

EXAMINERS' REPORT

November 2013 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. Reins Premiums = $25\% \times R2000m = R500m$

Reins Recovery = $25\% \times R1200m = R300m$

Hence:

Profit Commission = $20\% \times (70\% \times R500m - R300m) = R10m$

ii. Premium to Company B (amounts in R'm):

<u>Policy</u>	<u>EML</u>	<u>EML (After A)</u>	<u>S lines</u>	<u>Gross Prem to B</u>
1	100	$0.75 \times 100 = 75$	0	0
2	120	$0.75 \times 120 = 90$	0.2	$0.2/1.2 \times 0.75 \times 2 = R0.25m$
3	200	$0.75 \times 200 = 150$	1	$1/2 \times 0.75 \times 4 = R1.5m$
4	600	$0.75 \times 600 = 450$	5	$5/6 \times 0.75 \times 6 = R3.75m$

i.e. Total premium to Company B = R5.5m.

iii. Premium to Company C (amounts in R'm):

<u>Policy</u>	<u>SI</u>	<u>SI to A</u>	<u>SI to B</u>	<u>SI Retained</u>	<u>Max Recovery from Co. C</u>
1	200	50	0	150	$0.9 \times 50 = 45$
2	160	40	$0.2/1.2 \times 120 = 20$	100	0
3	400	100	$1/2 \times 300 = 150$	150	$0.9 \times 50 = 45$
4	800	200	$5/6 \times 600 = 500$	100	0

Hence, the premium paid to Company C = $(45 + 45) \times 1\% = R0.9m$.

iv. Relative experience of insured and surplus reinsurer:

- These would not be expected to be the same.
- Not all of the policies written will reach the surplus retention limit, and so will not be reinsured, and thus they will not share the same portfolio of risks.
- Of those policies that are reinsured, different proportions of each could be reinsured.
- Additionally, the insurer and reinsurer will have different experience with respect to expenses and investment returns.

v. Reinsurer's reaction:

- The reinsurer would not be pleased as this may indicate that the insurer is not able to estimate its risks correctly and thus the insurance premiums may be too low. Even

though the premium is shared proportionally with the reinsurers, if the premium is too low they will receive too little premium.

- They have no choice but to pay the claims now.
- If this continues they may be unwilling to renew the reinsurance treaty.
- The reinsurer may require the introduction of some sort of rule regarding the relationship between EML & SI, e.g. the EML cannot be below a certain % of the SI.
- The reinsurer may choose to do nothing if the impact is not significant.

Part (i) was handled well by most candidates, other than those who ignored the smaller policies on the quota share treaty.

Part (ii) was handled poorly by many candidates. It was disappointing to see how many candidates did not know how to combine quota share and surplus reinsurance.

Part (iii) was not well answered. Several candidates did not even realise that the maximum potential recovery would be based on sum insured rather than EML.

Answers to parts (iv) & (v) were reasonable, although generally too few distinct points were made.

QUESTION 2

i. The data that would be used in a generalised linear model when analysing policyholder retention would contain the following information:

- Whether or not the policy was renewed. This will allow one to distinguish between those that don't renew and those that do.
- If data is available as to why policy holders do not renew, that would also be beneficial.
- The number of invitations (or reminders) to renew the policy and method used would also be an important factor to consider and what impact these have on renewal.
- Other explanatory variables such as:
 - Rating factors specific to the policyholder such as gender, age and location.
 - Rating factors specific to the vehicle (or vehicles if several risks are written on one policy) such as age of the vehicle and use of the vehicle would be useful in identifying trends.
 - The type of policy taken out.
 - Other factors such as initial distribution channel, method of payment and number of renewals with the company.
 - Change in the premium on the latest renewal – if the data allows, it would be beneficial to split the change in the premium into rate change and risk criteria change.
 - Change in premium on previous renewal.
 - Measure of competitiveness on renewal premium.

- Details of any mid-term adjustments occurring in the preceding policy period.
 - These explanatory variables would be useful in analysing what factors have a direct impact on renewals.
 - They would be useful to identify if there is any statistically significant relationships between the factors and renewals.
- ii. A risk factor is a factor or characteristic of the insured that is expected, possibly with the support of statistical evidence, to have an influence on the intensity of risk in an insurance cover (i.e. impacting claim frequency and/or average claim size).
The risk factor may not be objectively measurable, e.g. driving ability.

A rating factor is a factor used to determine the premium rate for a policy, which is measurable in an objective way and relates to the intensity of the risk.

It must, therefore, be a risk factor or a proxy for a risk factor(s).

For example, one proxy for driving ability (amongst others) might be how long the policyholder has had their driver's licence.

iii. Possible rating factors:

- Policyholder details:
 - age (date of Birth): younger drivers are more likely to be reckless, while old drivers might have slower reaction times, poor eyesight etc.;
 - sex of main driver: past experience might show women drivers are less accident prone;
 - marital status: singles might be less careful and more accident prone;
 - length of licence: higher risk the less experienced the driver;
 - the occupation of the policyholder and other drivers: past experience will indicate low/high risk occupations, likely to be linked to lifestyles;
 - whether there are additional drivers as well as the policyholder: will add to risk if other drivers use the vehicle;
 - whether or not driving is restricted to certain named drivers: higher risk if unnamed drivers use the vehicle;
 - past experience: good indicator of driver ability;
 - whether or not the driver has any driving convictions: could show degree of recklessness;
 - accidents / claims in last n years (details if applicable): could indicate driver ability.
- Vehicle details:
 - the use to which the vehicle is put (e.g. for business use): if used for business vehicle usage and risk will be higher;
 - the age of the vehicle: older vehicles may be less responsive and more costly to repair;
 - make and model of vehicle: indicates maximum speed, safety features etc. which affects risk;
 - the extent of any modification to the engine or body: as above;

- location of policyholder (e.g. postal code): vehicle theft will vary by region;
- where the vehicle is kept overnight (e.g. on the road / garaged, etc.): higher theft risk if not parked in a garage;
- vehicle value: indicates cost of replacement/repair;
- whether vehicle is imported: affects cost of replacement/repair;
- immobiliser / alarm / tracker (manufacturer, model): risk of theft.

iv. Direct modelling of pure premium or incurred loss data is problematic since a typical pure premium distribution will consist of a large spike (i.e. a point mass) at zero (where policies have not had claims) and then a wide range of amounts (where policies have had claims). Many of the traditional members of the exponential family of distributions are not appropriate for modelling claims experience from such a distribution since they do not have a point mass at zero combined with an appropriate spread across non-zero amounts.

The Tweedie distribution is a special member of the exponential family that has a variance function proportional to μ^p , with p being an additional parameter. The main advantage of the Tweedie distribution is that in the case of $1 < p < 2$, the Tweedie distribution has a point mass at zero and corresponds to the compound distribution of a Poisson claim number process and a gamma claim size distribution.

v. Relative advantages:

The Tweedie GLMs fitted to the pure premium directly can often give very similar results to those derived by the “traditional” approach of combining models fitted to claim frequencies and claim severities separately.

This has the advantage of reducing the amount of iterative modelling required to produce satisfactory claim models.

Furthermore, the Tweedie distribution does not have the problem of considering how the models used to model the frequency and severity separately need to be combined in order to give an indication of loss cost, or “risk premium”.

Relative disadvantages:

A disadvantage of the Tweedie distribution is that it does not provide a better understanding of the way in which factors affect the cost of claims in terms of frequency and severity, as would be the case when fitting GLMs separately to the frequency and severity experience.

In addition, fitting GLMs separately to frequency and severity has the advantage of more easily allowing the identification and removal of certain random effects from one element of the experience, e.g. via smoothing or by excluding factors from one of the frequency or amounts models, which cannot be done using the Tweedie distribution.

This also means that the Tweedie model will be more affected by the volatility from the underlying severity experience and may produce less appropriate results.

Part (i) was generally well answered. Some candidates did not provide enough information (instructions specified that candidates must outline the benefit and this was not done) or didn't link data items to policyholder retention but focused on macro-economic variables.

Part (ii) was well answered by most. However, some candidates did not provide enough detail or suitable examples, and some (very disappointingly) did not know the difference between a rating factor and a risk factor.

Part (iii) was well answered by most. Some candidates lost marks for not providing enough detail (instructions specified that candidates must outline – which was not always done).

Parts (iv) and (v) were poorly answered, with several candidates scoring no marks on these parts. Candidates clearly did not know or understand the characteristics of the Tweedie distribution and its link to the exponential family, nor how it differs from the fitting of GLMs separately to frequency and severity claim experience data.

QUESTION 3

i. Likely rationale:

- The perception in the market is that young drivers are a risky market segment, usually having high claims experience.
- Graduates and professionals may, however, be better risks than average in the given age band.
- By targeting graduates and professionals the company will be hoping to attract the better risks from the young drivers' market segment.
- Hence the company will be hoping to gain more volumes at profitable premium rates.
- Other value could be added by, for example:
 - Lifetime value - whereby young policyholders should become lower risks over time, so if loyalty can be built they can add profit over the long term.
 - Selling other products to the same group, producing cross- subsidies.

ii. General:

- Since the company had no relevant internal data on which to base its premiums it will be vital to investigate experience.
- The company will investigate the various portfolio movements of the business to get an early indication of likely volume and profitability.

Specific investigations:

- Quote volumes by month:
 - This will help gauge the success of the marketing campaign.
 - It will provide an indication as to whether target volumes are likely to be reached.
- Calculate and monitor the new business conversion rates and NTU rates by month against target rates:
 - This could give an indication of whether rates are competitive.

- It may highlight changes in competitor pricing strategies during the year.
- Business volumes written against that expected:
 - Much higher volumes might mean that the rates charged are too low and might be unprofitable.
 - Much lower volumes might either mean the pricing is too expensive or that the marketing was not successful.
 - If the business mix or profile is not as expected the rating structure could be out of line.
- The average premium rates achieved compared to that expected, sub-divided by:
 - Age.
 - Month – to check for trends.
 - Distribution channel.
- Reported claims experience, i.e. frequencies and average costs (severities), sub-divided by:
 - Type, i.e. own damage, third party damage, windscreen etc.
 - Month – to check for trends/seasonality.
 - Incidence of large claims or loss accumulations versus expected.
- Expenses incurred split by:
 - Writing the business (marketing).
 - Policy servicing (issuing of documents and claims handling) compared to that expected.
- Commissions by sales channel.
- Premiums compared to those of competitors:
 - This will be important as competitors' rates formed the basis of its pricing.
 - It will be important to remain competitive.

Part (i) was generally well answered. The key was to point out that the company can select better risks out of a high risk segment and make a profit. Generic answers not specific to the question, such as “the company thinks there is a business opportunity” were not rewarded.

Part (ii) was not well answered. Answers should have focused on investigations of portfolio movements and actual versus expected for items that can give an early indication of profitability, number of quotes or taken up policies. Lapses and renewals are not relevant during the first year of business, neither was a loss ratio analysis or capital model.

QUESTION 4

i. Importance:

- The parameterisation process involves the setting of assumptions for the various cashflows/values/quantities in the model.
- Sensitivity testing involves testing how sensitive the output of the model is to changes in each of the input parameters.

- This is important to know, because the company should put more time and effort into accurately determining the assumptions that have the biggest impact.
- This is because there is the potential for the best estimate parameters to be incorrect.
- The output would therefore be incorrect, potentially resulting in poor decisions being made by management based on the model output.
- This is particularly a risk for the commercial property class because Aeros will not have much data yet.
- A key step up from sensitivity testing to scenario modelling is that assumptions are not changed in isolation, but any changes to one parameter are accompanied by consistent changes in other parameters in the model.
- Sensitivity testing a stochastic model involves changing the parameters of the cashflow distributions i.e. estimating parameter error. The “scenarios” (simulations) are then generated by the model. Scenario tests apply to deterministic models.

Key tests:

- Increase the number (average or variance) of large losses (aeroplane crashes, fire damage to large commercial buildings).
- Consider catastrophe severity such as storm at airport damaging many aeroplanes or earthquake causing damage to many buildings.
- If there is some long-tailed liability business, where assets held to back reserves do not match the liabilities, then the interest rate / returns on assets may be key.
- Business volume growth on the new commercial property book. If it is higher than expected then it may require more capital.

ii. Scenario tests:

- Involves considering combinations of variables that could realistically occur at the same time, resulting in a given outcome.
- Experts can apply their minds to thinking of reasonable scenarios.
- There will be consistency between cashflows because experts would have thought through the entire scenario carefully.
- There is more transparency than with a stochastic model.
- However, it may be difficult to attach probabilities (or return periods) to the scenarios.

Stochastic model output:

- Each simulation can be considered a generated scenario. The final result of each simulation can be broken down into cashflows, classes etc. contributing to the scenario.
- Generates many more scenarios than could be generated manually.
- If correlations and relationships between variables are set accurately then the cashflows within the scenarios generated by the model will be consistent.

- The model may reveal severe scenarios that were not thought of previously.
 - Even if these scenarios ultimately prove to be unrealistic, they will prompt investigation into these areas.
- Will generate a distribution of outcomes, so will be a smoother range of scenarios at different severity levels.
 - This is useful when communicating risk measures at different severity levels (confidence levels).
 - It is more difficult to understand what severity level the manually generated scenarios are (as mentioned above).

iii. Check the model set-up:

- The first step would be to check that all large losses are modelled separately.
- Check that the reinsurance programme is set up to calculate recoveries based on the inputted treaty deductibles and limits.
 - This is likely to be the case because the company has previously used the model to inform reinsurance decisions.
- Check if commercial property losses and aviation losses are on the same treaty.
 - This could affect the likelihood of limits being reached, e.g. on the number of reinstatements allowed.
- Even though only the Risk XL treaty is being tested, all other treaties (such as quota share and Cat XL) should be in place so that the effect of the Risk XL treaty can be accurately assessed.

Initial model run:

- Choose a starting treaty, including:
 - excess point;
 - upper limit;
 - number of reinstatements.
- Run the stochastic model with a best estimate set of assumptions for the large loss claims distributions (including all parameters of the distribution – mean, variance etc.).
 - The severity distribution will likely be a skewed distribution such as log-normal, Weibull, or Pareto.
 - The frequency distribution could possibly be a Negative Binomial or Poisson distribution.
- Analyse output (see making decision below)

Repeat the above process allowing for different reinsurance treaty assumptions:

- excess points;
- upper limits;
- number of reinstatements.

Rerun the model with adjustments to key parameters affecting recoveries, in particular large loss frequency distribution parameters to get an idea of parameter risk.

Making the decision

- For each run with different treaty details, the insurer would consider:
 - the impact on the capital requirement using the capital criteria, e.g. 1 in 200 VaR; and
 - the volatility on a less severe basis (lower percentiles).
- The reinsurance would likely reduce the expected profit because the reinsurer prices to make an (expected) profit.
 - Thus, while more reinsurance reduces risk it reduces the expected profit.
- The insurer will want to take into account the treaty that gives the best trade-off between risk and return.
- This will be impacted by the insurers risk appetite.
 - For example, if the insurer has a lower level of free assets it may be forced to go for the lower risk strategy (more reinsurance) even though it reduces expected profits.
- As part of the capital calculation, include assumptions for reinsurer default risk.
 - The reinsurer default risk would be higher in years of higher claims, especially if the reinsurer pays out recoveries to a number of insurers.

Part (i) was mainly bookwork. In many instances examples of sensitivity tests were not explained sufficiently to make it clear why they could be considered “key” tests. Many candidates referred to testing investment income, but failed to mention the effect on the value of liabilities.

Part (ii) was mostly theory, with the candidates who knew their bookwork scoring close to full marks. Many candidates simply listed advantages of the deterministic and stochastic approaches, without focusing on the relative advantages as required by the question. Many candidates suggested that deterministic scenarios cannot take account of correlations between variables. This is, however, incorrect because scenarios can be chosen where the elements in each scenario can plausibly occur at the same time.

Part (iii) required candidates to apply their knowledge of how a capital model works to solve a specific problem. Few candidates scored well on this question. Several candidates failed to comment on the trade-off between risk and return and instead suggested criteria such as “minimising capital” without any reference to the effect on expected return or return on capital. Many candidates wrote irrelevant points, for example, stating other uses of the model, or made generic points. Answers were generally not focussed on optimising risk XL purchasing, which is what was asked for in the question. Generally, insufficient thought was put into specific features required of the model, such as modelling of large losses separately. A number of candidates commented on other types of reinsurance (e.g. Cat XL) not asked for in the question.

QUESTION 5

i. Actuarial reserves:

- Outstanding reported claims reserve (or case estimates) – A reserve to provide for claims in respect of claim events that occurred before the accounting/valuation date and have been reported but have not yet been settled.
- IBNR – A reserve to provide for claims in respect of claim events that occurred before the accounting/valuation date but still need to be reported to the insurer by that date.
- UPR – The amount set aside from premiums written before the accounting date to cover risks incurred after that date.
- IBNER – A reserve reflecting expected changes (increases or decreases) in estimates for reported claims only i.e. excluding any true or pure IBNR claims
- Claims handling expense reserve – Reserves set aside to cover the cost of settling claims after the accounting date.
- AURR – The reserve required to cover the excess of the URR over the UPR, where the URR is the reserve required to cover claims and expenses expected to emerge from an unexpired period of cover.
- URR – An estimate of the amount of claims and expenses that will emerge from the unexpired policies.
- Reserve for reopened claims – A reserve held for claims that could potentially be reopened.
- Catastrophe (equalisation) reserve – A reserve held to cover significant cashflow outflows following a catastrophic event and aid in reducing the variability of the insurer's declared profit.
- Cashback reserves – reserves for loyalty benefit

ii. Advantages:

- The actuary uses generally accepted actuarial approaches (chain ladder, BF, and Loss Ratio methods).
- The actuary's approach is simple and may have been appropriate in the past when the majority of claims were for personal accident.
- The method uses a loss ratio in the most recent accident year where the chain ladder method may not be appropriate.
- The actuary uses a BF method in the more recent AYs. This adds stability to the chain ladder method.
- The actuary attempts to use the company's own experience to derive the prior loss ratio.
- The actuary allows for changes in premium rates and claims experience.
- Loss ratio or BF can produce accurate results provided the loss ratio is accurate.
- Distortions due to aggregating classes may be small given that most of the business is in personal accident.

- BF takes latest premium (exposure) into account which adds stability especially if there is little claims development.
- An advantage of the accident cohort is it projects IBNR claims.

Disadvantages & suggested improvements:

- The actuary assumes the 2009 AY is fully run-off however there is evidence of a tail i.e. the 4th development factor is 1.10 (690/626).
 - A tail could be fitted to allow for this additional development.
- Aggregating all classes of business together before calculating reserves means the chain ladder assumptions are likely not to hold as the run-off pattern may not be the same for each origin year.
- The projected loss ratios may also not adequately capture changes in business mix, claims experience or premium rate changes.
 - The actuary will need to consider each insurance class separately when setting claims reserves.
 - This will be subject to having enough data in each class to be credible (which is not the case for the commercial property class).
 - The actuary could use benchmarks for classes where there are little data.
- The actuary does not consider inflation in his reserving methodology which could be material if the liability business grows or if past inflation is not reflective of future inflation.
- The actuary does not discount in his reserving methodology which could be material given that there is some liability business.
- It is not clear whether the actuary allows for salvages and claims expenses.
 - These will need to be allowed for in the future.
- The actuary only considers the last 5 accident years which may not be sufficient given that there is still some development in the 2009 accident year.
 - The actuary could look at using more data e.g. the last 10 years of paid claims (i.e. a trapezium), though the actuary should satisfy himself that these data are still appropriate.
- The actuary uses paid data which doesn't make use of all the information.
 - The actuary should also consider using incurred data which uses more information as it includes case estimates.
- It is not clear how the actuary allows for reinsurance.
- The methodology could be difficult to explain to key stakeholders, e.g. board, regulator.
- It fails to allow for catastrophes or large claims.
- There is an overreliance on the 2009 AY in the BF method.
- Use of other methods, e.g. Cape Cod, ACPC method.
- Projecting 2009AY doesn't allow for commercial property experience as the first commercial property claim was in 2013.
- The large volume of data justifies the use of the chain ladder.
- The method may be inaccurate to use when expanding into new areas as the methodology is open to distortions due to a change in business mix.

- Potential anchoring to 2009 AY.
- Inflation adjustment distorted due to aggregation of different classes of business.
- Use of benchmarks due to little data for commercial property claims.
- Using one loss ratio for all classes may not be appropriate due to the risk of changes in business mix.
- The use of different methodologies between accident years can make comparisons difficult.
- A mixing of different classes of business means claims inflation is distorted.
- Possible inconsistencies of assumptions between methods.
- Difficulty in selecting prior loss ratio.
- Use of loss adjustors for commercial property claims.
- Extension to a stochastic model is difficult due to the reliance on loss ratios.
- Compare actual versus expected.
- Analyse small and large claims separately.

iii. Prior loss ratio = Ultimate claims / Earned premium

Assume:

- Premiums are annual and are written uniformly across the year.
- The 2009 AY is fully run-off.

Adjustment to earned premium for premium rate changes:

- To convert the written premium rate changes into earned premium rate changes assume premiums are, on average, written half way through the year.
- We can then create an index for the gross earned premium (GEP) in each accident year (2009-13), and hence determine the adjustment to the earned premium as the change in the GEP ratio.
- For example, for the 2009 AY: The earned premium in 2009 consists of premiums written in 2008 and 2009. If we assign an arbitrary value of 100 to premiums written in 2008 then premiums written in 2009 have a value of $1.05 \times 100 = 105$. To get the value of the index for the 2009 AY we use the formula:

$$\frac{100 \times \text{WP(in 2008)} + 105 \times \text{WP(in 2009)}}{\text{WP(in 2008)} + \text{WP(in 2009)}}$$

Adjustment to claims experience:

- We are told that the average benefit level (essentially the average cost per claim increases by 10% per year.

The prior loss ratios can thus be determined as follows:

Accident Year	Written Premium		EP Index	% Change in:		Prior loss ratio
	AY – 1	AY		EP	Risk Pr.	
2009	100.0	105.0	102.5	-	-	57.5%
2010	105.0	112.4	109.1	6.42%	5%	56.7%
2011	112.4	121.3	115.9	6.29%	5%	56.0%
2012	121.3	115.3	116.5	0.47%	5%	58.6%
2013	115.3	113.0	114.0	-2.14%	5%	62.8%

iv. Adjust the data to exclude the large commercial property claim in the 2013 AY.

Correct the chain ladder development factors (amounts in R'000s):

Accident Year	GEP	Cumulative Claims				
		0	1	2	3	4
2009	1 200	293.0	418.0	536.0	626.0	690.0
2010	1 350	291.0	449.0	589.0	658.0	725.3
2011	1 250	370.0	556.0	670.0	764.7	842.9
2012	2 500	399.0	602.0	759.4	866.7	955.3
2013	4 500	925.0	636.1	802.4	915.8	1009.4
Incremental development factors			1.49667	1.26142	1.14133	1.10224

Gross Claims Reserve		
Accident Year	Selected Method	Reserve
2009	Paid Triangle	-
2010	Paid Triangle	67
2011	BF	154
2012	BF	601
2013	Loss Ratio	2725
Total Claims Reserve		3547

Adding the reserve for the commercial property business of R0.5m gives total reserves of R4.047m.

Part (i) was a straight bookwork question on which many candidates scored well. A number of candidates stated that a DAC was a reserve, but it is an asset.

Part (ii) was a challenging question that required candidates to apply their knowledge. Some candidates gave as a disadvantage that the prior loss ratio ignores past experience. This is not the case as the prior loss ratio was based on the 2009 Accident Year adjusting for claims and premium changes.

Part (iii) was the most challenging part of the question. Most candidates correctly calculated the base 2009 Loss Ratio though very few followed an acceptable approach to calculating the increase in the claims' incidence and correctly adjusted written premium rate changes to earned premium rate changes. Marks were awarded for stating valid assumptions.

Part (iv) was, surprisingly, not well answered by most candidates. The techniques required to answer this question are standard actuarial techniques covered in earlier subjects. Some candidates calculated UPR reserves when the question specifically asked for the calculation of claims reserves.

QUESTION 6

i. Background:

- Commercial property risks are generally large, unique and often complex.
- The insured would require insightful, tailored advice on what their insurance needs are.

Brokers:

- Brokers act as intermediaries between the seller and buyer of a particular insurance contract without being tied to either party.
- They are likely to be paid by commission (brokerage) from the insurer.
- When placing business they are the agent of the insured.
- Brokers may be used by the insurer for some functions on behalf of the insurer (set out in binding authorities) such as underwriting smaller risks, issuing contracts, collecting premiums and facilitating the claims process.

Tied Agents:

- Agents are tied to the insurer for specific classes of insurance (e.g. commercial property insurance), and may not sell the products of other insurers for these classes.
- The agents may be tied to other insurers for other classes of business.
- Usually paid by commission.

Staff directly employed by the insurer:

- May be paid a fixed salary or commission, or a combination of the two methods.
- Staff may not sell the products of other insurers.

ii.

Income Statement		2010	2011	2012
Net premium earned		1 160	1 300	1 410
Net claims incurred		1050	1100	1850
Underwriting profit		12	87	-560
Insurance result		92	179	-459
Balance Sheet				
At 31 December	2009	2010	2011	2012
Free assets	407	425	731	345
Ratios				
Claims ratio		90.5%	84.6%	131.2%
Expense ratio		8.3%	8.5%	8.3%
Combined ratio (CR)		98.9%	93.1%	139.5%
Alternative CR		99.1%	93.5%	140.1%
Insurance Profit margin		7.9%	13.8%	-32.6%
Solvency Margin		35.4%	54.1%	23.0%

Claims ratio = Net claims incurred / Net premiums earned, where:

- Claims incurred = claims paid + incr. in outstanding claims reserve
- Premiums earned = written premiums – incr. in unearned premium reserve

Combined ratio = Claims ratio + Expense ratio, where:

- Expense ratio = expenses paid / net premiums written

Or alternative combined ratio =

(Net claims incurred + expenses paid)/Net premiums earned

Insurance Profit margin = Insurance profit / net earned premiums

Solvency margin = Free reserves / net written premium

iii. The main causes of the volatile financial results:

Claims – A large claim (or aggregation of claims) in 2012 due to:

- Inadequate reinsurance to absorb large claims or aggregation of claims. i.e. large claims or accumulations in excess of the existing reinsurance arrangement.
- Failure of a reinsurer so the insurer was faced with a larger loss.
- Unlikely to be caused by a change of reserving basis, as claims paid increased significantly in 2012.

- A change in mix of business may have contributed to the poor claims experience in 2012.
- The mix of business by distribution channel may have led to risk concentrations e.g. by geographic area.
- Relaxation of underwriting standards.
- New types of cover and inadequate premiums.
- Random increase in claims in 2012 due to a few claims on the insurer's largest insured properties.
- Several claims happening due to a single event such as an earthquake.

Investments:

- The volatile insurance result filters through directly into the solvency margin.
- In addition, free assets are also volatile due to high equity weighting (around 50% of assets).
- And due to long duration of fixed interest making this class sensitive to changes in interest rates. This would impact solvency if unmatched (specifically that assets were of longer mean duration than the liabilities, which is likely for short-tailed property class).
- Volatile capital appreciation is reflected by the volatile revaluation reserve.
- A sharp fall in the revaluation reserve in 2010 is followed by a sharp recovery in 2011, contributing to high free assets in 2011 (54.7% of net written premium).
- Capital losses in 2012 contributed to free assets falling below the required level.
- Investment income (as % of average funds) has been stable and has not been a source of volatility:

	2010	2011	2012
Investment income (on reserves)	5.7%	6.1%	6.0%
Investment income (on shareholder funds)	4.3%	4.6%	4.7%

- Other: Expenses have been relatively stable (as % of net written premium) so they have not contributed to the volatile financial results.

iv. The asset split (as % of total assets) is as follows:

At 31 December	2012
Investments	
Equities	49%
Fixed interest	26%
Cash	22%
Funds held by brokers	1%
Net DAC	2%

The suitability of the assets should be assessed relative to the liabilities:

- Commercial property insurance is likely to be short-tailed: reporting delays and settlement delays are likely to be short (although claims relating to stock may take slightly longer).
- Claims are linked to the cost of repairing and rebuilding damaged buildings and replacing lost stock, hence is linked to inflation.
- The currency of the liabilities is likely to be local, although the insurer may be writing business in other territories.
- Large losses can occur from a single event e.g. a large printing work, or industrial plant, or from an aggregation of closely located insured properties.

Suitable matching assets should thus be:

- Liquid and marketable (to cater for large unexpected losses) such as cash;
- Short-term (term outstanding of no more than a few months);
- Inflation-linked to allow for unexpected inflation. However due to the short-term nature of the class fixed interest stocks may be suitable as unexpected inflation is unlikely to deviate much from the expected level priced into the asset price.
- This suggests that cash and short-dated fixed interest stocks are most suitable for this asset class.

To the extent that the solvency margin exceeds the minimum required level, the insurer may adopt a mismatched position to enhance expected returns provided this does not increase risks to unacceptable levels.

The solvency margin was 35.8% and 54.7% in 2010 and 2011 respectively, which is well above the required level of 25%. This would suggest that the insurer can adopt a mismatched position.

However given the volatility of net claims experience, it would appear that the mismatched position is too aggressive, so that if claims and investment experience are poor in the same year (e.g. 2012) the insurer becomes insolvent.

A more suitable investment position (in the absence of increased reinsurance) might be a reduced level of equity holding (e.g. to around 20% of assets) and a shortening to the duration of the fixed interest stocks (to no more than 2 or 3 years).

v. a. Contingent capital arrangements and insurance-linked securities:

- Contingent capital arrangements:
 - Contingent (or Committed) capital is based on a contractual commitment to provide capital to an insurer after a specific adverse event occurs that causes financial distress.

- The insurer purchases an option to issue its securities at a predetermined price in the case that the defined situation occurs, on the understanding that the price would be much higher after such an event.
 - If the defined event occurs, leading to financial distress of the insurer, then the price of the insurer's securities will fall (i.e. it will be more expensive to raise capital by issuing securities). The option will allow the insurer to sell its securities after the adverse event at a higher price than their market price.
 - Contingent capital provides a mechanism of ensuring that, should a particular risk event happen, capital will be provided. As such, it is a cost-effective method of protecting the capital base of an insurance company. Under such an arrangement, capital would be provided as it was required following a deterioration of experience (i.e. it is provided when it is needed).
- Insurance-linked securities:
 - The insurer issues a bond with interest payments and repayment of principal contingent on claims experience specified at the time of issue i.e. if claims experience exceeds a specified level this allows the insurer to reduce or cancel the bond repayments in a pre-specified manner.
 - Claims experience may relate to:
 - the entire industry;
 - specific parts of the insurer's business;
 - catastrophic losses.

b. Reasons why the insurer may prefer to use these arrangements:

- Both contingent capital arrangements and insurance-linked securities provide a means to transfer risk to capital markets when traditional reinsurance is:
 - not available due to low capacity e.g. at the bottom of a reinsurance underwriting cycle;
 - not available on acceptable terms; or when
 - reinsurance premium rates are unacceptably high.
- Capital markets themselves go through cycles in terms of cost and availability of capital, which may not necessarily coincide with reinsurance underwriting cycles, so there is an opportunity to lower costs to transfer risk by having access to both capital markets and traditional reinsurance markets.
- In the case of insurance-linked securities, the capital has already been obtained by the insurer, hence there is no delay in obtaining funds to help pay for claims (unlike for reinsurance recoveries).
- Obtaining capital market funding after a period of poor experience or catastrophe could avoid realising assets at an unfavourable time.

There was a wide dispersion of marks, but on average the marks were poor. Part (i) was a straightforward application of bookwork, yet very few candidates got more than half of the marks. A number listed "banks" as a distribution channel in addition to brokers and tied agents, however a bank is likely to be a specific type of a broker or tied agent.

For part (ii) too many candidates did not know the most important of the accounting ratios. While marks were awarded generously for any sensible alternatives, a number made basic errors such as using numerators and denominators that do not correspond (e.g. claims incurred/premiums written for the claims ratio).

Answers for part (iii) were very poor, with very few candidates making the points about the volatility of investment returns (as reflected by the revaluation reserve). Almost all candidates focussed only on claims, but even then very superficially.

Part (iv) was an easy investments question, which was handled very poorly. While many candidates observed that the solvency margin was below the minimum, they almost always stopped there, not discussing the implications for investment strategy. Some thought that because there were cash holdings roughly equal to the statutory minimum solvency margin, that the rest of the assets could be invested aggressively, ignoring mismatching issues.

Part (v) was bookwork but very few candidates answered satisfactorily.

END OF EXAMINERS' REPORT