

EXAMINERS' REPORT

November 2017 examinations

**Subject F203 — *General Insurance*
Specialist Applications**

Overall

For numerical questions, the Examiners' preferred approach to the solution is reproduced in this report; other valid approaches are given appropriate credit.

For essay-style questions, the marking schedules contains open ended marks for other sensible comments in some sections where they are deemed necessary. There are significantly more than 100 marks available

Performance on this paper was mixed. In line with previous F203 exams, a considerable number of candidates undermined themselves by providing generic or off-topic answers. Specific observations are provided by question throughout this report.

Candidates should note that F203 is the key paper at which we test candidates' broader thinking. This is generally the final paper before qualifying as a professional, and we consider a capacity for broader thinking to be one of the best indicators of a candidate's suitability to act as a professional actuary. As such we aim to design exam papers so that it is difficult to pass without displaying some capacity for independent and broad thinking, as well as to heavily reward instances where these skills are displayed. When reviewing past papers, candidates should assume that the marks available for generic points are substantially less than those awarded for the more challenging points that would be the mark of high quality professional insight in a practising actuary. Marks available for list items from bookwork are lower still.

In conclusion, we would offer candidates two key pieces of advice – read the question properly and take the time to think about what is going on. Time spent making sure that you are answering the question that is asked is therefore more valuable than a panicked rush to put down as many points as possible, regardless of whether they are relevant.

QUESTION 1

This question examined candidates understanding of mitigating action to be taken in the event of a poorly performing insurance portfolio. The question examined bookwork in terms of a section 36 portfolio transfer and Extreme Value Theory. The question also examined the factors that need to be considered when determining the price to pay for transferring liabilities. Candidates failed to demonstrate higher order knowledge of valuing the liabilities.

(i) *Examiners' notes:*

This was a knowledge and application question. Better candidates were able to generate a number of advantages and disadvantages of a portfolio transfer, Reinsurance and sale of license.

Portfolio Transfer Advantages:

- A one-off payment will transfer all product liability
- The cell captive will still be operational and future products can be sold via the captive
- Policyholder consent will be easy to obtain as ThatchOff is the policyholder in a captive context
- ThatchOff will no longer need to perform any policy administration functions and this will save cost
- ThatchOff will no longer need to hold capital to service this portfolio. Although it may have other portfolios

Portfolio Transfer Disadvantages:

- The process is time consuming and admin intensive
- Approval is required from the Regulator and the regulator will indicate whether he is satisfied
- ThatchOff may be left with expensive staff and overhead costs in the cell captive with no portfolio to manage
- ThatchOff will still be required to submit regulatory returns and hold a minimum capital requirement
- The cost of the portfolio transfer could be very high
- Reputational risk if other insurer does not pay claims
- Assets may need to be realized at unfavourable or tax inefficient time

Reinsurance Advantages:

- The cell captive will still be operational and future products can be sold via the captive
- Reinsurance should allow ThatchOff to hold a lower level of capital
- Lower concentration risk
- This should be the simplest and easiest method of transferring the liabilities
- Can still benefit from interest on reserves held
- No policyholder or regulatory consent will be required unless reinsurance needs to be placed in a foreign market

Reinsurance Disadvantages:

- The cell captive will in all likelihood still need to run off the underlying policies
- All court cases and claims will still be brought against and managed by the cell captive
- ThatchOff SA is still liable in the event of reinsurer default
- The required reinsurance products may not be available or the cost may be prohibitive
- The required reinsurance capacity may not be available locally and will have to be placed in the international market. Capital relief will be lower for non-approved reinsurance.

- Depending on the RI basis there could be gaps in cover

Sale of license – Advantages

- ThatchOff will have no further liabilities to worry about from that product
- The admin of managing a cell captive license will no longer be required and this will save cost
- ThatchOff will no longer be required to hold any regulatory capital

Sale of license – Disadvantages

- The transaction will be complicated and require both regulatory and competition commission approval
- ThatchOff will have to probably pay to sell the cell captive as the liabilities will be higher than assets given that a commercial decision needs to be made whether future premium will be ceded to that license
- Finding a buyer for the license may prove difficult
- The cession of future profits and policies to the global cell captive will prove more difficult

(ii) *Examiners' notes: This was a straightforward knowledge question and better candidates answered the question well.*

Application for Registrar Approval filling in amongst others:

- Who requested the transfer and the effective dates of the transfer
- Who the affected policyholders are
- What the policy conditions are and the details of any differences
- Agree that policyholders have been given information in order to make an informed decision
- Agree that policyholder consent have been or will be sought
- Interim arrangements with respect to benefits while transfer is being completed
- List of assets and their fair value to be transferred
- Auditor certificate

The Registrar determines whether information submitted is sufficient

The Registrar indicates whether he is satisfied

Within a period of 60 days after the transfer the public officers fill in Annexure 6 stating that the transfer was done as per the Registrar's approval

The 2 insurers will negotiate the amount of the payment taking the following into account:

- Valuation of ultimate liabilities
- The uncertainty surrounding the valuation
- Administration costs or savings for each party
- The impact of future investment returns
- Any impact on outwards reinsurance
- Level in line with the insurer's risk appetite

(iii) *Examiners' notes: This question was poorly answered as most candidates did not read the question properly and focused on techniques to value liabilities rather than the factors to consider when valuing the liabilities.*

- a. Factors to consider when calculating the ultimate value of these liabilities
- Number of thatch treatments performed by ThatchOffSA with the new product /products sold
 - Climatic conditions that lead to the combustion
 - Are these climatic conditions limited to a certain area of the country?
 - Can the treatments be reversed?
 - What is being done to manage the existing risk?
 - Are there any accumulations of treatment risk?
 - Were any treatments done in complexes / groups of thatch risks?
 - How many claims have been received relative to treatments performed?
 - What % of EML are the current claims at?
 - For the claims where lives were lost, have lawsuits been brought against ThatchOffSA?
 - What are the expected claim amounts for these lawsuits?
 - Are there any previous claims of this nature in SA?
 - What has court award inflation been lately in the SA market?
 - Have all owners of houses where treatments were done been notified of the risks?
 - Any chance of a class action lawsuit?
 - Can size of risk be determined from the cost of the treatment?
 - Appropriate discount rate to employ for long tailed liabilities
 - Is there cost of product recall included in the cover? / Re-thatch of treated houses
 - Is there a need for an AURR?
- b. Uncertainty surrounding the valuation
- The large losses and lawsuits probably not settled yet
 - Uncertainty in case estimates
 - Accumulations and large risks
 - Further loss of life is a large risk but difficult to estimate the probability
 - Quality of data or lack thereof captured by the cell captive
 - Injuries to minors can have reserving implications for 20 plus years
 - Traditional reserving techniques will be difficult to apply because of lack of data and volatility of large losses
 - Stress and scenario testing may help illustrate the uncertainty
- c. Capital Implications under both Interim Measures and SAM Interim Measures
- IBNR for Liability is substantially more than any other class of business
 - How much premium was earned by the cell captive over the last few years
 - Insurance Risk Capital charge quite high at 32% of NWP. How much RI will be in place?
 - How will the funds received be invested? Anything but cash used to match current and technical liabilities will attract a charge
 - Quality of underlying assets will also determine concentration risk charge
 - Operational Risk risk factor will also increase as EP over latest period will increase
 - Solvency will depend on whether assets less liabilities have increased by more than the SCR
- SAM
- Do you have appropriate cashflow projections over which to run off the technical claims provisions?
 - Technical provisions may be very long tailed in nature
 - Premium and Reserve risk charge for the additional reserves
 - Payment received in cash may affect spread and counterparty default risk
 - Does this portfolio add any diversification benefit when compared to your other lines of business?
 - Operational and CAT risk charges will increase

- d. RI and potential large losses
- Risk attaching or losses occurring basis
 - Risk appetite of your shareholders will determine the amount of RI to purchase
 - Will proportional or non-proportional RI be more suitable for the portfolio
 - Catastrophe claims on both property and lives a possibility. Can you get RI for this?
 - Cost, credit rating and availability of suitable RI
- e. Return on equity for shareholders
- What is the weighted cost of capital for your shareholders?
 - Risk appetite of shareholders and return above cost of capital for a portfolio of this level of risk
 - ROE sensitivity to different assumptions used
- f. Administration costs for your company
- Do you have staff with the necessary experience to deal with these claims or will you have to recruit?
 - Do you currently administer any similar products and are there economies of scale to leverage off?
 - Does your administration system already cater for these products?
 - Do you have procurement contracts to deal with construction of houses?
 - Will you be able to easily migrate existing claims and claims data from ThatchOffSA to your policy admin system?

(iv) *Examiners' notes: This question tested knowledge and application of Extreme Value Theory and was satisfactorily answered by most candidates.*

How does EVT work?

- EVT studies probability models for the occurrence of rare events
- Commonly use distributions such as Pareto and log-normal for severity of insurance losses and binomial, Poisson and negative binomial for frequencies
- EVT is commonly used for pricing of excess of loss RI for either high layers or covered perils on rare events
- EVT is used in reserving for deriving recoveries from XOL protections or pure IBNR losses where the protections are either high layers or for covered perils which are rare events
- There is generally a trade-off between using a lower threshold and more data points and a higher threshold with less data points
- EVT is also used in Capital modelling for deriving tail distributions for large or Cat losses
- Two families of distributions are considered for severity, the GEV and GPD
- The GEV is not generally used in practice for insurance. GPD more useful for modelling the tails of a distribution
- Parameterization of the GPD is done by mean excess function, maximum likelihood estimation, method of moments, probability weighted moments and the Hill estimator
- The mean excess function can be very useful for determining thresholds
- For frequency distributions of this nature the variance tends to be greater than the mean resulting in Negative Binomial distributions often being more appropriate than Poisson distributions

Suitability of EVT for calculating liabilities of this portfolio

- EVT can be considered to model the frequency of large losses especially loss of life and large property claims provided sufficient data are available to parametrise the distribution
- EVT can be used to predict the severity of claims in the tail of the distributions provided sufficient data are available to parameterize an appropriate distribution
- The ultimate claims including IBNR can be estimated in this manner
- The level of uncertainty of the results need to be clearly communicated as the distributions will be parametrized using low volumes of data
- The uncertainty together with the risk appetite of the insurer can then be used to select an ultimate value that is sufficiently unlikely to be exceeded.
- The distributions assume independence and identical distributions which may not be the case in accumulations of that risk

QUESTION 2

This question examined a wider fields topic of the evaluation of pricing adequacy and reserve strain of a maintenance plan. Standard actuarial techniques were required to provide quite basic feedback on the adequacy of pricing and in general the calculations were poorly performed. The question also examined the SAM implications of starting a new license as well as the pricing, reserving and capital implications of providing insurance cover to self-driving vehicles.

- i) *The first part was adequately answered by most candidates. Very few candidates provided a satisfactory reserve calculation.*

Two marks were allocated for performing or surmising a simple calculation to estimate the ultimate cost ratio as shown below:

Calendar year		2012	2013	2014	2015	2016	Total
Vehicle sales (turnover R'000)		950	1,500	2,500	3,000	3,450	11,400
Maintenance Cost		2	24	51	98	156	331
Year Sold	2012	2	9	11	15	18	55
	2013		15	30	40	50	135
	2014			10	27	34	71
	2015				16	35	51
	2016					19	19
Maintenance Cost Ratio		0.2%	1.6%	2.0%	3.3%	4.5%	2.9%
Year Sold	2012	0.2%	0.9%	1.2%	1.6%	1.9%	5.8%
	2013		1.0%	2.0%	2.7%	3.3%	9.0%
	2014			0.4%	1.1%	1.4%	2.8%
	2015				0.5%	1.2%	1.7%
	2016					0.6%	0.6%

Calendar year		2012	2013	2014	2015	2016	2017	2018	Future	Total
Vehicle sales (turnover R'000)		950	1,500	2,500	3,000	3,450				
Maintenance Cost		2	24	51	98	156				
Year Sold	2012	2	9	11	15	18	21	12		88
	2013		15	30	40	50			175	310
	2014			10	27	34			196	267
	2015				16	35			298	349
	2016					19			396	415
Maintenance Cost Ratio		0.2%	1.6%	2.0%	3.3%	4.5%				
Year Sold	2012	0.2%	0.9%	1.2%	1.6%	1.9%				9.3%
	2013		1.0%	2.0%	2.7%	3.3%				20.7%
	2014			0.4%	1.1%	1.4%				10.7%
	2015				0.5%	1.2%				11.6%
	2016					0.6%				12.0%

- To understand the true cost need to consider by calendar/maker year cohort
- It is better to consider the maintenance cost ratio as opposed to the cost itself as it is adjusted for the exposure (turnover)
- Considering costs in the year it was paid may hide true trends in cost
- It may be distorted by calendar year effects like high parts inflation, sudden increase in labour costs, etc.
- 2012: 5.8% total is not yet complete cost - still cover for 2017
- Assuming sales are spread uniformly over the calendar year, there is still cover for half of 2018

- May use trend in sales numbers over years to assume growth within a year and thus have a non-uniform assumption for outstanding cover for 2018 which given increase in sales implies more than 50% of 2018 still undeveloped
- Looking at each cohort, maintenance costs are increasing as the vehicle gets older (delay effect)
- This may be indicative of some of the parts not lasting the original intended maintenance period
- Can use this trend to allow for tail factor development of outstanding cover
- May have to allow for higher tail development given the uncertainty of electrical parts lasting the full maintenance period
- The 2013 cohort seems to have exceptionally high costs - vehicles manufactured in that year may have some manufacturer fault
- 2013 prices could have been lower due to a promotion - rather look at number of vehicle months as exposure as opposed to turnover
- When analysing trends for ultimate costs it may be better to exclude 2013 from analyses since it is an abnormal year and may distort assumptions
- It also seems like maintenance costs are increasing over calendar years - this may be indicative of the electrical vehicles being more complex and more items requiring servicing
- Or inflationary effects on parts or labour potentially driven by exchange rates or scarce skills
- More claims could be induced by increased marketing creating awareness of the cover
- No information is given on whether the fleet remains constant over the duration of the coverage period
- The number of vehicles are likely to reduce over time as some get written off or are no longer in use
- This effect may mean that maintenance cost may further be understated if the reduction in vehicles improve over time
- This may be an explanation of the increase in costs over calendar years
- It may also be useful to analyse the development in maintenance cost by different types of maintenance sources to gain a better understanding of the drivers in trends for example labour, parts, expected and unexpected service items
- It may also be useful to analyse maintenance cost by the mileage driven by each vehicle as vehicles driven more may have higher costs (this includes use e.g. private vs business)
- Locations sold - different regions will have different impact due to road conditions and weather
- Given all these arguments, there is a high level of uncertainty on the true ultimate cost of the maintenance plan

ii) *Question ii was satisfactorily answered by most candidates as they generated a lot of ideas surrounding mitigating actions.*

Stop the plan:

- This means that the client will be exposed to the uncertainty of the true cost of maintaining the vehicle
- This may have a negative impact on vehicles sales against the original intention of providing the benefit
- This will only help for new vehicles sold - existing clients will still have cover

Revise the T's and C's:

- For example, reduce permissible mileage, reduce period of the plan or add a co-payment
- Reducing the mileage allowed may reduce overall cost if that is one of the reasons for escalating charges
- Reducing the term may be a good option to reduce cost since costs escalate with duration of the plan being in force
- A co-payment will immediately reduce the cost of the plan
- It may even ensure that clients look after their vehicles better and hence may reduce the cost not just from the co-payment itself but also the behavioural impact

- These options may improve the cost of the plan without deterring clients from buying the NV vehicles
- This will only help for new vehicles sold - existing clients will still have cover

Take out a commercial / corporate insurance policy with an insurer:

- This will remove any uncertainty as the insurer will charge a premium that can be determined upfront
- The downside is that the insurer will add a margin for uncertainty and profit which may render the benefit rather expensive
- It may be possible to find cover for existing clients as well

Set up a cell captive insurer:

- This would mean that NV would be able to retain the profits within the cell and would benefit from any potential positive run-off experience.
- However, NV would be paying a cell captive fee to be able to "rent" the insurer licence.
- This would give them access to reinsurance to insure the risk of adverse run-off experience

Set up their own captive insurer:

- NV would be able to save on fees
- They would still have access to the reinsurance market for adverse run-off
- But they would have to manage the insurer themselves and obtain a licence from the regulator and report to the regulator.

iii) *This question was poorly answered which is disappointing as it examines the application of standard liability valuation and SAM implications on the start-up of a new license.*

Valuation of liabilities:

- Existing maintenance claims should be reserved for on a best estimate basis allowing for future development of costs and expenses
- Allowance should also be made for maintenance claims incurred but not reported
- The contract boundary of the premium liabilities of the maintenance plan will be for the full plan of 6 years
- All future premiums and maintenance costs will have to be considered when determining the liability
- Costs should include direct handling as well as indirect costs
- Cashflows should be probability-weighted best estimate
- An explicit risk margin based on the cost of capital method should be held
- Explicit allowance for inflation (parts and labour) given uncertainty
- Consideration should be given if discounting will be required applied at risk-free rate
- Should make allowance for known and expected trends in costs
- Net of expected reinsurance recoveries

Solvency Capital Requirement:

- Reserve risk capital will be held based on the volatility of the claims reserves
- It should be considered if the industry standard factors are indeed appropriate for this non-traditional risk
- Premium risk capital will be held based on the volatility of the premium reserves
- Given that premium will be received upfront for 6 years of cover it is expected that UPR will be large, attracting a big premium risk charge
- This may indicate a large lapse risk if contracts are profitable

- It should be considered if the industry standard factors are indeed appropriate for this non-traditional risk
- An allowance may be required for catastrophe risk
- The standard formula allows for perils not relevant to this type of risk - a separate consideration may be required
- An allowance will also be made for market risk depending on the underlying investments of the premiums received before claims are paid as well as capital kept in the captive insurer.
- Market risk will also be bigger given large UPR balances invested in longer-duration assets to match the duration of liabilities
- If assets invested in another currency to match imported parts, a currency capital charge will apply
- SAM also requires an allowance for operational risk based on the turnover or reserves
- Allowance can also be made for the loss-absorbing impact of tax
- Only reinsurance with reinsurers in equivalent jurisdictions are recognised for capital relief
- The captive will have to keep more capital than the minimum SAM requirement to protect against volatility

iv) *This part of the question was not answered well by all candidates. Candidates did not demonstrate the ability to generate a lot of ideas on the topic of self-driving cars and very little higher order thinking was apparent.*

- Is self-drive really risk free?
- What about covering the other perils e.g. theft, acts of nature, etc? - not competitive in market
- New perils may be introduced into the system for example software failure, hacking
- Will the driver be able to override self-drive mode and if so, who is liable?
- What about third parties that are not self-drive?
- How would fault be determined if one of the parties involved is a computer?
- Would regulators allow self-drive vehicles?
- There may be restrictions imposed on use or even on the ability to recover from other parties in the event of an accident
- There would be basically no data to price this risk
- May have to introduce an excess to deter clients from making accidents when overriding self-drive mode
- Although self-drive may reduce the risk of the vehicle being in an accident there is still considerable risk from other normal vehicles
- Also, many other may be uninsured. Thus, regardless of fault, there will be damage that needs to be fixed.
- Not just software security but also just failure of software may introduce risk into the system
- If there is a major failure of software, it may actually mean that all vehicles are affected simultaneously - this would be some form of catastrophe event
- It may be difficult to find reinsurance cover for such risks since it is unknown and there are very little data or history to calculate the appropriate premium
- May have to consider non-traditional markets for reinsurance cover
- The solvency requirements as calculated by the standard formula may not be appropriate for the underlying risk
- This may necessitate to use ISP's or an internal model
- This will add considerable cost to managing the business
- Self-drive technology is fast improving as more data is gathered and models become more sophisticated
- This may reduce the cost of providing this cover over time as the frequency of events reduce
- The sophisticated parts in the car may increase potential claims cost compared with traditional vehicles
- However, as these technologies become more mainstream, the parts cost may reduce
- Legal costs to resolve claims may be more than traditional insurance products due to these type vehicles being quite new and it may take longer for legislation to adapt to these products.
- Since NV are insuring their interest, would it still be important to include rating factors on the drivers?
- If there is distinction, would they be charged different prices for the vehicles - this may create some unhappiness amongst clients
- NV could also accept the subsidy within the captive. They would just need to monitor the mix of business they write
- There may still be some selection risk if these factors are excluded e.g. They may attract younger people which may increase the overall cost of the vehicles
- The litigation process for self-drive claims may take quite a long and thus may cause quite a long-tail on the claims reserves
- It may be necessary to allow for legal inflation when reserving for these claims

- Repudiating claims by the captive on whichever grounds may cause quite a bit of reputational risk to NV
- It will be very important that clients understand the cover - which perils are included and which ones not
- Given the uncertainty of the appropriate level of capital NV may wish to hold a bigger margin over and above the standard industry multiple
- This will increase the overall cost of capital of proving this benefit
- If clients claim very frequently - how would you manage these clients to manage their risks better
- Cannot stop cover if it is part of the lease agreement of the vehicle. May have to define an increasing excess following each claim or alternatively increasing co-payment
- Need to get approval to write class motor business
- System implications
- Staff / Procurement contracts
- Reputational risks
- Fraudulent claims
- Economies of scale with lower expense per policy

END OF REPORT