INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2017

Subject ST7 – General Insurance: Reserving and Capital Modelling Specialist Technical

Introduction

The Examiners' Report is written by the Principal Examiner with the aim of helping candidates, both those who are sitting the examination for the first time and using past papers as a revision aid and also those who have previously failed the subject.

The Examiners are charged by Council with examining the published syllabus. The Examiners have access to the Core Reading, which is designed to interpret the syllabus, and will generally base questions around it but are not required to examine the content of Core Reading specifically or exclusively.

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, particularly the open-ended questions in the later subjects, the report may contain more points than the Examiners will expect from a solution that scores full marks.

The report is written based on the legislative and regulatory context pertaining to the date that the examination was set. Candidates should take into account the possibility that circumstances may have changed if using these reports for revision.

Luke Hatter
Chair of the Board of Examiners
December 2017

A. General comments on the *aims of this subject and how it is marked*

1. The aim of this General Insurance Reserving and Capital Modelling Specialist Technical subject is to instil in successful candidates the ability to apply, in simple reserving and capital modelling situations, the mathematical and economic techniques and the principles of actuarial planning and control needed for the operation on sound financial lines of general insurers.

2. Candidates who are well prepared generally appear to perform reasonably on ST7, although a number of candidates do not appear to be adequately prepared or, show poor exam technique. The following points are always worth considering to improve performance:

   2.1. Lists are hugely valuable for breadth of point generation but candidates should always exercise judgement when applying them. In many instances questions will be specifically designed to render a number of the standard points inappropriate and marks (often generous multiple marks) will be available for identifying and articulating these nuances well.

   2.2. Calculation questions will come up on a regular basis within ST7, as candidates can clearly observe from examination of historical papers. Candidates should always be prepared for such staples as balance sheet preparation, triangle manipulations & projections and reinsurance layer calculations (along with being able to carry out any necessary adjustments including inflation, exposure, earning distortion and time period issues).. A clear audit trail should be provided to help secure appropriate method marks where the calculations are incorrect.

   2.3. Capital questions should be expected on every paper and represent a sufficient proportion of the course content that candidates should not expect to be able to pass on their reserving knowledge alone. Those who do not encounter capital work in their professional lives should be particularly careful to ensure that they take time to familiarise themselves with this element of the course.

   2.4. Candidates should aim to be able to give near exact glossary definitions as incoherent or vague descriptions will be marked harshly. If candidates struggle to remember definitions verbatim they should take the time to properly analyse the glossary definition to ensure they have fully absorbed all the nuances of the definition.

   2.5. It is important to always read the question properly and to answer only what you are asked.

   2.6. Always assume that question content is there for a reason. If something is pure bookwork, it should be obvious as such as it will generally go straight to a question with little or no specific context. These are the only sorts of questions where you should expect to provide generic answers. Otherwise you will need to make reference to the situation posed in the question to score well. For example if lines of business, types of insurance entity, a specific set of regulatory requirements or anything else is mentioned they have been chosen as they have an impact on the answer. If numbers are mentioned, they are there because we expect you to look at them, think about them and offer some comment or display some ability to notice unusual features of a table of numbers (a key skill for an actuary). Every exam there will be a significant number of candidates who are clearly extremely well prepared, who write very long answers that clearly display all the base knowledge one might require to be able to think intelligently about a question, but because the answer is purely generic with no obvious attempt to apply the knowledge they score poorly.

3. Candidates, who give well-reasoned points, not in the marking schedule, are awarded marks for doing so.

B. General comments on *student performance in this diet of the examination*

1. Overall the performance was reasonable with a handful of excellent papers. Responses to the last question show that time pressure was an issue for some candidates.

2. Responses to question 7 were mostly poor. The examiners appreciate that under exam pressure it can be difficult to produce a plausible set of numbers. The vast majority of candidates provided little or no audit trail resulting in very few marks (if any) for the significant work involved in producing some calculations.

3. As usual strong candidates distinguished themselves by linking examples to specifics in the question whereas weaker candidates seemed to repeat learned material often out of context.

C. Pass Mark

The Pass Mark for this exam was 59.

Solutions

Q1 Seasonality is the tendency for certain aspects of the claims experience to vary over the course of the year [½]

This can include frequency of certain types of claim [½]
…Exposure to particular perils [½]
…Severity of certain types of claim [½]
…Reporting delays [½]
…Claims processing delays [½]

Seasonality may not have a bearing on annual development factors but may ensure that quarterly factors appear less than smooth. [1]

Examples could include (credit for other valid):
Increased motor claims during winter due to hazardous conditions [½]
Increased subsidence claims during summer due to hot conditions [½]
Burst pipe claims during winter due to freezing conditions [½]
Reporting or processing delays around Christmas or other holidays [½]
[Max 4]
[Total 4]

This question was generally well answered although less well prepared candidates associated seasonality purely with the impact of changing weather patterns on claims.

Q2

(i) Facultative reinsurance is an arrangement covering a single risk [½]
…or package of risks[½]

There is no obligation for the ceding company to offer the business, nor is the insurer obliged to accept it. [½]

Each case is considered on its own merits and the reinsurer is free to quote whatever terms and conditions it sees fit to impose for that risk. [½]
[Max 1]

(ii) Large individual risks [1]
Risks outside of reinsurer appetite [1]
Non-core elements of a package insurance [1]
To reduce the size of the EML under surplus RI [1]
Risks not covered by standard RI programme [1]
Unusual line sizes not economical to reinsure with treaty RI [1]
Arbitrage opportunities relative to inwards pricing [1]
Reduce peak or aggregating exposures [1]
Manage exposure limits (e.g. net line sizes or RDS) [1]

As part of reciprocal arrangements [1]
[Max 4]
[Total 5]

> *Question 2 was reasonably well answered although few candidates provided many relevant examples of where facultative reinsurance may be used.*

Q3

(i) A time limit placed on the period in which claims must be made [½]
…outside of the normal policy period [½]
…generally applying to non-renewing policies if claims made cover [½]

Can be defined in policy wording or in case precedent [½]
Often applies to classes of business subject to significant delay [½]
[Max 2]

(ii) *UK EL*
Would not expect discovery periods [½]
…as compulsory cover to protect employees who should not be penalised for any reporting delay by policyholder [½]
…although contract may include some wording that would allow the insurer to separately challenge the policyholder [1]

Run-off D&O – arguable either way
Would expect some form of discovery period [½]
…as claims can emerge long after any incidents so this provides some cap on the tail of exposures [½]

OR

Would not expect a discovery period [½]
…as the run-off period itself is the allowable claim period [½]

Commercial property – arguable either way
Would not expect any discovery period [½]
…as business is short tail so claims should be reported soon [½]

OR

Would possibly expect a discovery period [½]
…as claims should be known at an early stage so requiring good reporting behaviour should not be onerous on the insured [½]
[Max 3]

A significant number of candidates erroneously stated that Employers' Liability would have a discovery period due to the possibility of significant delay before it was evident a claimable event had occurred.

Q4

(i) Process uncertainty is the risk inherent in writing business and settling claims in general insurance. [1]
The modelling of the number and amount of claims will vary from the true value according to random variation. [½]
[Max 1]

(ii) Changing development patterns [½]
Inherent uncertainty on individual claims [½]
Demand surge [½]
Booked reserves different from best estimate [½]
Climate change [½]
New distribution channels [½]
Changing use of profit share arrangements [½]
New claims handling procedures [½]
Bodily injury claims [½]
Differences in third party behaviour [½]
Legislation changes [½]
Broker mergers [½]
Aggregators [½]
Accounting changes [½]
Offshoring [½]
Tax changes [½]
Levies [½]
Economic conditions [½]
Traditional monetary policy loses effectiveness [½]
New investment types [½]
Globalisation of investment markets [½]
Influence of other investment markets [½]
Globalisation of insurance markets [½]
Regulation arbitrage [½]
New markets [½]
Economic cycle [½]
Exchange rates [½]
Insurance cycle [½]
Additional marks available for other valid reasons (½ each) [3]
[Max 5]
[Total 6]

Answers to (i) were generally not specific enough, e.g. not referring to premiums and claims. Most candidates scored well on (ii).

Q5

(i) A negative gross redemption yield means that if the company holds the bonds to maturity the coupons and redemption proceeds will be less than the original investment in cash terms [1]
…even without any form of default [1]
…albeit unlikely with better quality government bonds [1]
…although the bonds are long-dated [½]

In real terms (i.e. after inflation) the loss may be more material [1]
…particularly as long-dated [1]

Transaction costs may make the losses greater still [1]

At certain points there may be unrealised losses or gains on these investments that differ from the theoretical redemption yield [1]
…if there are changes to the overall yields / rating offered by the governments in question [1]
…difficult to see how there would be unrealised gains on bonds that already have a negative return [1]

The company is effectively paying the government to lend it money [1]
This would not appear to meet a typical investment criteria of maximising returns (within other criteria) [1]
However it is possible that there are other criteria that have driven this investment decision [1]

Matching – unlikely to meet matching objectives as assets would be long dated and not real in nature [1]

Risk appetite – may be held as perceived to be lowest risk relative to other investment alternatives [1]

Capital – may be lowest capital requirements depending on the regulatory specification [1]

Alternatives – depending on market conditions may not be any better alternatives available, although this is unlikely [1]

Diversification – may offer diversification with the broader portfolio [1]

Stakeholder expectations – may be expected by regulators / rating agencies / investors etc. to have government bond holdings [1]

Investment guidelines – may require holdings, potentially reflecting out of date guidelines from a period where yields were positive [1]

Tactical – may have some reason to believe that there is a short / medium term profit opportunity, for example if there is even greater flight to quality [1]

Liquidity – the government bond markets (particularly those paying negative yields) are likely to be very liquid [1]

Additional marks available for other valid reasons (1 each) [2]
[Max 8]

(ii) *Term deposits*

Unclear whether these would offer materially more competitive rates of return than government bonds [1]

Exposed to default of the banks (would not expect any separation of funds if interest is payable) [1]
…likely to be higher risk than government default [1]

Have to hold assets for a fixed term to get full interest [1]
…so unlikely to meet liquidity requirements for general insurers
…unlikely to be any form of secondary market for this [½]
…may be partial interest payable on released assets but would reduce any margin differences further [½]

Vault

Would be a challenge to accrue sufficient volumes of physical cash for a large holding with a large insurer [1]

If using a third party vault would be likely to have cash storage fees which would drive yields negative, although potentially by less [1]

If using own vault would have construction and maintenance costs which may be prohibitive [1]

Security / theft risks with either approach [½]

May be operational challenges if currency notes are updated [1]
[Max 4]
[Total 12]

This question was generally not well answered with many candidates providing rather narrow answers focussed on matching. Many candidates misunderstood the fixed term nature of term deposits erroneously citing higher liquidity than government bonds.

Q6

(i) *Going concern* [½]
The enterprise will continue in operational existence for the foreseeable future. [½]

Accruals Basis [½]
Revenue and costs are recognised as they are earned or incurred, not as money is received or paid. [½]

Consistency Basis [½]
There is consistent accounting treatment of like items within one period and from one period to the next [½]

Prudence & Realisation [½]
Revenue and profits are not anticipated (that is, must be realised), and provision is made for all known liabilities, whether the amount of these is known with certainty or is a best estimate in the light of the information available. [1]

Separate valuation of assets and liabilities [½]
When determining the aggregate amount of any item the enterprise must determine separately the amount of each individual asset or liability that makes up that item [1]
[Max 5]

(ii) Situation a: Consistent with the "Going Concern" concept… [1]
…i.e. the company is not facing liquidation (break-up basis) [½]
…or assuming the insurer is valued as if business will continue to be written [½]

Situation b: Inconsistent with the "Accruals Basis" concept… [1]
…where revenue and costs are recognised as they are earned or incurred [½]
…not as money is received or paid [½]

Situation c: May or may not be consistent with "Consistency" concept… [1]
…consistency of accounting treatment from one period to the next required… [½]
…however not definite that the two bases are not equivalent (could be proved to be) [½]

Situation d: Inconsistent with the "Prudence and realisation" concept… [1]
…as revenue and profits are not anticipated [½]
….and inconsistent with "Accruals Basis" concept (as defined above) [½]

Situation e: Consistent with the "Prudence and realisation" concept… [1]

…provision is made for all known liabilities in light of the information available… [½]
…however the loss occurred after the valuation date so should not be specifically adjusted for [½]
but there should be a note in the accounts with respect to such a significant post balance sheet event [1]

Situation f: Inconsistent with "Separate Valuation of assets and liabilities" concept… [1]
…when determining the aggregate amount of any item, the insurer must separately determine the amount of each individual asset that makes up the item [1]

[Max 9]
[Total 14]

This question was mostly well answered. High scoring on (i) generally also translated to a good score on (ii) as the application of the bookwork was relatively straightforward.

Q7

(i) The 24^{th} method assumes that annual policies are written evenly over each month and risk is spread evenly over the year. [1]

A risk attaching reinsurance contract provides coverage for claims arising from policies commencing during the period of the reinsurance [1]

This means that the exposure period covered by the reinsurance coverage can be up to 3 years, violating the assumption of the 24^{th} method [1]

If this method were used it could lead to an overstatement of the earned premium. [1]

Reinsurance contracts may not be written uniformly over the month e.g. contract have a start date of the start of the month. [1]

The method is simple and should be cost effective [1]

It may not make a material difference to use a more accurate approach. [1]

Risks may not be spread uniformly over the year e.g. reinsurance of cat exposures [1]

Overall this would not be an appropriate method. [1]

[Max 5]

(ii) *Interpolate to get appropriate factors for 6 months*

Assuming that claim development is uniform between development years [1]
Assume that youngest year is half as developed as y1 factor (credit for any other reasonable assumption) [1]

We get the following revised % developed and CDF

Year	1	2	3	4	5	6	
	2017	2016	2015	2014	2013	2012	
Dev	0.110	0.347	0.549	0.688	0.793	0.867	[1]
CDF	9.10	2.88	1.82	1.45	1.26	1.15	[1]
UY ULR	88%	82%	84%	90%	96%	105%	[1]

Need to convert to an accident year basis, assuming
Assumption about type of underlying business (risks attaching or LOD) [½]
Assumption about inception dates and / or writing pattern of RI contracts (e.g. all on 1/1 or evenly) [½]
Additional credit for noting that H1 premium is very close to annual premium [1]
Assumption about inception dates and / or writing pattern of underlying contracts if RAD e.g. evenly [½]
Assumption about term of RI contracts e.g. annual [½]
Assumption about term of underlying contracts e.g. annual [½]
Assumption about spread of risk e.g. even [½]
Assumption about written premium for 2011 e.g. same as 2012 [½]
Assumption about written loss ratio for 2011 e.g. same as 2012 [½]
Loss ratio is uniform over underwriting year (no seasonality) [½]
Appropriate proposal for weighting between prior & current UWYs consistent with assumptions made e.g. 50/50 if LOD or 1/1 RADs [2]
Recognition that 2017 half year is more weighted to prior years e.g. 75/25 [1]

Example outcome (50/50 and 75/25 for 2017 H1)

	2017	2016	2015	2014	2013	2012	
AY ULR	105%	100%	93%	87%	83%	83%	[3]

[Max 9]

(iii) The loss ratio appears to be improving by underwriting year [1]

This trend may be reversing in 2016 [1]
…though this may be due to an being only half way through underwriting year [1]
…coupled with the extra weight being added to the BF which has a higher initial expected loss ratio [1]
…and the additional uncertainty from extrapolating the CDF when development is significant [1]

It looks like the initial expected loss ratio is conservative in all but the first underwriting year [1]

The accident year loss ratio for each year are similar to the prior year underwriting year results as is to be expected from the method of calculation. [1]

It is not showing the reversal of trend for 2016 due to the relatively low weight being given to 2016 on an earned basis. [1]

[Max 3]

[Total 17]

Question 7 was poorly answered overall.

In (i) very few candidates identified that the risk exposure period would exceed one year thereby violating a key assumption of the 24ths method.

In (ii) very few candidates produced viable numbers and even fewer produced an audit trail to assist the examiners in awarding marks.

Q8

(i) Public / 3rd party liability [½]
…as may cause damage or injury as part of activities [½]

Motor [½]
…as likely to be using vehicles for the production / filming [½]

Property own damage [½]
…likely to have property e.g. cameras used for filming [½]

Employers' Liability [½]
…will have employees and likely to be legal requirement [½]

Travel [½]
…likely to involve a variety of locations, some remote [½]

Business Interruption [½]
...delays to filming possible e.g. from weather [½]

Kidnap & ransom [½]
…may be filming in some dangerous areas [½]

Aviation [½]
…if using e.g. helicopters for filming [½]

Environmental [½]
…good business practice in current climate [½]

Additional marks available for other valid insurance + reasons (1 each) [2]

[Max 6]

(ii) E*ssential Features*

Interest in risk [½]
… (a) meets this as would experience a loss [½]
… (b) doesn't meet this as prize is gain not loss [½]

Financial & quantifiable [½]
… (a) doesn't meet as not readily quantifiable [½]
… (b) meets this as clearly quantifiable and financial [½]

Insurance loss must bear relationship to financial loss incurred [½]
…(a) may or may not meet depending on policy structure [½]
…(b) does not meet as does not reflect a loss [½]

Desirable Features

Independence of individual risk events [½]
… (a) meets criteria as likely to be uncorrelated [½]
… (b) similar [½]

Low probability [½]
… (a) probably meets [½]
… (b) probably meets [½]

Pooling of similar risks [½]
… (a) does not meet as unusual [½]
… (b) does not meet as unusual [½]

Overall limit on liability [½]
… (a) could design policy to meet this [½]
… (b) would meet this as clear value [½]

Limited moral hazard [½]
… (a) does not meet criteria as in company's control [½]
… (b) does not meet criteria as the company is incentivised to make the insured event occur [½]

Sufficient info for risk estimation [½]
…(a) does not meet criteria as unusual [½]
… (b) does not meet criteria as unusual [½]

However may be able to obtain some useful data from other sources [1]
Overall neither is likely to be viable [1]

[Max 12]

[Total 18]

Part (i) was bookwork and was generally well answered. Part (ii) was a simple application of bookwork and was also well answered by most candidates.

Q9

(i) Data will be needed for the reinsurance in place as well as that relating to additional reinsurance purchased [½]
…or variations to the current programme e.g. increased limit factors [½]
…cost of future [½]

General Information
Contract type (i.e. QS, XL. Fac) [½]
Currency [½]
Subject Premium Basis (e.g. % of subject premium / fixed) [½]
Participating reinsurers and share of each contract [½]
Inception and expiry dates [½]
Classes of business that cede to the programme [½]
Territorial/class exclusions [½]
Credit rating of insurer [½]
Reinsurer dependencies [½]
Reinsurer accumulations [½]

For Quota Share
Ceded premium [½]
Return commission [½]
Profit share details [½]
Ceded premium limit [½]

For XL
Rate on line/Rate on premium [½]
Attachment point/deductibles/limits [½]
Reinstatement terms (number, cost) [½]
Amount placed [½]
Claims Basis (RAD/LOD) [½]
Indexation terms [½]
Perils and regions covered (Cat XL) [½]

Additional marks available for other valid comments (½ each) [1½]
[Max 5]

(ii) **Ceded Loss Ratio** [½]
…expected ceded claims / expected ceded premiums [½]
…recognising reinstatements [½]
…gives indication of level of profit ceded by insurer [½]

Ceded combined ratio [½]

...as above but allowing for reinsurer expenses and brokerage [½]
…gives indication of margins made by reinsurers [½]
…may be useful for negotiations [½]

Capital requirements [½]
…Under proposed programmes [½]
…or without any cover [½]

Gross return on capital [½]
…profit excluding reinsurance / capital required without reinsurance [½]
…gives indication of profit / ROC achievable with higher risk retention [½]
…useful for comparison to other ROC variants [½]

Net return on capital [½]
…profit with target programme / capital required with target programme [½]
…gives indication of returns achievable with programmes [½]
…useful for comparison to other ROC variants [½]

Ceded return on capital [½]
…Profit ceded to reinsurers / capital saved by reinsurance [½]
…lower value is better (unlike other ROC measures) [1]
…gives indication of overall capital efficiency of purchases [½]
…comparing to other ROC measures shows diluting / accretive effect of reinsurance strategy [½]
…can be calculated at individual programme level [1]

Expected quote share PC [½]
…or return period alternative [½]
…to assess value of other components of overall treaty [½]

Attachment Points [½]
…return periods of losses to each layer of non proportional [½]
…to assess likely frequency of reinsurance activating [½]
…to help determine appropriate layer structures to meet risk appetites [½]

Exhaustion Points [½]
…return periods of exhaustion of each layer of non proportional [½]
…to assess required reinstatement levels to meet risk appetite [½]

Reinstatement costs [½]
…at mean or return periods [½]
…to assess costs of reinstatements for better negotiation of terms [½]

Capacity Limits [½]
…for example net CAT / RDS levels [½]
…to help with aggregate management [½]

Interval Metrics [½]

…any metrics above could compare between year 1 or year 2 etc [½]
…helpful for understanding impacts on SCR1 vs SCRu basis [½]

Additional marks available for other valid metric + description + rationale (½ each) [6]
[Max 9]

(iii) May be difficult to estimate pricing basis for additional coverage and variations on contracts [1]

Model may not be sophisticated enough to allow for complex features of reinsurance contracts [1]
e.g. indexation clause, hours clause, multi class, group programmes. [1]

May be costly to development model to allow for variations in contracts that do not exist in current programme. [1]

Difficult to model new lines of business for which new parameters are required. [1]
Quality of parameters may not be sufficient for detailed analysis [1]
particularly where conditions differ overseas [1]

Certain coverage may not be available [1]

Regulatory regime may not permit the optimal reinsurance structure e.g. limit on amount risk ceded. [1]

Difficult to estimate the value of any changes in the ancillary services provided by reinsurers [1]

Medium sized company may have insufficient data to provide reliable results. [1]
Additional marks available for other valid comments (1 each) [3]
[Max 5]
[Total 19]

Part (i) was well answered in contrast to part (ii) where most candidates struggled. Where metrics were provided the description of how they could be used was often vague at best.

END OF EXAMINERS' REPORT