

Subject F203 — General Insurance
Specialist Applications
20 May 2015
MEMORANDUM

QUESTION 1

i. *Examiners' notes: Consider the situation explained by the question carefully. The insurer's claims database for home contents is lost – you do not have any internal data to rely on and have to make an alternative plan. Many candidates didn't grasp this concept and elaborated on general pricing methodology and theory which attracted few marks. Candidates who described a methodical approach to deal with the loss of the claims data and critically evaluated the practicality of postal code rating in the given context scored well. It is important to remember that exposure data is not lost. Many candidates focused on "rural" vs. "urban" – although this is stated in the question as part of the underwriter's comments, the question asks specifically for a postal code rating factor (and not a rural vs. urban split only).*

- No data on contents claims is available so cannot perform any analysis or pricing on historical contents cover experience.
- Written reports and documentation may only include summarised claims information, but this will most probably not be detailed enough to analyse experience across different postal codes
- Consider competitor rating structures and policy wordings if available (industry data)
- Consult underwriters for opinions, both internally and externally
- Ask the company's claim managers/claims department for input and any additional information on claims experience by postal code/suburb/province
- Consult internal and external loss adjusters for input
- Can ask large brokerages, especially ones with national representation, for information or external claims data
- Can consult reinsurers/reinsurance brokers
- Theft is the main peril under a typical contents section
- So can check external /public information and statistics on house break-ins by area and use relative differences between area incidence rate to derive relativities for area grouping
- Also, can use buildings claims data to approximate contents relative claims frequency by peril, as they are likely to be correlated, although not equal. (*Portable possessions will not be a suitable proxy.*)
- e.g. Theft (where theft/break-in/robbery is the underlying peril), fire, burst pipes/geyser/leakage damage, weather events and earthquakes, malicious damage
- Identify any future trends that is likely to influence relative experience between postal codes, e.g. rates of house burglaries in specific areas
- Allow for any expected future trends in rating factor relativities
- Check whether factor can be implemented on the company's system
- Postal Code too granular to be feasible under the circumstances

- If not feasible because of high number of levels, group postal codes in more manageable cohorts, e.g. by province or suburb
- Compile information from all sources into a set of relativities
- Have underwriters review final set of relativities and invite further input
- Can apply new rating factor to active book and test the distribution of premium between area groups/postal codes
- Need to measure likely impact on total premium as a result of introducing the new rating factor to ensure adequate total premium collection.
- Introducing this rating factor is expected to reduce anti-selection risk. Need to estimate how new business volumes, cancellations and profitability will be affected. (Look at competition in market)
- Need to set the rules by which new rating factor will be introduced on existing business.
- Will it be once-off or as policies go through annual renewal?
- Need to develop a process to deal with new postal codes that will be introduced in the future
- Need to ensure that appropriate data fields are captured on the system such that experience across postal codes can be stored and analysed.
- Ensure that appropriate data back-up systems are now set in place.
- Have to set up appropriate monitoring systems to review performance of the book as well as the effectiveness of the area group/postal code rating factor.
- Reviews should be conducted frequently such that undesirable trends can be identified and corrective measures deployed without delay
- Can consider other potential rating factors and measure significance against location factor, e.g. type of house, house value, building cover insured value etc.
- Users of the system, e.g. sales consultants and brokers needs to be trained on any system changes
- Need to determine if "postal code" plays/will play a statistically significant role in this book of business / determine the size of its effect
- Is granularity available to link between the postal code and the actual location of the risk (e.g. if post office boxes are used as address)?
- The total cost of introducing the new rating factor should be considered against the expected benefit, e.g. better selection, better underwriting margins, increase in sales, etc.
- Pilot rates on a subset of the book
- Need to communicate to the policyholders
- There is lapse- and re-entry risk (end policy and take out new policy under different address that will result in lower premium)

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- ii. *Examiners' notes: Some candidates compared one-way and two-way analyses as different methods of pricing rather than providing the advantages and disadvantages of the use thereof to review a pricing model. Although most candidates pointed out that the method is limited in its ability to help identify interactions, none mentioned the risk of a change in business mix which can invalidate conclusions drawn from the tables.*

Advantages

- Useful where there is not enough data to use advanced mathematical/statistical modelling techniques that rely on large volumes of data for parameterisation.
- Can be used when the standard form and assumptions underlying more advanced methods are not suitable to contents insurance claims data
- Easy to create and update / simple method
- Less costly as it does not require specialised software used to perform more advanced modelling / quicker to implement
- Can use standardisation methods to remove or standardise for the effects of other factors

Disadvantages

- Lack of homogeneity/Presence of interaction effects in one-way and two-way groupings - only view statistics relating to one factor at a time
- One way analyses are affected by correlations between factors.
- Therefore it is difficult to conclude whether any trends can be ascribed to the actual factor, or whether it is driven by the mix of exposure across the different levels within the factor.
- As mix change, conclusions from the analyses are likely to change.
- Standardisation of factor levels is an approximation
- For postal code the number of cells will be too large
- Lack of statistical information in conclusions, e.g. no estimates of parameter uncertainty or significance. Conclusions mostly based on judgement

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iii. *Examiners' notes: The question expected candidates to describe how they would have applied GLMs as a method to build a pricing model in the given context. Although consideration of key assumptions in applying this method scored some marks, comments including in-depth general GLM theory and formulae were not required.*

- Data needs to be put into the model in the appropriate format
- Specify time period of the analysis
- Then, link exposure and claims data
- Identify catastrophe claims and large once-off claims.
- Identify any other anomalies or errors in the data.
- These claims should either be removed or capped so that they don't distort the result
- Can allow reinsurance recoveries in claim amounts, but account for gross reinsurance costs in the pricing elsewhere
- Modelling should be on net cost of claims, allowing for excesses, salvages and recoveries
- Ideally, frequency and severity (average cost per claim) should be modelled separately
- A Poisson model can be used to model frequency / Assume model errors follow a Poisson distribution
- but need to check that contents frequency is sufficiently high for Poisson model to be appropriate
- A Gamma model can be used to model severity / Assume model errors follow a Gamma distribution
- but need to check goodness of fit of the claims distribution
- If not possible to model frequency and severity separately, then risk premium can be modelled using a Gamma or Tweedie distribution
- Need to assign appropriate link function to each GLM, e.g. the log link function for both frequency and severity
- Identify rating factors to test for significance against model responses
- Test each factor using:
 - o Statistical significance tests, e.g. Chi-Square Test
 - o Consistency tests, across time or across random factor levels
 - o Reasonability checks – can the modelled and observed trends be explained?
- By interacting one rating factor with one or more other rating factors, complex interactions can be tested for significance
- The cost of capped and removed claims needs to be allowed for, e.g., adding a flat margin on the base risk premium
- Model validation checks need to be performed on final models

- Compare actual claims experience against predicted claims experience on either
 - o A randomised hold-out data sample
 - o An out-of-time validation set
- The intent of the model is to predict future claims experience. Therefore, model predictions should allow for future expected trends, e.g. future inflation
- Claims must be fully developed to ultimate / make an adjustment for IBNR
- Adjust historical claims for inflation to today's values
- Consider how nil claims will be dealt with (If nil claims are included then use Tweedie rather than Gamma)
- Need to know whether expenses are included in the claims data or not

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iv. *Examiners' notes: Candidates didn't score well on this question. Few candidates were able to determine the impact of April and December seasonality on June and December IBNR valuations and therefore were not able to consider the appropriateness of the IBNER reserve at both valuations. Although most of the information needed was provided, some candidates recalculated some of the results provided which wasted time.*

- Actual run-off close to expected for all months except for December 2013
- For December 2013 claims, IBNR was under-projected by $((1306-875)-155)/431 = 64\%$ and ultimate under-projected by $(1,306-1,030)/1,306,000 = 21\%$
- Important to consider link ratio/percentage to ultimate of December claims. December 2013 incurred data in bottom corner is a highly sensitive to the ultimate prediction
- Calculate loss ratios for each origin month. (This didn't score specific marks, but gave some more insight into the problem.) Total loss ratio over whole period = 56%

Origin Month	Ultimate Loss Ratio						
Jan-12	50%	Jul-12	55%	Jan-13	56%	Jul-13	51%
Feb-12	51%	Aug-12	49%	Feb-13	55%	Aug-13	53%
Mar-12	54%	Sep-12	53%	Mar-13	53%	Sep-13	52%
Apr-12	69%	Oct-12	51%	Apr-13	66%	Oct-13	53%
May-12	52%	Nov-12	49%	May-13	55%	Nov-13	52%
Jun-12	49%	Dec-12	82%	Jun-13	53%	Dec-13	78%

- Higher loss ratio/link ratios for December and April, probably linked to holiday seasons and a typical phenomenon in specified portable possessions cover
- However, higher loss ratios alone for April and December accident cohorts do not mean that the development pattern of IBNR should necessarily differ from the expected
- April and December link ratios of month 0-1 are significantly higher than for other incurred months / April and December percentage of claims to ultimate in month 0 are high
- However, the late claims reporting in April will not influence either valuation, as
 - o At the end of December, April claims should be fully run-off
 - o By the end of June, April claims have caught up, i.e. "late" claims have been reported
- December late reporting will influence the December valuation only, as
 - o At the end of June, preceding December claims should be run-off
 - o But at the end of December, December IBNR would be understated due to later reporting of claims
- Using a simple BCL will therefore under-project claims development experience at each December valuation
- as the method uses a weighted average of all previous months' development of total claims reported from month one to month two (development factors/link ratios too low for December). The average ratio will be too low for December projections

- For the December 2013 valuation, IBNR was given and actuals can be found by deducting total ultimate less total reported to date for each cohort and summing across incident months. Thus:
- Total Calculated IBNR at 20.12.13: R296 (given)
 - o Total Actual Reported Claims Aug 2013 - Dec 2013 of 4,526 less calculated ultimate of 4,262 gives 264 (or 560 if IBNER is also included in the comparison)
 - o which is 89% compared of the given 100% IBNER.
- Therefore, the IBNER reserve of 100% can be justified for December valuations
- But it is anticipated that no IBNER will be necessary for the June valuations
- It would be useful to investigate the consistency pattern of December incurred claims development over a longer period

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v. *Examiners' notes: This question was poorly answered. Many candidates recommended a list of alternative reserving methods without providing well-reasoned arguments on why each method would be better than the BCL method that was used.*

- The IBNER is excessive and indicates that the reserving method is not appropriate
- the company needs to hold an IBNR reserve that will be sufficient to cover the run-off of claims at both valuations / effect of seasonality
- Ultimately, the level at which the IBNR is set needs to be such that the company's senior management as well as the regulator are convinced that the reserve will be sufficient to meet claims run-off in most instances
- According to AGPN401, IBNR should be held at a margin above best estimate (75% is often used) in order to ensure sufficiency
- The underlying assumptions of a BCL method is not appropriate to reserve for this class, given its volatile run-off pattern
- The company could rather use -
 - o An adjusted cohort BCL method, i.e. with ratios for December based on cohorts of data for previous December claims, etc., as (based on just 2 years of data) ratios do not look too unstable based on monthly cohorts e.g. as for December and April
 - o A loss ratio method across all months
- Given the cohort effect a straight chain ladder method is not going to work and therefore a BF approach will also be inappropriate
- Request more data to get better stability in the parameters for any method used
- A stochastic method reserving method, such as the Mack Method, can be used to determine the margin above best estimate at which IBNR will be set
- If year-on-year run-off experience is stable enough, an IBNR at the 75th percentile is likely to be sufficient to cover the run-off of claims in most years
- However, with unstable development any method, including Mack, is going to be difficult and determining the reserve at the 75th percentile particularly difficult

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QUESTION 2

i. *Examiners' notes: This was bookwork and was generally answered well. Remember not to waste time by providing information not asked for e.g. detail regarding the calculation of technical provisions. Bonus marks were awarded if candidates could produce some of the detailed prescribed tables (containing the factors that should be used) but this was not a requirement of the question.*

- Capital requirement is the higher of the MCR and SCR
- MCR is highest of:
 - o R10m
 - o 13 weeks operating expenses (=25% of expenses)
 - o 15% of NWP in prior 12 months
- $SCR = BSCR + OP$
BSCR is the basic SCR and is calculated as:
$$BSCR = \sqrt{IC^2 + MC^2 + CC^2}$$
Where
 - OP = Operational risk
 - MC =Market risk
 - CC = Credit risk
 - IC = Insurance risk
- This approach diversifies the risk based capital between market, insurance and credit risk
- Insurance risk capital (IC) covers premium risk and reserve risk
- Reserve risk covers the risk that established provisions are insufficient to meet final claims settlement payments
- Premium risk considers the risk of the premium charged being insufficient to cover potential claims
- The factors depend on class of business and is applied to NWP
- Market risk capital (MC) covers revaluation losses on assets due to market volatility
 - o The factors depend on assets per asset category
 - o Market risk applies only to assets backing liabilities i.e. free assets are ignored
- Credit risk capital (CC) covers risk of losses due to the default of counterparties
 - o The factors depend on assets per credit rating category
 - o No charge applies to government bonds
- Operational risk capital (OP) allows for loss resulting from inadequate or failed internal processes, people and systems, or from external events
 - o Basic Operational risk is calculated as the higher of OP_{prem} and OP_{prov}
 - o There is a loading for year-on-year premium growth in excess of 10%: $OP_{prem} = 0,03 * GEP + \max(0; 0,03 * (GEP - 1,1 * GEP_{prev}))$ {If this formula was given it must be correct - must be GEP and must show clearly which premium relates to current and previous year}
 - o OP is limited to the lower of $OP = \min(30\% \times BSCR, BasicOP)$
 - o $OP_{prov} = 0,03 * \max(0; GTL)$

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- ii. *Examiners' notes: Candidates who made suggestions on how the insurer could manage constituent components of the SAM capital adequacy framework to improve its coverage ratio scored well on this question. A few well-prepared candidates were able to assess the viability of the various options against the SAM implementation timeline, although most candidates did not include this in their answers. Some candidates provided only a description of the framework, which was not what the question asked*

Detailed knowledge of the SAM technical specification was not required as part of the answer. However, where candidates provided correct detailed information, credit was given. Examples of facts for which marks were given are included under "Additional points" below.

Remember that the concept of "approved reinsurance" does not exist in the SAM framework.

- SCR coverage = (Own Funds)/(Solvency capital requirements)
- To increase SCR coverage have to increase own funds, or decrease SCR, or both

Increase Own Funds

- **Capital injection**
- **Quick and immediate way to increase own funds**
 - o But increasing capital employed reduces return on capital
 - o So, there is a limit on the amount of capital that could be injected before the insurance operation does not make economic sense
 - o In practice likely to use injection in combination with other suggestions
 - o Raise funds in capital market / issue more shares (if listed)
- **Retain dividends**
 - o Future profits retained and not distributed are a good form of capital
 - o But takes time for future profits to realise and be retained
 - o With SAM implementation estimated for 1 Jan 2016, there is little time to make effective use of this strategy
 - o For listed insurers retaining dividends could be perceived poorly by shareholders
 - o Especially if insurer has a history of distributing high portions of profits
 - o Again a limit on the maximum capital that could be retained before ROC reduces below economically viable levels
- **Financial reinsurance / Alternative risk transfer**
 - o Here a portion of future profits could be realised now through a reinsurance arrangement
 - o This could be put in place relatively quickly i.e. less than 1 year
 - o But would require negotiation with a willing reinsurer to demonstrate the viability and sustainability of the future stream of profits
 - o Accounting for the reinsurance arrangement should be confirmed, especially given rules around significant risk transfer
 - o And confirming the sustainability of the reinsurance arrangement within the SAM regime
 - o If the insurer has other existing reinsurance arrangements, this could be put in place quickly
 - o Would likely increase counterparty default risk
- **Reduce technical provisions**

- Discounted cashflow modelling of technical provisions can produce a smaller technical provision compared to allowed simplifications
- This “reduction” in TP will increase OF
- Extent of “reduction” depends on the tail of provisions
- For example technical provisions relating to liability could provide more relief than (say) motor type business
- Could take time to implement this change, as cashflow model must be developed
- And will introduce cost for the regular revaluation on a cashflow basis
- Sign-off of the model is also likely to be more easily obtained, especially if the insurer has put an actuarial control function into place

Decrease SCR

- Reinsurance to reduce SCR

- Possible to reduce the SCR under standard formula by having large non-proportional and stop loss reinsurance protection. Proportional reinsurance will reduce premium and reserve risk.
- Quick to put in place, provided the market terms required by reinsurers are reasonable
- If the non-life underwriting risk component contributes significantly to the SCR then the impact of reinsurance could be significant
- But having multiple reinsurance arrangements complicates the standard formula calculation

- Application of the SCR formula

- Broadly speaking, a factor based approach is more capital intensive than the standardised scenarios
- SCR could be reduced if catastrophe risk capital is evaluated using the standardised scenarios
- Relatively quick to implement, provided the detailed exposure data is available
- Other areas of potential SCR reduction include:
 - Obtaining credit rating where credit ratings are not available
 - Unbundling contracts into various business classes where these are currently classed as 1 business class
 - Data availability and resource cost to realise this needs to be considered against the potential SCR reduction
 - Reduce business volumes / stop writing business with high CAT risk / stop writing business in more volatile lines
 - Ensure that future growth assumptions are not overestimated (impact volume measures)
 - Make sure that technical provisions are at best estimate level (and not too prudent) to prevent volume measure being too high
 - Change mix of exposure from higher to lower risk lines of business

- Change counterparties / market risk

- Generally speaking, poorly rated counterparties attract more capital than highly rated counterparties
- Examples of counterparties include banks, corporates and reinsurers
- Not that quick to move counterparties, as underlying contracts (investment mandates, reinsurance contracts, physical investments etc.) have to be altered
- Could be useful in the medium term i.e. 2 to 5 years
- There are a limited number of top tier banks in South Africa to hold cash on hand
- Reduce foreign currency risk by investing in local assets only

- Reduce Type II credit risk by reducing receivables (or ensure that receivables are less than 90 days)
- Reduce concentration risk by spreading assets over more counterparties
- **Change underlying business**
 - Standard formula is risk based, so can reduce SCR by moving away from capital intensive business (Consider mix of business)
 - Takes time for reduction in SCR to come through, as volume measure looks at a rolling 12 months GWP. So, ceasing capital intensive business now - only see full reduction in 12 months' time
 - Not a quick strategy to implement, as business units responsible for capital intensive business needs to be re-deployed
 - Likely that capital intensive business is also profitable
 - So cannot change business only based on capital intensity but should consider range of other factors
 - Writing business across multiple classes rather than in a single class can introduce some benefit for diversification of risk. However, this is more a medium to long term solution
- **Apply for undertaking specific parameters**
 - Assuming above strategies do not provide sufficient relief, could apply under SAM for use of undertaking specific parameters to be used in the standard formula calculation
 - These USP's are tailored to the insurer's specific risk profile and could be higher or lower than the current standard formula
 - A view on being higher or lower is obtained when undertaking the Own Risk and Solvency Assessment that is required under SAM
 - Assuming USP could reduce SCR, not a quick strategy to put in place
 - As application for USP's likely to be accepted only after SAM takes effect
 - And notable uncertainty on whether regulator will approve USP application
 - Unlikely to be a long-term solution, as approvals could be for limited time only
 - Application process cost should be evaluation against potential SCR reduction
- **Apply for partial or full internal model**
 - Such a model provides SCR tailored to the insurer's specific risk profile and could be higher or lower than the current standard formula
 - Good strategic solution, but takes notable amount of time to put in place >3 years
 - Requires skilled in-house / consulting resource assistance to develop model, test, document and go through application process
 - Costly to develop and maintain going forward
 - Regulatory approval process very onerous and approval is uncertain

Additional points:

- lapse risk - state that lapse risk is not a significant issue for ST insurers / Reduce duration e.g. move from annual to monthly policies to reduce lapse risk.
- Operational Risk - Can't do much about it
- Consider co-insurance arrangement with another insurer
- Check for errors in the calculation
- Make sure loss absorbing capacity of deferred tax asset is allowed for (reduces the SCR)
- Consider tiering of funds - i.e. make sure that most assets are Tier 1 for inclusion in OF. Tier 1 assets must be at least 50% of SCR and at least 80% of MCR. Tier 3 assets must be less than 15% of SCR. (Otherwise inadmissible)

- Unlisted shares in holding company is deducted - minimise these
- Listed shares in excess of 5% in holding company is inadmissible
- If there is a bank in the group (if part of a group) make sure that less than 10% of cash is invested in that bank
- Transfer participations to holding company or other parts of the group (not easy/quick to do)
- Reduce exposure to ancillary funds (e.g. letters of credit)
- Reduce intangible assets (80% capital charge)
- Reduce "other liabilities" as far as possible

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- iii. *Examiners' notes: The question expected candidates to have a reasonable understanding of the FSB's planned intervention approach at various levels of insurer solvency.*

Implications for failing to meet 1x SCR:

- During the light and comprehensive parallel run, having an SCR coverage below 1 times (on the SAM standard formula) does not trigger formal regulatory interventions
- This changes once SAM takes effect to trigger regulatory interventions
- Although the legislation is still being drafted, this intervention is likely to follow the "ladder of intervention"
- Where the regulator increases the amount of scrutiny as the SCR cover ratio deteriorates
- But start the intervention when the SCR coverage is still above 1 times
- Examples of implications when breaching the 1 times SCR coverage:
 - o More frequent reporting
 - o Regulatory request for formal financial recovery plan or to recapitalise
 - o If breach deteriorates, for example drop below the MCR then more penal regulatory restrictions, including suspending insurer's new business.

Other considerations

- Time frame required to implement proposed solutions are key
- Along with the viability of the proposed solutions
- Need to focus on significant impact solutions that can be implemented before SAM takes effect i.e. where benefit is far > than cost
- Company may still be covering its MCR
- However, need to keep in mind:
 - o Future plan of the insurer (stay going concern, put into run-off, rapidly expand) and future market conditions
 - o Other emerging regulation impacting on the business model (demarcation regulation, reinsurance review etc.)
 - o Potential merits and drawbacks of merger with insurer operating complimentary business model
 - o Compare results with the rest of the industry and peers (is this an industry-wide issue or company specific problem?)
 - o Reputational damage if capital requirement not met
 - o Reinsurers / potential new policyholders may not want to do business if solvency issues
 - o Credit rating will be affected if regulatory requirements not met

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