Actuarial Society of South Africa

EXAMINATION

13 May 2010 (pm)

Subject F203 — General Insurance

Specialist Applications

Examiners Report

Question 1 i)

Comments:

This was a pure bookwork question and the candidates answered it well.

Answer:

Risks Attaching Basis: A basis under which reinsurance is provided for claims arising from policies commencing during the period to which the reinsurance relates.

For this type of policy the claims data should be grouped by underwriting period.

Losses Occurring Basis: A policy providing cover for losses occurring in the defined period no matter when they are reported or when the policy was written.

For this type of policy the claims data should be grouped by accident year/quarter/half-year.

Question 1 ii)

Comments:

Most candidates struggled with this question. Not one candidate mentioned the need for a tail factor in the property and liability books. Some candidates also mentioned that the motor book should be split between own damage and liability, not realizing that the liability triangle is given separately. Very few candidates mentioned alternative reserving techniques such as BF or Cape Cod. Candidates also failed to realize that a change in the salvage contract for all claims reported from 1 July onwards will affect the development factors along the diagonal.

Answer:

General
If possible add more history to the triangles. This will give greater statistical reliability, but this advantage has to be weighed against the disadvantage of the possible irrelevance of older data.

It is not stated for which purpose the reserves are being calculated. The degree of prudence will depend on the purpose but the inference is that it is for balance sheet purposes.

For all lines of business it is advantageous to calculate reserves based on data gross of reinsurance and projecting outwards reinsurance separately. The difference between the 2 calculations will provide the net reserves. The possible disadvantageous of this is that the triangle representing the outwards reinsurance might be very sparse and therefore unreliable.

Private Motor:
Changes to the data to incorporate the changes in business:

The change in reinsurance treaty is on a losses occurring basis and will therefore only affect claims from the 2007 accident year onwards.
It will therefore affect the bottom part of the triangle and development factors from incident year 2007.

To improve the quality of the development factors for the 2007 year onwards the history should be restated as if the non-proportional treaty has been in place all along. This will provide better development factors for the development periods 5 and 6.

Because the retention on the non-prop treaty is higher the development factors will probably be higher from 2007 onwards. This is clear from the data.

The reinsurance recoveries from the non-approved reinsurer must be added back to the claims if the reserves are calculated for statutory purposes.

The new salvage treaty is going to affect the development patterns along the 2008 diagonal and onwards. This implies that the average development factors will be distorted.

If at all possible all salvage recoveries should be added back to the historical claims and the new salvage contract should be applied. This will restate the history to reflect the current situation.

The upward trend in the first 2 development periods should be investigated. It might be appropriate to give more weight to the later development periods.

Best Reserving methodology:
The BF or Cape Cod methods might be a better solution because development factors are not stable. This assumes that business has a fairly accurate expected loss ratio which is not necessarily true given the changes in the reinsurance and salvage contracts.

Another option is to use a combination of both chain-ladder for the older years on the old reinsurance treaty and BF for the last 3 years.

Private Property:
Changes to the data to incorporate the changes in business:
The development factors before accident year 2007 are very stable. There is a marked increase in the development factors from 2007 onwards.

This might be an indication of one of the following:
- There might be a difference in either the underlying product or the claims handling process between the business administered in-house and the business administered by the broker.
- Case estimates might be less conservative for the new book of business and therefore the higher development factors.

Best reserving methodology:
A small tail factor should be added because there is still some development after 5 years.

Split the 2 property books and reserve separately.

Chain ladder can be used on the older book because the development factors are very stable.

The new book does not have enough history to use annual chain ladder development factors.

One solution is to split the data into quarters. This will give more development factors to get an indication of the stability.
Another option is to use the BF or another exposure method such as Cape Cod until there is enough historical data to use chain ladder.

Passenger Liability:
Changes to the data to incorporate the changes in business:
From 2009 the passenger liability reserves will have to be split into 2 parts. The first part to reflect the losses occurring policies and the run-off of those, and the second part going forward to allow for the claims made basis.

If the reinsurance treaties operate on a risks attaching basis, the triangle will have to be re-organized according to underwriting year, while no change is needed if the treaties operate on a losses occurring basis.

The chain ladder based on net incurred claims is not appropriate to calculate reserves for the losses prior to 2009 because

- The primary assumption that the reporting and payment of future claims will be similar to the patterns observed in the past is violated. This is evident from the fluctuation in the development factors for incurred claims.
- The reinsurance structure has not been consistent. Retentions have been increasing from year to year which might cause development factors to increase

It is also clear from the data that a tail factor should be added because there is still substantial development after 5 years. The current reserves do not make provision for any development in the tail.

Best reserving methodology:
Before 2009:
Because the underlying premium can not be split between own damage, third party and passenger liability, it is not possible to use a standard BF method – it is impossible to determine an expected loss ratio for passenger liability.

It is possible to use another exposure method such as number of insured vehicles as an exposure method for either the BF or Cape Cod.

However, the BF and Cape Cod is not appropriate if the underlying data are very thin or volatile, since the expected claims are based on reported claims to date.

Benchmark development factors may be used, e.g. factors developed from the STAR returns.

Frequency/severity methods can be used.
This is usually done by developing 2 triangles: A triangle containing the number of claims and a triangle with the severity.
It is likely that the development factors for the 2 triangles will also be very unstable.

You can also investigate the possibility of doing a chain ladder on the net paid triangle if the data are available and the development factors are more stable.
This will require the estimation of a much larger tail factor because payments develop slower.

From 2009
Claims made policies cover all claims reported to an insurer within the policy period, irrespective of when they occurred.

This implies that there is no IBNR, only IBNER.

For the new claims made policies the history should be reorganized to get an indication of the IBNER development in the past.

The triangle should be based on report date versus development date.

The development factors obtained from this triangle should be applied to all claims made policies from 2009 onwards.

Question 1 iii)

Comments:

This question was not answered very well. Some candidates elaborated on how the actuary can diminish the affect of the increased loss reserves and how it will affect the company's financials, but this was not the question. Candidates also did not discuss this in enough detail.

Answer:

Combining classes will provide diversification and will usually result in lower reserves.

However, this is not good practice because of the following reasons:
• The reinsurance structures differ between the lines.
• If a line of business is sold or placed in run-off the reserves for that line should be determined and sold independently. This might cause the remaining reserves to be inadequate.

- Calculating the reserves separately provides the company with a level of prudence that will help to withstand adverse development.
- Reserving accuracy and credibility are improved by subdividing experience into groups exhibiting similar characteristics.
- Different classes of business have different development patterns. If classes are combined and the proportions between the classes change, the run-off development will be distorted.
- The only reason for combining different classes is if there is not enough data in a specific class to provide credible results.
- There is a big difference between the reporting and development patterns of motor and property on the one hand and liability on the other. The liability presents the bigger risk because of the longer tail and should therefore be separated. It is possible that the variability in the liability line will disappear if combined with the other lines.
- Because of the change in the liability policies to claims made cover, these policies will have no IBNR and can't be added to the other lines.
  Additional Points:
  The liability lines can be discounted while the other lines can not.
  The different lines are exposed to different inflationary factors.

Question 1 iv)

Comments:

This question was reasonable well answered. Candidates got confused about the guidelines between SAICA and PGN401.

Answer:

a.   According to the accounting guideline issued by SAICA (February 2001) explicit discounting may be applied to categories of claims outstanding at the end of an accounting period where the average expected period to final settlement from the end of that accounting period for the category of claims in question, weighted on the basis of expected gross claims, is greater than four years.

Adequate data must be available to construct a reliable model of the rate of claims settlement.
The discount rate should not be greater than the rate expected to be earned by the assets held, that are appropriate in size and nature to cover the provision for claims being discounted, during the period necessary for the payment of such claims.

It should not exceed either a rate justified by the performance of such assets over the preceding five years, or a rate justified by the performance of such assets over the year preceding the balance sheet date.

b.   Expected future investment on a portfolio of assets to the liabilities, bearing in mind the term, nature and currency of the liabilities.

The rate of return on specific matching assets. It is normally presumed that as far as possible, insurance liabilities are matched by fixed interest investments and cash, rather than securities and creditors. The matching portfolio assumed should be consistent with that assumed in the calculation of the Minimum Capital Requirement asset charge.

Yields on fixed interest securities;

An allowance for tax

Allowance for default risk

Consistency with inflation assumptions

Question 1 v)

Comments:
Many candidates concentrated on what should be considered when you apply discounting (same as Question 1 iv) rather than on how to incorporate it in a reserving exercise. Many candidates also failed to mention that it has to be based on actual cash flows, therefore paid triangles.
Claims handling expenses are not part of the normal claims cost. These are unallocated expenses such as staff costs.

Answer:

Do the following:
a.   Discounting: Reserves are usually calculated on an undiscounted basis and then apply the effect of discounting.
Determine future cash flows by calculating development factors based on a **paid triangle** to get a prediction of future cash flows.
Assume that the ultimates are as per those arrived from the incurred claim projections.

b.   Claims run-off expenses can be calculated based on the following factors:

- The historical patterns of claim settlement. Both current open claims and the expected IBNR claims must be run-off based on these patterns. This gives an indication of the number of open claims in future periods until all current business is run-off.

- The number of claims staff required to service the open claims in each period. This should be based on the ratio between the current number of open claims and the claims staff complement. This gives an indication of the number of claims that can be handled by each staff member.

- The average cost to company of a claims staff member. An inflationary increase in cost to company can be incorporated.

- For each future month divide the future number of open claims by the number that can be handled by each staff member to determine how many staff members will be required in future and multiply this by the average cost to company of a claims handler.

Question 2 i)

Comments:
This question was reasonably well answered.

Answer:
It could be one of, or more likely, a combination of the following factors:
- An error in the application of the premium framework
- The loading was not applied to all policies as was intended
- Loadings could have changed and offset the effect eg. Expenses, profits
- The numbers in the financials could be incorrect

- Exposure movements:
    - Selective withdrawals – members with higher average premiums lapsed
    - New members joining with premiums which are on average lower than the existing book.

- Demographic changes and effects of the rating structure:
    - Member ageing effect: if many members move from "risky" age bands (eg. Under 25 years) to "less risky" age bands (eg. Over 25 years). Will depend on the rating structures
    - Premiums may be a function of sum insured, and if this decreased, premiums would've decreased.

- Rating structure might not deal properly with above changes if it is calibrated on irrelevant parent company data

- Experience rating may have had an effect & no claims discounts

- If any changes were made to the cover levels or benefit structures e.g.
    - Excess levels were raised
    - Sum Insured limits were introduced
    -
- Other discounts offered eg. Loyalty/retention discounts

- Were any changes/recalibrations of the rating structure made after the 7.5% increase? E.g. did for competitive reasons.

Question 2 ii)

Comments:
Many candidates mentioned the necessity to test the adequacy of the premiums. This is not the issue at hand – the question refers to the investigation that is required to determine why premiums did not increase as expected and not why the company is running at a loss. Parent company information is also useless to establish why premiums did not increase as expected.

Answer:

First understand whether the numbers being discussed are correct. If correct, then understand why they are the way they are. If not correct, then isolate errors and derive new numbers.

Reconciliation of numbers in financials

- The financials are being used as the "benchmark", but it may be that they are incorrect

- Since average premium per member considered, reconcile both exposure levels and premium levels independently

- Check if data from underwriting transactions pulled through correctly to the financials – should be checked for a sample of individual policies

- May need to get some audit assistance for this

- Were any accounting adjustments made in the financials which influence the numbers, but which may not be reflected in the underlying raw policy data?

- Check that we are comparing "like with like": cash flow basis numbers vs accruals based numbers (i.e. written vs earned)

Check if the increases were correctly applied in the rating systems and quoting software.

- For a sample of individual policies (or even for all policies if sufficient processing power is available), recalculate the theoretically expected premium levels by starting with last year's premium and adding the 7.5% increase.

- Compare this to the number actually on the system, as well as that actually billed to the policyholder and actually received. If any differences arise, then check why.

Allow for the effect of other changes which may have occurred on the policy, by applying these changes in a step wise fashion and recalculating the premiums at each point, noting the change:

- Claims effect (no claims discounts)
- Other discounts (eg. Loyalty/retention discounts offered)
- Cover details/levels changing
- Age & durational impacts

Check if the policy loadings changed and make similar changes in the theoretically calculated premium to isolate the impact of such changes.

Check if call centre agents are allowed to offer any discretionary discounts and determine if this may have offset any of the increases applied to policies.

Should basically do a detailed analysis of change on the membership and premium experience. To the extent that claims experience directly impacts on premium levels, claims should also be investigated through a detailed experience investigation.

Split entire book up into the following groups:

- Policies which remained from a year ago
- Policies which have lapsed/cancelled in the last year
- New policies joining during the last year

May need to allow explicitly for policies which lapsed during the last year and rejoined again within the last year – churn effect may have impacted on premium levels. This is especially true if rating structure increases premiums steeply with policy duration. In order to do this accurately, we might need to link policies on characteristics unique and consistent for individuals (e.g. ID number) since the person will appear twice (or more) in our data, but with differing policy numbers.

The experience investigation should determine whether the exposure characteristics and premium and claims experience differs significantly between these three main policy types. Such differences may have distorted the average premium analysis.

The detailed experience investigation of exposure and premiums should consider the following:
- It should be done separately for the 3 types of policies mentioned above.
- Should consider exposure levels split by various risk factors such as
    o Age
    o Gender
    o Region
    o Average discount levels
    o Policy duration
- The analysis should also include the total and average premium levels over time, split by similar categories as those defined above.
- The following numbers may also need to be analysed over time:
    o Average sum insured levels
    o Average excess levels
    o Average age

- o Average discount % offered
- o Premium as a % of the sum insured

If the claims experience on a policy directly influences its premium levels, then it is important to analyse claims experience as well.
This should also be split by key demographic/risk factors as was done for the exposure analysis.
 Values to analyse might include:
- Claims frequency
- Claims severity
- Burning costs

Analyse lapse rates & new business rates by the various demographic/risk factors. Significant changes in lapses of new business volumes over time, should be checked against the analysis of average premium over time, to identify if there is any relation/correlation – might suggest a cause.

Consider the changes to competitor rates if the information is available because this might have had an effect on the lapse experience and therefore the resulting premium increases.

Question 2 iii)

Comments:
Some candidates confused the requirements of a cash flow model with that of an internal model. Although most students mentioned the key features, such as new business versus existing business, expenses, etc. that should be included in the model, they did not discuss each of these features in sufficient detail.

Answer:

The business should be modeled on a sufficiently granular level to allow one to test the realistic and often complicated impacts and implications of various rating strategies and adjustments.

Ideally one should build a model office, capable of projecting individual model points policies forward over time.

One should start with the existing book of exposure, recording the exact demographics & policy specific details which impact on premiums (eg. Age, gender, duration, region, sum insured…)

For each policy an exposure level should be determined, reflecting its actual exposure level over time – i.e. this can allow for effects such as lapse rates, membership movements. The exposure unit should correspond to the periodicity underlying our modeling (e.g. years, quarters, months…)

The existing exposure should then be projected forward one time period at a time, at each point paying attention to reflect:
- Increased ages when policyholder birthdates are encountered
- Increased duration – might impact on claims and premiums
- Exposure movements/migrations between various policyholder categories. Possibly done through multi-state modeling (e.g. to model no claims discount levels)

For each policy, model expected claims experience:
- Frequency – allows us to apply a no claims bonus/discount factor
- Severity – allows us to apply experience rating factor, if relevant

Claims experience might feed into subsequent premium increases through a "feedback" feature in our model. Adjust premium levels up/down depending on claims experience, to simulate the effect of management reactions.

Of the active exposure projected forward at each point in time, determine which are up for renewal through reference to the actual underlying policy details. Apply the proposed premium increase strategies to the exposures projected at each time point, to determine the theoretical premium levels. E.g. apply updated complex rating structure such as GLMs, or simple across-the-board increases such as 7.5%.

Lapses/withdrawals should be modeled in detail and will be a key feature of this model. They should ideally be a function of:
- Policy duration – typically shows good relation to lapse rates
- Premium increase levels – high increases lead to more lapses
- Policy risk features (e.g. gender, region)

New business should be modeled explicitly as well.

Since we want to reflect the impact of premium increases on the business, it is important that new business volumes are a function of the proposed premium levels.

This could be done by modeling number of quotes generated per time period, and determining how many of these are successful.

The success rate should then be a function of the average premium levels, either through simple curves or through more detailed modeling (e.g. GLMs).

Again, the modeling of new business should allow for the fact that different types of policyholders exhibit different behaviour. E.g. older individuals will tend to shop around more for better rates if quoted rates seem high.

Once the volume of new business exposure is modeled at each point in time, this can be rolled forward at the relevant premium increase strategies, in the same way as the existing business.

This means that the model should keep track of the exact details of each new policy written (e.g. Effective dates) so that premium increases can be applied at correct points in time. Features such as age and duration should also be tracked accurately so that the correct effects are reflected on the premium levels.

The claims experience for new business must be modeled in a similar way to that of the existing business, paying regard to the impact of demographic characteristics on claims frequency and severity.

Expenses should be modeled explicitly.
Driven by a detailed expense model. At least split between:
- Fixed per policy expenses
- Variable expenses e.g. Claims handling
Expense contribution of each policy model point should be determined in each projection period.
Expense inflation should be an explicit assumption, and must be consistent with other inflation assumptions e.g. Claims inflation.

Other modeling features to include:
- Effect of seasonality on claims, lapses, new business volumes
- Economic influences e.g. Inflation, Exchange rate impact on car repair costs
- Competitive forces
- Underwriting cycle
- Business/practical constraints e.g. call centre capacity to generate & convert n quotes to new business
- Quality of service and impacts on lapse rates
- Fraud
- Stochastic modeling vs deterministic modeling e.g. stochastic lapses, claims
- Liquidity. Ability to meet cash flow requirements can only be met to the extent that cash is available.
- Explicit retention strategies
- Marketing strategies

Question 2 iv)

Comments:

All the candidates failed to simplify the premium formula and therefore did not pick up the anomalies in the solvency and reinsurance loadings. Apart from this candidates did fairly well in this question.

Answer:

Very simple, may not differentiate between the various risk categories accurately enough

Could introduce more rating factors, and more levels for the various factors. Constrained by data available.

Examples of extra factors
- o   Postal code

- o Vehicle make, model, vintage
- o Class of vehicle (eg. Sport, SUV, sedan etc…)
- o Use of vehicle (eg. Private, Business)
- o Odometer reading
- o Actual mileage driven in the month through GPS technology
- o Security features (eg. Alarms, gearlock)
- o Enhancements/extra's (eg. Sound systems)
- o Number of authorised drivers
- o Engine capacity
- o Dealer repair required (Y/N?)
- o Colour

No interaction effects. Could consider introducing interaction effects where evidence that it may lead to improved modelling. E.g. age & gender interaction

Excess loading levels are not sensible. Policyholder can get a lower premium just by reducing his/her excess level. Must be corrected.

Differing excess level can have an impact on the frequency and severity distributions of claims. So to simply have as a relative adjustment/loading, may not capture the differing distributions adequately. Could consider constructing separate structures for each of the excess levels, if there is enough data

Vehicle purchase price may not be a good measure, as it may cause confusion/uncertainty e.g. When looking at new versus second-hand vehicles. Rather look at something like retail value or book value.

NCD structure can be enhanced:
- o Look at claim values, not just whether have occurred or not
- o Number of levels quite low, consider adding one or two more
- o The structure resets in the event of a claim, even if at best level. Consider revising so that one just moves one or two levels down, rather than all the way to the bottom.

- o Consider competitor's/market practice.

Instead of having a structure which outputs a monetary premium value, consider a rate expressed as % of sum insured value. May deal with issues such as vehicle depreciation more appropriately.

Loadings:
- o Formula can be rewritten as: $OP = RP + RP{*}a + RP{*}b{*}(1+a) + OP{*}c$ [½]
- o This shows some potential anomalies:
  - ▪ In the application of the reinsurance loading, the effect of the solvency loading is double counted. The formula should be adjusted to avoid this by changing $(1+a)(1+b)$ to $(1+a+b)$. The rewritten form of the formula will then become:
  - ▪ $OP = RP + RP{*}a + RP{*}b + OP{*}c$

- Solvency loading is applied in a way which expresses it as % of risk premium (RP). Might be more appropriate to express as % of office premium (OP).
- The reinsurance allowance (b) could possibly rewritten as a % of the office premium (OP), depending on the agreements with the reinsurer(s)
- No explicit profit loading included in the formula.
- Might want to include contingency margins.
- If there are any regulatory or industry levies, these should be included, as % of the OP.

Question 2 v)

Comments:

This question was well answered by most candidates.

Answer:

TP:
- Additional benefit will result in higher premiums. Might not be well received by existing policyholders, leading to lapses.
- If TP component of cover is made standard/compulsory on the product, it might loose appeal with policyholders who bought the policy because they only want own damage cover.
- If TP cover includes bodily injury, there could be an overlap with the cover provided through the RAF – policyholders might perceive this as a waste of money.
- If claims profile is very different from current profile, then claims experience might develop in unexpected ways.
- Nature of exposure is such that it is harder to keep track of effective exposures & hence manage risk.

Fleet cover:
- The company is a direct writer – not the distribution channel required for writing fleet business which required focused relationship management usually provided by account managers and brokers.
- Although the risk of individual selective withdrawals might be reduced, there is a risk of entire group withdrawing. Withdrawals of large groups may be very disruptive and have an adverse financial and operational affect.
- Fleets might expect beneficial terms to reflect economies of scale – puts pressure on margins
- Systems might not be able to cope with new form of cover and different administration requirements.
- Time, effort involved in building new fleet rating approaches & frameworks
- Fleet cover rates are often set to apply for a year – might make it hard to react to adverse experience if ad-hoc rate revisions not possible
- Claims run-off nature of fleet business might be different, complication reserving (e.g. runoff patterns of claims)
- If pockets of "bad risk" exist in a group, it may be harder to selectively rate these, due to group nature of the premium.

Both:

- New type of benefits
    - limited data
    - limited experience & expertise
    - limited resources
- Risk of inaccurate rating and resulting underwriting losses.
- The Initial underwriting results are typically expected to be poor for new business products & benefits and then stabilise. Might put cash flow/liquidity strain on business. financial performance of company has to date been poor and the company can therefore not afford additional capital strain.
- Reliance on parent data might cause erroneous rating
- Might have implications on reinsurance, if no longer suitable to nature of risks and risk appetite of the company
- If on the prescribed reserving formulae (7% of premiums), then the new business volumes might cause reserving strain.
- If new business volumes balloon, might cause new business expenses to balloon as well
- May possible start competing with parent company for market share