to process variance. There may also be errors because the predictor has a different mean than the losses (bias).
- The error of the predictor may stem from the error of its components. The historical losses (the usual base statistic), when trended and developed, will contain prediction errors because the factors used to bring losses to a fully developed current cost level are different to what will happen (loss development and trend variance).
- When models for losses are used as complements, there may be errors in both the type of model used (model error) and the specific parameters selected for the model (parameter error).
- If the complement of the credibility is accurate in its own right and relatively independent of the base statistic (which receives the credibility), the resulting rate will be more accurate.
- The error in the credibility estimate depends on the errors in the base statistic and the complement of credibility. The accuracy of the complement of credibility is just as important as the accuracy of the base statistic.
- Independence is most important when credibility is most important. That is, independence is most important for the intermediate credibilities (Z between 10% and 90%).
- So, a complement of credibility is best when it is statistically independent of (that is, not related to) the base statistic.

Generally very poorly answered, with most candidates not answering the question.

In part (i) most candidates mentioned and wrote down the credibility premium formula but did not explain how it is used and its purpose. There was very little insight into why it is actually used. Some answers bore no relationship whatsoever to the question asked.

In part (ii) candidates generally only discussed data issues. It appears as if some candidates interpreted the compliment of credibility as the collateral data rather than $1 - Z$. Generally too few points were given, and several answers were extremely short.

QUESTION 2

i. Reasons for Cat XL reinsurance:

- Protection:
 - Protect against accumulations of risk leading to a loss on many busses from the same event.
 - For example, a fire at the bus depot where the busses are parked overnight or a hail storm in the city where the busses operate.
 - Will smooth profits in the event of a catastrophe occurring.
 - Improved protection relating to catastrophes could improve policyholder confidence and increase sold.
 - Since Trident only operates in this niche market, there is a higher concentration of risk, resulting in a greater need for catastrophe reinsurance.
- Capital considerations:
 - By purchasing catastrophe reinsurance, Trident would need to hold less capital (assuming capital based on risk).
 - And capital costs money (the return required by shareholders). So the lower capital would mean that lower profits are required to yield the same return to shareholders.
 - But there would also be a cost of reinsurance (the reinsurance premium). The reinsurers will have priced in a profit margin to account for their increased capital cost due to taking on the risk.
 - However, the reinsurer is likely to have a lower cost of capital than Trident because the reinsurer benefits from diversification by class and geographical area (due to reinsuring a number of different insurers).
 - Thus, even though the reinsurer prices its cost of capital into the reinsurance premium, the benefit of the reduced cost of capital for Trident may outweigh the loss due to the reinsurance premium.
 - By reducing its capital requirement, Trident may also be able to write more business (busses in different areas or even different classes) and achieve a greater level of diversification on its business (or for other purposes).
- Technical assistance:
 - The reinsurer may provide assistance in designing and pricing.
 - Although for a niche product such as this, Trident is likely to be an expert in the field.

ii. Relative advantages of catastrophe bonds:

- Gives insurers access to an alternative to reinsurance (in the form of capital markets).
- Insurers' ability to transfer risk is no longer restricted to the supply of reinsurance.
- Catastrophe bonds can also be used by reinsurers, increasing the ability of the insurance market as a whole to accept risk.
- If supply of reinsurance is low, prices may be unreasonably high but capital markets might be willing to take on risk at a lower cost.
- A possible reason for this is that investors will benefit from diversification away from the capital markets which are highly correlated to economic factors such as economic growth, interest rates and inflation, whereas catastrophes are random and independent of these economic factors.
- By complementing catastrophe bonds with reinsurance, insurers can reduce their reliance on reinsurers in the event of a catastrophe and hence reduce their credit risk.
- With catastrophe bonds, the insurer gets money up-front so in the event of a catastrophe there is no risk that they do not get paid.
- This lower default risk will in turn reduce capital requirements.
- In addition, there will be no delay in payment as there could be with reinsurance, improving liquidity.
- By having catastrophe bonds, the capital markets can place a price on the catastrophe risk. This can lead insurers to be more conscious of their risk exposures and risk mitigation.
- Cat bonds may be administratively simpler, as the coupon does not need to be recalculated each year (as reinsurance premiums do) and claims do not need to be accurately estimated (as is required for reinsurance recoveries).

Relative disadvantages of catastrophe bonds:

- Don't receive the other benefits of reinsurance such as expertise, product design, etc. (But the insurer can make use of a combination of reinsurance and catastrophe bonds and still benefit from the expertise etc. of reinsurers.)
- The insurer will need to service the debt at the agreed rates for the entire duration of the bond. This rate might be high depending on the conditions of the market and recent catastrophe experience at the time of bond issue. Whereas reinsurance premiums are usually renewable annually, so the insurer can benefit from periods of soft rates (although on the flip side, they will also have to pay higher rates when the reinsurance markets are hard).
- The returns required by investors might be high as they don't understand the risk involved.
- It is not indemnity cover: In the event of a catastrophe, the money from the bond may not be enough to cover the actual claims whereas reinsurance recoveries are based on the actual loss amount.
- Cat bonds may be expensive to set up and will require additional expertise that Trident is unlikely to have at present.

- Cat bonds cannot be updated over time, whereas reinsurance policies can be adjusted to take into account a change in exposure.
- There are effectively no reinstatements under catastrophe bonds. In the event of multiple catastrophe events (however unlikely) Trident will likely not have enough money from the cat bond.
- The size of Trident's book may not be large enough to grant a catastrophe bond. Generally cat bond issues are very large in size, making it more appropriate for reinsurers to use cat bonds as a means of alternative risk transfer.
- By receiving the money up-front, this creates an investment risk for Trident.
- By preferring cat bonds over reinsurance, relationships with reinsurers may be negatively affected, resulting in poorer terms on remaining policies reinsured.

Some candidates misunderstood what catastrophe bonds do and thought that the insurer would benefit from coupon payments and a capital repayment in the event of a catastrophe. Given that the operations of the catastrophe bond were explained in the question, this was a poor error.

Points were often not adequately explained, for example "will affect relationships with reinsurers" as a disadvantage of catastrophe bonds, could have been expressed as "by preferring cat bonds over reinsurance, relationships with reinsurers may be negatively affected, resulting in poorer terms on remaining policies reinsured."

Some candidates just stated the advantages and disadvantages of cat bonds with no reference to reinsurance, and thereby did not answer the question asked.

QUESTION 3

- i. They are attempting to use a computer to simulate the actual future cash flows and changes in values of assets and liabilities of an insurance company.
- ii. Potential uses of internal model – to assist with:
 - The model will be used to maximise the return to shareholders subject to constraints imposed (e.g. regulation).
 - Pricing and the impact of changing premium rates.
 - Setting reserves.
 - Optimising reinsurance purchasing.
 - Determining capital requirements.
 - Allocating capital between divisions, classes and underwriting managers.
 - Determining optimal investment strategy.
 - Estimating the consequences of changes in the business e.g. new class of business.
 - Sensitivity testing to understand the key determinants of profits and capital requirements.

iii. Determining capital requirements:

- The capital requirement will be calculated at a level such that if a “substantial” loss were to occur, the company would still have sufficient money to be solvent.
- This “substantial” loss is usually set at the 1 in 200 level over a 1 year time horizon, which means that a loss of this amount or greater has a 0.5% chance of occurring in the next year (according to the model). This is also known as the 1 in 200 Value at Risk (VaR).
- The potential loss/capital requirement would depend on the risks inherent in the business. This is what risk-based capital implies, that the level of capital held is higher if the business is riskier.
- For this VaR to be calculated, the output of the model needs to be a probability distribution of profits. For this to be possible, the model needs to be a stochastic model.
- Ideally the model should include all elements that contribute to the profit (result) of the business, including:
 - premiums
 - commissions paid to brokers
 - operating expenses
 - claims
 - reinsurance premiums and recoveries
 - commissions from reinsurers
 - investment income and capital appreciation
 - variability of shareholder funds
- A statistical distribution will be set to each of these elements, and each time a simulation of the model is run, a random value will be drawn from each distribution. Normal distributions may suffice for certain quantities (perhaps premiums or expenses), but heavy tailed distributions such as the Pareto distribution will be required to model claims. The model will be run many times, resulting in a distribution of outcomes.
- Because of the significance of catastrophe events to the capital requirement, a separate catastrophe model may be built with the output being fed into the internal model. A frequency severity model is likely to be used (with low frequencies and high severities). It is likely that much research will be put into the modelling of catastrophe events. An example of a catastrophe event which could result in a large number of planes being impacted is an earthquake, fire, flood etc. at the airport where the planes are parked.
- These cashflows should not be modelled independently. Direct relationships should be modelled and indirect relationships should be modelled with correlation structures. An example of a direct relationship is calculating the reinsurance premium based on the gross premium calculated by the model by using the percentage reinsured (for proportional reinsurance) or the premium rate (for non-prop reinsurance). (Or another suitable example e.g. commission as percentage of premium.) An example of an indirect relationship is the claims between two different classes (or if aviation is the only class insured by Avisure, planes might be grouped into size categories, and there

might be a correlation between the number of claims from each category which could perhaps be linked to a weather index). Modelling of assets should be consistent with general economic principles, e.g. interest rates, inflation etc.

- The timing of cashflows is also important as this will impact investment return. For attritional losses, simple assumptions may be made for e.g. claims occur halfway through the year and are paid according to some payment pattern. For catastrophe events or large losses, a time variable may be incorporated because there are fewer catastrophes and large losses (if any), so the average time is likely to be more variable.
- Most claim incidents involving plane crashes are likely to result in large claim amounts.
- Claims which could potentially exceed the deductibles on risk excess of loss reinsurance treaties should be modelled separately from the aggregate loss distribution.
- The model output should be constructed so that the contributors to capital can be clearly identified. So that appropriate action can be taken to reduce the capital if desired (while at the same time understanding the impact of any changes on expected profits). For example, if the main cause of capital is the potential for a catastrophe event, then can reinsurance be purchased or can an index-linked bond be issued?
- General desirable features of the model:
 - the model should be adequately documented
 - each line of business would be modelled separately
 - based on accurate and relevant data
 - flexible, robust
 - easily communicable
 - not overly complex
 - output verifiable by an independent source

iv. Advice to users and operators.

- The model will not reflect reality entirely because reality is too complex. The model is likely to leave out certain elements of reality and make simplifying assumptions. The designers of the model should make sure that the key elements of the business are explicitly included in the model, while some of the less significant items can receive less attention (cost vs. benefit decision). But the users of the output should clearly understand how the simplifying assumptions impact the results (the likely direction and quantity) before just blindly using the model output to make decisions.
- The output should be carefully tested to make sure that it is accurate.
- The model should be used to increase the understanding of the business. For example, to understand what is causing the capital requirement at the 1 in 200 level, the 50 trials causing the 1 in 200 result of the company (usually big losses) can be analysed to check the contribution to the loss from each of the potential causes, including attritional claims, large losses, catastrophes, investment losses, drop in business volumes etc. This will give management a better feel for what is happening in the business and lead to better business decisions.

- The quality of data is a key determinant of the quality of the model output. Where data are poor or scanty, it would be very risky to base important decisions on the model.
- Even where the model is well designed and data are accurate, what the future holds has an element of randomness. The users should be wary of placing too much focus on the (statistical) mode of the output (or most likely result) and also take into account the spread of the results which is particularly significant for general insurers, with a highly negatively skewed profit distribution (mainly due to the long-tailed nature of claims distributions).
- Key parameters should be sensitivity tested to understand the potential change in results if certain parameters were changed.
- Depending on the quality of the data, margins may need to be added in to account for parameter uncertainty.
- Changes to parameters should not be done in isolation, correlations need to be taken into account.
- If someone other than the actuary is using the model, they should make sure they understand how to use it.
- It is important in particular that each element of the output is understood clearly.
- The model should be changed over time as our understanding of the underlying risks changes, e.g. as new research and methods become available.

Parts (i) & (ii) were straightforward, and were generally answered well. However, some statements were too vague, e.g. “assist with risk management” (as a use of the model) because setting reserves, pricing, determining capital etc. are all part of the risk management process.

In part (iii) candidates wrote a lot on which risks to include in the model, but without explaining the process of capital modelling (simulations, correlations, parameters etc. Several candidates focussed on the desirable features of a model in general (such as flexible, documented, meet regulatory requirements etc.) without explaining how the model might be used to determine the company’s risk-based capital as required by the question. Candidates generally failed to highlight the likely biggest drivers of capital (such as catastrophes and reinsurer default). More time should have been devoted to discussing the modelling of these big contributors to risk-based capital.

In part (iv) the scope of the question, meant that candidates who were able to generate a large number of points scored well.

QUESTION 4

i. Claims data items may include:

- A link to relevant policy record (to access items such as details of cover, etc.).
- Dates of claim incidence, reporting and settlement.
- Case reserve estimates (particularly relevant in larger claims).

- Status of present record (e.g. open, closed, reopened, etc.).
 - Relevant amounts e.g. exposure, sums insured, claims paid / agreed).
 - Record of past claims (relevant for policy limits, etc.).
 - Administrative details (e.g. details of claim assessor).
 - Reinsurance recoveries triggered.
 - Claim description.
 - Exposure details and rating factors **at time of loss** (these will change over time, so looking at policy info in future may not give the required information).
- ii. a. Information entered onto the wrong claim record:
- Claim & policy numbers should be linked in some way (e.g. through certain common digits).
 - Check digits should be introduced, which are automatically checked by the system to eliminate mistakes through mistyping one digit.
 - The system should link to the corresponding policy record, and verify & display key items, e.g. name, dates of cover.
- b. Incorrect claim dates entered:
- The system should automatically check that the policy was on-risk on the day when the claim occurred.
 - The system should automatically check that the date of loss is before the date reported.
- c. Incorrect payment dates entered:
- Automatically check that the payment date is after the date reported.
 - Automatically check that the payment date is after any previous payment dates entered.
 - Only permit the entry of payment dates which are on, or before, the current date.
- d. Incorrect amounts (or the wrong currency) entered:
- Identify very large or small claims for verification.
 - Identify situations where the currency differs from the currency of previous payments for verification.
 - Identify (for verification) situations where the currency entered does not correspond to the currency used in the country of the policyholders' business address (this need not be an error however).
 - Identify (for verification), claims that are in a different currency to the premium on the policy.
 - Check claims amounts do not exceed policy limit (sum insured).
 - Check that claims amounts are greater than 0.

- e. Incorrect case estimates entered for a claim:
 - Automatically check that the case estimate entered does not exceed: Sum Insured – Payments already made.
 - Ensure that case estimates are zero on claims with a closed status / are non-zero on open claims.

- f. Information omitted:
 - Do not allow submission of a claim if certain key data items are missing.
 - Highlight any missing information which needs to be captured before proceeding with a claim.

Overall this was not a difficult question, and was fairly well answered on the whole.

Part (i) was fairly easy, owing to the large number of data fields required in a claims database. Some candidates, however, focussed on policy information and earned no credit for these points.

In part (ii) candidates generally did not write enough points – often writing only one point for each of (a)-(f). Some candidates mentioned training staff, spot checks and double-checking values against records (for case estimates for example). These are not automatic checks as asked for in the question.

QUESTION 5

- i. Company may wish to calculate IBNR as a separate element:
 - In order to give more information to decision makers, helping control the business.
 - Because statutory returns require this.
 - Because the method used for calculating outstanding claims may not include IBNR.

- ii. Relative advantages and disadvantages:
 - The simple ratio methods ((a), (b) & (c)) are quick and simple to calculate and information is available from the accounts.
 - Information for (a) will be known the soonest.
 - The projection method, (d), needs expected loss ratios to be derived, making it more complicated.
 - Ratio methods are suitable for short-tailed classes e.g. household.
 - Also suitable if the liability class of business is not a significant part of overall claims.
 - Simple ratio methods are not very robust and require stable loss ratios.
 - If premiums are affected by the insurance cycle (as in household) then (a) may not be suitable.
 - (b) and (c) do not suffer from this but may be unreliable during times of adverse claims experience.

- In the case of household, lots of claims (e.g. after flooding) at the end of the year would not be wholly reflected in (a), (b) or (c).
- However, (b) may be reasonably good.
- For liability business, IBNR are often either new types of claims which arose many years ago or are the usual type of claims arising more recently.
- (b) will not allow for changes in volumes over recent periods, or inflation.
- (c) may be better for the more recent claims.
- (b) will not be appropriate if speed of settlement has changed.
- (d) is better for long-tailed business and hence for liability claims. It can also allow for different experience in each accident year and for trends or once-off events.
- For (a), IBNR will increase in line with premium growth, which makes sense as far as premium growth is due to exposure growth and not increased premium rates.
- A disadvantage of (a) is that the written premium does not necessarily reflect exposure, for example if big policies with annual fees are written in the last month, the actual earned premium (and exposure) will be less than the written premium.
- Method (a) does not work when premium is very unstable as the IBNR from previous years is then understated (if premium suddenly reduces) or overstated (if premium suddenly increases).
- (b) and (c) take longer than (a) because they first need estimates for OCR.
- (b) and (c) do not suffer from premium rates being affected by the insurance cycle.
- For (b) and (c) an unusually large claim outstanding will distort the measure.
- For (b) and (c), the IBNR will be consistent with the reserving basis used to calculate the OCR.
- (c) is less impacted by a change in settlement pattern than (b).
- (d) is not distorted by changes in premium rates as the loss ratio should take account of the quality of business.
- (d) is more time consuming as it requires a separate calculation for each accident year.

In part (i) some students defined IBNR and then went on to explain why it is necessary to calculate IBNR. This was not answering the question, which asked why it is necessary to calculate IBNR separately (i.e. not just calculate a total reserve which includes IBNR).

In part (ii) many candidates did not discuss the relative appropriateness of the methods by taking into account the types of business the company writes. In general, too few points were given. Some candidates made unrealistic assumptions.

QUESTION 6

i. Rating factors:

- payroll
- industry

- materials handled by employees
 - processes carried out by company
 - exposure (e.g. duration of cover, hours worked)
 - number of employees or turnover
 - past claims experience of company
 - location
 - safety precautions in place, e.g. sprinkler systems, first aid training, etc.
 - maximum level of cover provided or deductibles
- ii. Prospective Experience Rating is a system by which the premium of each individual risk depends, at least in part, on the actual claims experience of that risk in an earlier period.

Underwriting risk is increased as the premium for the current year is guaranteed, and poor risks may not renew their policies and thus the insurer is unable to recoup losses.

iii. Determination of Renewal Premium:

- In determining the base period to use, the insurer needs to ensure that there is sufficient data for the exercise to be credible and to enable the insurer to identify any trends or latent claims.
- However, the data should not be so old that it is no longer relevant for the intended period of exposure (following the renewal).
- Having decided what base period to use for the calculation of the renewal premium the insurer needs to collect the claims and exposure data from that period for the industrial company, ensuring these are consistent with each other.
- The data should include detailed claims information showing the type of claim as well as all the relevant dates related to the claims (incidence, reporting and settlement).
- Adjust the data to allow for periods of unexpired risk based on the assumption of how risk is spread over each policy year.
- Adjust the data appropriately, if necessary, to allow for any IBNR claims using past history.
- The allowance for IBNR claims should consider accident and disease claims separately, as these will have different characteristics.
- Outstanding claims should be projected to ultimate.
- The expected future exposure for the company should also be determined.
- It is important to ensure that the past data are relevant for the future period of exposure. Any factors that may cause this not to be the case need to be taken into account and necessary adjustments made, e.g. a change in working conditions at the company which may affect the future frequency and severity of claims.
- The past claims data may contain some large claims. The insurer can deal with these by:
 - truncating and grossing up over the whole portfolio, or
 - ignoring any claims that are deemed to have an insignificant chance of recurring.

- As with the allowance for IBNR, accident and disease claims should be treated separately.
- Data on past claims inflation are required in order to express past claims in present day monetary terms.
- Claims costs then need to be projected to the period of exposure to which the new premium rates would apply using the future inflation assumption.
- This will require information on earnings inflation, court award inflation and general claims cost inflation.
- It is important to identify any trends in the data.
- The analysis needs to be done for claims frequency and severity separately so as to ensure that trends are not concealed by a global premium rate.
- One would need to exercise some judgement in order to determine whether trends are likely to persist and the extent to which they need to be taken into account when determining the renewal premium.
- The insurer may want to adopt a credibility approach to calculate the renewal premium in which case the final premium would be derived by applying credibility factors to the experience of this particular employer with the experience of similar risks i.e. book rates.
- Could seek reinsurer's advice.
- The analysis of claims data (frequency and severity) will yield a risk premium.
- Various loadings need to be applied to this risk premium in order to calculate the office premium, e.g. profit, commission, expenses.
- It is important that the split of expenses between fixed and variable (as well as direct and indirect) and the choice of loading applied (per policy or percentage of premium) enables the insurer to recoup all of its costs.
- The office premium calculated cannot be viewed in isolation. The insurer needs to be mindful of its competitors' rates.
- The insurer needs to be clear about the extent to which it is prepared to deviate from the calculated theoretical premium in order to retain the business of this employer.
- A rate per employee could be calculated. In this way an adjustment premium could be payable at the end of the year to protect the insurer against a deviation in exposure from the 2500 employed at the time of renewal.

Part (i) was fairly well answered by most candidates.

In part (ii) some candidates decided to also describe a retrospective experience-rating system (not asked for), while some could not distinguish between a prospective and a retrospective rating system. Some candidates did not seem to know what an experience-rating system is.

While several candidates produced fairly comprehensive answers to part (iii), many produced very poor attempts.

QUESTION 7

i. XYZ: Balance Sheet as at 31.12.2010

Assets	(R mill)	Liabilities	(R mill)
DAC	20	UPR	80
Investments	700	Claim reserves	532
		AURR	8
		Share capital	25
		Retained profits	<u>75</u>
Total assets	<u>720</u>	Total liabilities	<u>720</u>

$$\text{UPR} = 160 \times \frac{1}{2} = 80$$

$$\text{DAC} = 80 \times 25\% = 20$$

$$\text{Expected losses on unearned premium} = 80 \times 85\% = 68$$

$$\text{Claim reserves} = 600 - 68 = 532$$

(as claim reserves on underwriting basis were based on full premium written)

$$\text{AURR} = \text{URR} - \text{UPR (net of DAC)} = 68 - 60 = 8$$

Share capital & retained profits unchanged

(Credit was also given if UPR was calculated by assuming premiums are received monthly in advance. In this case:

$$\text{UPR} = \frac{11}{24} \times \text{R}160\text{m} = \text{R}73.3\text{m (gross of DAC) etc.})$$

(ii) ABC: Balance Sheet as at 31.12.2010

Assets	(R mill)	Liabilities	(R mill)
DAC	60	UPR	280
Cash	25	Claim reserves	867
Investments	1250	Share Capital	25
Goodwill	25	Share premium account	75
		Retained profits	<u>113</u>
Total assets	<u>1360</u>	Total liabilities	<u>1360</u>

$$\text{Combined UPR (net of DAC)} = (200 - 40) + (80 - 20) = 220$$

$$\text{Combined URR} = 65\% (200) + 85\%(80) = 130 + 68 = 198$$

Therefore no need to set up AURR

$$\text{Claim reserves} = 300 (\text{ABC}) + 540 \times 1.05 (\text{XYZ}) = 867$$

$$\text{Goodwill} = 125 - 100 = 25$$

$$\text{Cash} = 150 - 125 = 25$$

$$\text{Retained profits} = \text{balance from A} - \text{L} = 113$$

$$\text{Total Assets \& Total Liabilities} = 1360$$

iii. Type of business:

- For ABC, Claim reserves / earned premium = $300 / 400 = 75\%$.
- This suggests that ABC's business is short-tailed, e.g. residential or small business property damage, motor insurance, etc.
- For XYZ, Claim reserves / earned premium = $540 / 160 = 337.5\%$.
- This suggests that XYZ's business is long-tailed, e.g. liability.

Impact of takeover on ABC's solvency:

- ABC's solvency ratio = $240/400 = 60\%$.
- ABC's solvency ratio (excl. cash) = $115/400 = 28.8\%$.
- While solvency looks strong, it is likely to have been building up cash for the takeover.
- This appears reasonable for short-tailed business
- XYZ's solvency ratio = $100/160 = 62.5\%$.
- This is suitable for the long-tailed (and possibly uncertain) nature of its claims.
- After the takeover, ABC's solvency ratio = $213/560 = 38\%$ (or $188/560 = 33.6\%$ (excluding goodwill)).
- Looking at the Combined Ratio (before management expenses), we see that ABC appears to be significantly more profitable than XYZ.
 - ABC: 20% (commission) + 65% (claims)= 85% .
 - XYZ: 25% (commission) + 88% (claims) = 113% .
- One should investigate whether this is generally the case or an exceptional year (for either ABC or XYZ).

iv. ABC:

Short dated fixed interest stocks are generally a good match since:

- Short-term interest rates vary in line with inflation, providing some inflation protection.
- These investments are very liquid in most markets.
- The cash position was probably built up in anticipation of the takeover.
- Provide stability of market values (useful for maintaining a stable solvency level).
- Stable market values do not lead to sales at depressed market prices (which can erode solvency).

Counter-arguments:

- Motor insurance might include a liability insurance component, which is longer tail than property damages, requiring investment in longer-dated and higher-return investments.
- The strong solvency position might suggest that a more aggressive position could be adopted to pursue higher returns for shareholders (and the take-over might have been done for this reason).

XYZ:

While short-dated stocks provide stable market values (and hence solvency position), they are not a good match for XYZ since:

- Claims expected to increase with judicial and salary inflation, which is probably higher than price inflation (to which short term interest rates are loosely linked).
- Expected returns are lower than other asset classes e.g. equities and property.

Counter-arguments:

- Some short dated stocks and other highly liquid assets are needed to meet unexpected claims and expenses arising in the short term.
- Stable market values do not lead to sales at depressed market prices (which can erode solvency).

Proposed changes:

- Switch to 'real' type assets for the long-tailed business such as equities and property (up to R540m).
- Short-dated stocks and cash are suitable for short-tailed business, so no changes needed for this.
- The resulting solvency position after takeover does not appear particularly strong (especially excluding goodwill) so the scope for mismatching assets and liabilities to pursue higher expected returns from volatile assets is not high.
- Check that overall assets comply with regulations (e.g. a merger of assets might result in an illegally overweight position in a particular asset which needs to be rectified).

Overall this question was answered very badly, reflecting a very poor knowledge and understanding of both accounts and investments.

Part (i) was a very basic question, yet it was very badly done. A very common error was showing DAC as an asset and then showing UPR net of DAC under liabilities, effectively double counting the DAC asset. Despite being given a loss ratio, candidates did not bother to check whether an AURR was required (it was).

In part (ii) most candidates did not seem to know what to do. A number of candidates that provided an incorrect balance sheet did so without including workings, so no or little credit could

be given for method. Very few candidates realised that R125m of cash or investment needs to be paid to existing owners of XYZ, and so should be deducted from assets of the merged entity. Most candidates ignored the information that required them to increase total XYZ claim reserves by 5%. UPR and DAC were poorly handled, showing a lack of understanding of basic accounting concepts. Very few realised that the R125m purchase price exceeded the R100m of equity in XYZ balance sheet, and this excess of R25m gives rise to a goodwill asset. Many candidates correctly realised that Retained Profits would be a balancing item.

Most candidates appeared to have very weak knowledge and understanding of the basic accounting ratios required in part (iii), despite this being bookwork. Rather than use ratios, a great number of candidates focussed their observations around the loss ratios that were provided, using these ratios to justify whether the business is long-tailed or short-tailed. Some even used the commission rate to justify the type of business being written. A high proportion of candidates compared profitability of the firms by comparing the Retained profits items on the balance sheets – this item is a historic figure of accumulated profits less dividends paid out, so cannot possibly be used to compare current profitability of the companies.

Part (iv) was a basic investment question. However, it was not answered well even by the candidates that correctly identified (or assumed) the nature of ABC's and XYZ's business. Several candidates made the simple statement "ABC is in short tail business so cash is a suitable match" without discussing this in any further detail as required by the question. Some candidates thought short-dated instruments are too risky and unsuitable, and ABC should only be invested in cash.

END OF EXAMINERS' REPORT