

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2014 examinations

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 at the date the examination was set. Candidates should take into account the possibility that circumstances may have changed if using these reports for revision.

F Layton
Chairman of the Board of Examiners

December 2014

General comments on Subject ST7

Candidates who are well prepared generally appear to perform reasonably on ST7, with the more challenging questions tending to occur on SA3. Candidates should consider the following advice however (if they have not already):

- 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.
- Calculation questions will come up on a regular basis with 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).
- 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.
- 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.
- It is important to always read the question properly.

Comments on the September 2014 paper

The paper had a broader spread than the previous paper, with more smaller questions. There were a range of very typical calculation questions appropriate for ST7, which were structured in such a way that many candidates managed to get acceptable scores while still not covering the key nuances of the questions through giving a solid effort on the core calculation. The main capital question on the paper was better answered than some previous diets (although it was heavily bookwork) suggesting that some candidates are starting to take on board advice about revising this core part of the syllabus.

1

- Recoveries may be made from reinsurers or other ART markets when the claim is covered by any reinsurance policy the insurer has taken out.
- Subrogation (third-party recoveries) occurs when the insurer can reclaim the cost of a claim from the person who caused the loss or from his insurer.
- Salvage occurs when the insurer has to pay the full value of damaged goods but can still sell the goods in a damaged form, perhaps as scrap or for a reduced price.
- Government or other industry subsidy of major losses, for example crop-damage subsidies.
- Recoveries of fraudulent amount
- Recoveries under principle of average if policyholders under-insured
- Recoveries from other insurers, e.g. Claims sharing / knock for knock / double insurance
- Depending on policy terms & conditions, insurers may be able to recover any retained amount (excess / deductible / SIR) from policyholders
- . . . or may even be able to offset outstanding premium amounts (or any experience rating adjustment component) against the quantum of any claim settlement

[3]

Simple question, some additional depth but could score highly without it.

2

There will be no direct selection since the cover is free of charge

Unless there is scope to opt out for a discount

The offer may affect purchasing behaviour for the vehicle itself however leading to effective selection e.g. by someone finding it very difficult or expensive to purchase comprehensive insurance: young drivers, drivers with bad claims history or points on license

. . . this could be exacerbated depending on the marketing strategy of the dealer

Will the product be flat rated for policyholders characteristics, or will there be scope to vary the amount paid by the manufacturer

If so what factors can vary and by how much

If key factors such as age / gender etc. could significantly reduce mix risks

In order to estimate a risk premium the insurer will need to estimate a profile of rating factors for an average purchaser

Should investigate whether the car manufacturer has any data that could help with this

The question of whether or not the scheme will be profitable is of critical importance to the insurer: this should take account of premiums, investment income, claims and commission.

The insurer will need to calculate an expense loading based on the costs of setting up any special systems or policy documents

And considering the volume of business based on the car manufacturer's forecast

There is the prospect of retaining business from the car purchasers

Will need to estimate the persistency rate for renewals

The final premium will need to be negotiated

Possibility as a fixed amount per unit or amount per purchase price or combination thereof.

Scope for renegotiation in pilot period

Any specific deals for repair / replacement cars from manufacturer

General T&Cs for product

Specifically – business or personal use or additional named drivers that could be material

Should consider the effect of this business on the mix of business between motor and other classes

Depending on volume of business:

On the investment income

And on the solvency margin

Who has renewal rights / cross selling

Is there some form of profit share at the end of the year?

Tie-ins beyond trial period and related scope for clawback

Data quality & reporting delay

Conduct risk / sales methods

Possible tax risk of shifting value to IPT rate rather than VAT rate product

Generic points – to consider on any opportunity.

Generic points – to consider on any opportunity.

[6]

Not brilliantly answered. Few candidates thought about deal specifics, many didn't even pick up on flat rating issues that were core of the question.

- 3** (i) Market risk is the risk that, as a result of market movements, a firm may be exposed to fluctuations in the value of its assets and liabilities or the income from its assets. [1]

- (ii) Market risk arises from differential movements in assets & liabilities from economic / investment factors, so even if the investments themselves are low volatility additional market risk can arise from mismatching to liabilities

Market risk arises on both the asset and liability side of the balance sheet.

If capital requirements are set using a model that is sensitive to both sides then market risk on the liability side needs also to be taken into account, and this will not be affected by the investment of the assets.

For example, a rise in the market level of interest rates will reduce the value of fixed-interest assets, and investing very short or on demand, as this company does, will minimise any such loss.

However, if the liabilities are long-tailed, for example including long-tailed liability accounts or annuity-type awards, their value will reduce with a rise in interest rates, since they will be discounted at higher rates. This would have offset the loss on assets had they been invested with a similar maturity to the liabilities, and overall there would have been no loss, and no requirement to put up capital for this particular eventuality.

Similarly, if there is a reduction in rates there will be a loss through an increase in the value of liabilities.

If the company follows the strategy discussed then this will need to be covered by a capital charge that would have been unnecessary had the liabilities and assets been matched by term and there been the prospect of a gain on the assets to offset the loss on the liabilities.

An unmatched investment strategy gives rise to reinvestment risk that gives rise to a capital charge that can be reduced or eliminated through a matched strategy.

May also not be matched by currency

[4]

[Total 5]

Not brilliantly answered. Many candidates missed key issues that it is relativities of assets & liabilities that are key.

- 4** (i) Fronting occurs when an insurer, acting as a mere conduit, underwrites a risk and cedes all (or nearly all) of the risk to another insurer which is technically acting as a reinsurer.

Note the fronting insurer remains ultimately liable for the risk if the reinsurer defaults

Usually the insurer will receive a fee for this from the reinsurer of a certain proportion of the premium.

The business will normally be priced and administered by the reinsurer or one of its associated businesses.

Fronting may also describe the practice where an individual effects a policy for himself but tries to save money by putting the policy in someone else's name. [2]

- (ii) One possible reason for a fronting arrangement is that the reinsurer is not authorised to write the business concerned.

E.g. May not have the product line licensed, and so can only write on reinsurance rather than direct

E.g. May not have relevant licenses for the territory and not want to get licenses / set up subsidiary

It may simply be in another jurisdiction and may not want to set up a subsidiary in the country concerned.

This might be the case for a foreign company wanting to serve its local customers in their overseas operations but this business not being large enough to justify setting up a subsidiary.

Another possibility is where a company has a captive insurance company established in a captive location but local regulations require insurance to be placed locally; this can be particularly the case for compulsory insurances such as employers' liability and motor third-party liability.

Another possibility is that the reinsurer does not have a sufficiently good credit rating to write the business but there is some particular reason to place the business with it.

The fronting insurer may have a higher rating.

The fronting insurer may have a stronger brand in the market

Another reason for using fronting might be that a company wants to write business that is often sold in a package, but does not want to write the full range of covers in the package;

for example, it might want the property element of small-commercial package business but not the liability element, and it can pass this off in full to a reinsurer.

It may enable the fronting insurer to enter a market without a firm commitment

The fronting insurer may have stronger administrative and/or distributive capabilities.

There may be tax advantages in this arrangement.

There may be capital advantages in this arrangement.

May be regulatory / conduct / TCF advantages

Low risk fee income

Reciprocal arrangements

May keep a share of it

[3]

- (iii) It is important to note that fronting does not relieve the fronting insurer of the liability to pay the claims under the policies.

If it did then fronting would not achieve the objective of the company seeking a better credit rating than the reinsurer's.

This means that the fronting insurer has a counterparty risk from the reinsurer: it will remain liable for the claims even if the reinsurer defaults.

This presents a credit counterparty risk, which in a jurisdiction that requires risk-based capital will require a commitment of capital.

May be disadvantage to reinsurer if required to provide LOC or collateral to support this

If the fronting insurer does not handle claims there may also be reputational risk if the originator of the insurer or the reinsurer has problems in its claims handling; there may be other similar reputational risks.

If the fronting insurer runs into financial difficulties then the reinsurer may feel obliged to take over the liability if the nature of the relationship between the reinsurer and the insured's or the company originating the insurance requires it, for example if the reinsurer is a subsidiary of the originator, which sells the insurance to its customers.

May be excess profits ceded to fronting reinsurer

Fronting is often considered unfavourably by regulators, even if it is not forbidden.

Companies that front in such jurisdictions may harm their relationship with their regulators and may therefore restrict their services in this regard.

[3]

[Total 8]

Fairly well answered, quite bookworky.

5 A surplus treaty is a proportional reinsurance, which means that a predetermined proportion of each claim is recovered from the reinsurance.

However, the proportion will vary from policy to policy, the proportion for a particular policy being determined when the policy is written.

For this reason a surplus treaty will normally be written on a risks-attaching basis, covering all policies that are written during the term of the treaty.

The proportion reinsured for a particular policy is at the discretion of the insurer, within the limits set out in the treaty.

The most important determinants of these limits are the retention and the number of lines.

These are normally related to the estimated maximum loss (or probable maximum loss, EML or PML), which is the estimated largest single claim that may occur on the policy, rather than the sum insured.

The EML may be equal to the sum insured under the policy, or it may be less, because the insurer considers that a total loss is not possible, perhaps because of the nature of the insured policy or because the policy covers a number of properties that are physically separate and at such a distance from each other that an incident affecting more than one is not thought possible.

If a claim arises that is greater than the EML then it still has to be paid by the reinsurer however

The retention is the maximum amount of EML that an insurer may retain without ceding any of the policy to the reinsurer.

It may retain less than this, although there will be a minimum amount that it can retain.

This minimum will be defined by the number of lines on the treaty, although there may be an overriding minimum, known as the minimum retention.

The number of lines is the maximum multiple of the insurer's selected retention that the reinsurer will accept on a single policy.

This means that the maximum proportion of a policy that the company can cede is

$L \div (L + 1)$, where L is the number of lines, subject to the minimum retention on the treaty, should there be one.

If the EML on the policy exceeds the treaty retention then the minimum that can be ceded is $1 - R \div \text{EML}$, where R is the retention.

Can only cede a maximum of $(L+1)*R$

After which additional Fac / surplus or retention may be required

If $\text{EML} > (L + 1) \times R$ then the insurer must cede $L \times R$ of the EML, and the proportion ceded will be $L \times R \div \text{EML}$.

The actual retention exceeds the treaty retention. In these cases the company must retain more than anticipated in the treaty, or arrange to reinsure the excess, $\text{EML} - (L + 1) \times R$, either facultatively or through a second surplus treaty.

The premium paid by the insurer to the reinsurer will be the same proportion as it cedes on each policy, and will be calculated on each of the underlying premiums individually.

Return commission should be paid to the insurer at the same rate as paid on the underlying policies and there may also be an overriding commission, which may be at a fixed rate or depend on the results of the business ceded.

[8]

Fairly well answered as bookwork. Some candidates a bit sloppy in their descriptions though.

- 6** (i) Cover for security breaches such as criminals exploiting IT weaknesses e.g. theft of client monies following web attack also incident management expenses and investigation.

General malicious interference

Websites or other applications that fail to operate reliably...

..clients could suffer losses if can't access funds e.g. failure to complete on house purchase.

Reimburse costs in making data safe again after breach.

Losses arising from bank compromising confidential client data...

..examples could include cost of investigation or even fines imposed.

Misuse of company e-mail or website content that defames a third party.

Damage to third party systems caused by virus that may have been transmitted by bank.

Non physical damage 1st party business interruption

Damage to systems / hardware / bank data caused by attacks

Restitution costs to affected customers, e.g. New cards / credit searches

Reputational risk costs

May be difficult to cover as hard to measure / define

Intellectual property theft

[4]

- (ii) This high profile area is likely to be sensitive to government and regulator intervention.

For example if the government increases remediation/penalties in the event of data loss

...or example of government disallowing cover e.g. to discourage extortion.

Fast moving technology could change the risk that insurer faces..

..increase in prevalence of such crimes could mean product under priced.

Pricing basis often has significant impact on initial reserves so under-pricing could lead to under-reserving.

Particularly as likely to be no historic data to model business.

Policy wordings for the new product may be difficult to determine – e.g. should terrorist led cyber attacks be excluded?

Banks may not be interested in product leading to low sales failing to cover expenses.

..particularly if competition in market is fierce.

Possible issues about losses arising in different territories/jurisdictions given global accessibility of websites.

If sold to existing clients, risk that problems with new product could lead to reputational damage and loss of current business.

Pricing issues i.e. balance between making the product economic and ensuring sufficient take up.

Changing & evolving so data likely to be out of date rapidly even where there is data, e.g. If bank has some historic information

Underwriting would need highly specialised knowledge of technology and bank data systems

Unclear whether claims made or occurrence, potential risk of legacy issues,
e.g. Long standing policies

There may be almost no data available.

Generic points such as impact on reinsurance/new business strain etc.

Point 1

Point 2

[5]

[Total 9]

*Averagely answered, many candidates struggled to think about an obscure class of business
and a specific client base in much detail.*

7 (i) Specify the methods used to validate the capital model.

Require validation to be performed at certain frequency (e.g. annually)

Mandate certain qualifications for those responsible for the validation of
models.

Specify common stress tests that all companies must perform (e.g. $x\%$ interest
rate change)

Benchmarking against standard factors / standard formula

Documentation of validation

Governance requirements – e.g. board sign off / attestation statements

Validation requirements around data inputs / external models

Pick up on previous validation findings

Require public disclosure of the results of model validation tests.

Regulator requires that models are externally validated.

Require submission to regulator of validation report.

Regulator undertakes audit of each firm's validation process on periodic basis.
[3]

(ii) **Stress testing** quantifies the effect of varying single parameter

Can be used to identify/quantify impact of different stress scenarios on an
insurer's expected financial position.

Tests can be deterministic or based on probability distributions.

Can focus on understanding specific risks in isolation

Scenario testing quantifies the effect of a change in a combination of parameters

Useful for testing the combined effect of a number of risks (and mitigating actions).

Sensitivity analysis is the process of testing how results change following a small change in one of the assumptions.

The purpose is to identify the more sensitive assumptions in the model.

Not possible to test all assumptions in complex model so consider changing block of assumptions (e.g. loss ratio variance) by a fixed amount or look at largest classes.

Back testing is the process of comparing actual experience with model output.

The purpose is to test how well the model predicted the outcomes that actually occurred.

Assessment will need to be made as to whether any deviations are random or are a consequence of limitations in the model.

Model documentation is essential for providing a verifiable audit trail in the development and operation of the model.

Documentation should cover rationale for selecting assumptions and the particular risk issues considered.

Peer review should be undertaken by someone not involved in the day to day capital modelling...

...this can be done internally or using an external specialist.

Market benchmarking enables comparison of key assumptions and results with those of similar companies.

Benchmarks may be available from regulators, market bodies or actuarial consultants.

Analysis of change compares key inputs and outputs of the latest model to the previous version of the model..

..and provides a mapping of the key drivers of any changes.

Reverse stress testing is the process of considering the scenarios that could lead to failure of the overall business model

The purpose is to test that the overall model does capture major exposures and key business risks

P&L attribution is the process of reviewing outcomes from the prior accident year and testing them against the modelled parameters

The purpose is to create a cycle of feedback that drives a process of continuous refinement and to ensure that there are no material sources of volatility not represented within the model

*Any other validation technique
..and appropriate explanation of technique.*

[9]
[Total 12]

Fairly well answered (particularly for a capital question), but mostly bookwork.

8 (i) Year-to-year factors

<i>Underwriting</i>	<i>Development period</i>			
<i>Year</i>	<i>1–2</i>	<i>2–3</i>	<i>3–4</i>	<i>4–5</i>
2009	1.810	1.278	1.111	1.035
2010	1.480	1.235	1.080	
2011	1.471	1.235		
2012	1.479			

Percentages developed to ultimate

<i>Underwriting</i>	<i>Development year</i>				
<i>Year</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
2009	37.6%	68.0%	86.9%	96.6%	100%
2010	48.9%	72.4%	89.5%	96.6%	
2011	48.6%	71.5%	88.3%		
2012	47.9%	70.9%			
2013	46.3%				

[2]

- (ii) The development factors for 2009 are out of line with the following years (they are much higher)

Average development factors for underwriting years 2010 to 2012

Development period	1–2	2–3	3–4	
Year-to-year	1.477	1.236	1.080	
	1–ult	2–ult	3–ult	4–ult
Year-to-ultimate	2.090	1.401	1.125	1.035

In each case:

This is expected as the business written in 2009 commenced 1 July so the figures in each cell for this year are each at an earlier stage of development

For the later years the figures are effectively on average at stage of 0.5, 1.5, 2.5, ... years through policy periods

Whereas for 2009 the figures are effectively on average at stage of 0.25, 1.25, 2.25, ... years through policy periods

Assuming that policies are written evenly over a calendar period.

Also the figures may well show that there should be a tail factor whereas none has been assumed

Also seems that 4–5 factor is based on 2009 which as commented is out of line so may not be appropriate to use

Inclusion of 2009 in the year to year / year to ult factors will create distortions

This is clear in the year to ultimate factors for 2013 in particular where the deviance in the 2009 factor is more material, diluted for 2010 and 2011 where the weighting is more to experience

Other generic – e.g. Mix change

Other generic – reserving basis, large claims, paid data etc.

[6]

- (iii) A tail factor should be assumed: any reasonable answer from say 1.01 to 1.05 if reasonably argued: suggestion that 1.025 is reasonable based on progression of 1.0845, 1.0301,...as cumulative figure for 5–6, 6–7, ...

2009 data should be adjusted to be on same basis (same stage of development) as other years e.g. by linear interpolation

$$\text{Dev yr 1: } 0.75 \times 2,332 + 0.25 \times 4,221 = 2,804$$

$$\text{Dev yr 2: } 0.75 \times 4,221 + 0.25 \times 5,394 = 4,514$$

$$\text{Dev yr 3: } 0.75 \times 5,394 + 0.25 \times 5,993 = 5,544$$

$$\text{Dev yr 4: } 0.75 \times 5,993 + 0.25 \times 6,205 = 6,046$$

$$\text{Dev yr 5: } 0.75 \times 6,205 + 0.25 \times 6,857 = 6,228 \text{ where } 6,857 = 6,205 \times 1.015$$

i.e. assuming a one-year development of $1.015 \times$ for next year of 2009 or any other reasonable development for 2009 i.e. less than the assumed tail factor above

New triangle:

<i>UwYr/DYr</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>Ultimate</i>	<i>reserve</i>
2009	2,804	4,514	5,544	6,046	6,228	6,384	179
2010	3,749	5,550	6,855	7,401		7,815	414
2011	4,012	5,901	7,286			8,344	1,058
2012	3,998	5,912				8,348	2,436
2013	4,512					9,570	5,058
	<i>1–2</i>	<i>2–3</i>	<i>3–4</i>	<i>4–5</i>	<i>5–ult</i>		
Dev factors	1.5022	1.2330	1.0845	1.0301	1.0250		
	<i>1–ult</i>	<i>2–ult</i>	<i>3–ult</i>	<i>4–ult</i>	<i>5–ult</i>		
Cumulative	2.1211	1.4120	1.1452	1.0559	1.0250		

All straightforward calculations except 2009:

Reserve = 6,384 – 6,205 i.e. actual claims paid not adjusted claims paid
Total reserve = 9,145

[9]

(iii) Percentages of ultimate for adjusted triangle

<i>UwYr/DYr</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
2009	43.93%	70.71%	86.84%	94.71%	97.56%
2010	47.97%	71.02%	87.72%	94.71%	
2011	48.08%	70.72%	87.32%		
2012	47.89%	70.82%			
2013	47.15%				

Development factors for adjusted triangle

<i>UwYr/DYr</i>	<i>1–2</i>	<i>2–3</i>	<i>3–4</i>	<i>4–5</i>
2009	1.6098	1.2281	1.0906	1.0301
2010	1.4804	1.2351	1.0796	
2011	1.4708	1.2347		
2012	1.4787			

The development factors and percentages of ultimate look reasonably stable by underwriting year

.. suggesting that the adjustments made were reasonable
.. with the one exception of the first underwriting year/development year
.. for which both the development factor and percentage of ultimate, while better than previously, still look somewhat out of line

The use of linear interpolation is probably not sufficiently accurate at such a young development period

Better would probably be some sort of graphical interpolation or non-linear formula

The percentage of ultimate progression for underwriting year 2009 up to 100% also looks reasonable suggesting that the assumed tail factor is satisfactory.

[5]

[Total 22]

Varying quality. Many candidates seemed to miss the time period issues on 2009, and their answers suffered accordingly. It was possible to score reasonably by doing core calculations though.

- 9** (i) Where inflation has a significant effect on the cost of claims a stability clause may be applied to the excess point.
..so that the reinsurer does not receive higher proportion of claims due to inflation.

The formula weights the retention by the time that each partial payment was made..

..thereby allowing for expected inflation at the time payment made.

Equivalent adjustments usually made to policy limit to maintain value of cover.

[2]

- (ii) *Determine payments to be made at each point in time (£, ground up basis, discounted)*

<i>Date</i>	<i>Lump sum (1)</i>	<i>Annual pmt (2)</i>	<i>Cumulative Total (3)</i>	<i>Retention (4)</i>	<i>Weighted Retention (5)</i>	<i>Incremental Loss to treaty (6)</i>	<i>Disc loss to treaty (7)</i>
01/07/2014	1,600,000	0	1,600,000	2,185,454	2,185,454	0	0
01/07/2015	0	250,000	1,850,000	2,251,018	2,194,314	0	0
01/07/2016	0	257,500	2,107,500	2,318,548	2,209,493	0	0
01/07/2017	0	265,225	2,372,725	2,388,105	2,229,459	143,266	135,003
01/07/2018	0	273,182	2,645,907	2,459,748	2,253,235	249,405	230,412
01/07/2019	0	281,377	2,927,284	2,533,540	2,280,179	254,434	230,448

Lump sum (column 1)

£1.6m (no inflation necessary)

Annuity payments (column 2)

01/07/2015 250,000
01/07/2016 $250,000 \times (1.03) = 257,500$
01/07/2017 $250,000 \times (1.03)^2 = 265,225$
01/07/2018 $250,000 \times (1.03)^3 = 273,182$
01/07/2019 $250,000 \times (1.03)^4 = 281,377$

Determine correct cumulative total (column 3)

No need to consider indexed limit as total less than unindexed amount.

Indexed retention (column 4)

01/07/2014 $\text{£}2,000,000 \times (1.03)^3 = \text{£}2,185,454$
01/07/2015 $\text{£}2,000,000 \times (1.03)^4 = \text{£}2,251,018$
01/07/2016 $\text{£}2,000,000 \times (1.03)^5 = \text{£}2,318,548$
01/07/2017 $\text{£}2,000,000 \times (1.03)^6 = \text{£}2,388,105$
01/07/2018 $\text{£}2,000,000 \times (1.03)^7 = \text{£}2,459,748$
01/07/2019 $\text{£}2,000,000 \times (1.03)^8 = \text{£}2,533,540$

Weighted retention (column 5)

Using formula provided in part (i)

01/07/2014 $\text{£}2,185,454$
01/07/2015 $(\text{£}2,185,454 \times 1,600,000 + \text{£}2,251,018 \times 250,000) / 1,850,000$
 $= \text{£}2,194,314$
01/07/2016 $\text{£}2,209,493$
01/07/2017 $\text{£}2,229,459$
01/07/2018 $\text{£}2,253,235$
01/07/2019 $\text{£}2,280,179$

Estimate loss to treaty once cumulative discounted payments exceed calculation

Nil for years 2014–2016 as weighted retention not reached
01/07/2017 cumulative loss above retention so $2,372,715 - 2,229,459$
 $= 143,266$
01/07/2018 incremental payment $2,645,907 - 2,253,540 - 143,266$
 $= 249,405$
01/07/2019 incremental payment $2,927,284 - 2,280,179 - 392,672$
 $= 254,434$

Discounting incremental amounts (column 6)

$$143,266 \times (1.02)^{-3} = 135,003$$

$$249,405 \times (1.02)^{-4} = 230,412$$

$$254,434 \times (1.02)^{-5} = 230,448$$

Company has 15% share so reserve:

$$(135,003 + 230,412 + 230,448) * 15\% = 89,380$$

Assumptions:

No changes to the annual payment from time of settlement.

Claimant keeps whole payment once made (i.e. not pro-rated on death)

Exactly 5 annual payments are made (life expectancy is accurate).

[8]

- (iii) Liabilities are now likely to be much longer term than under lump sum..
...therefore likely to be significant mismatch between assets and liabilities.

Ideally should have assets that are linked to inflation that match outgo..
..but unlikely to be able to match wage inflation so may need RPI/CPI as proxy.

Uncertainty in future life expectancies and therefore term very difficult to match..
..perhaps longevity based derivatives but could be expensive and risky.

Require annual income to meet the annuity component of payment..
..although could be met out of future premium income if business is ongoing.

Depends on the proportion of reserves/liabilities that are likely to settle in this way..

..if only a small proportion of portfolio no significant action may be needed
or if free assets are large so lots of flexibility may not be as affected

..particularly if the costs of changing portfolio are high/returns are poor

Availability of assets could be a problem as long duration investments may not exist..

..or competition from other investors such as pension funds may make them costly.

[6]

- (iv) New risks like longevity will have to be considered..
..as if claimants live longer than expected, it will increase the liabilities.

If retrocession is purchased, the recoveries will be made many years in future..

Or might buy more in total due to additional risk
...thereby increasing amount of counterparty credit risk.

Purchase of different investments to match liabilities could change market risk..
...for example derivatives/hedges for longevity risk.

Or if mismatch between assets and liabilities is increased, this will need to be modelled.

Likely to be lack of historic data for valuation, e.g. impaired life expectancies
..particularly as published mortality tables unlikely to be appropriate
..so reserving risk could well be higher.

New administration requirements could lead to higher expense risk.
Operational risk – may be challenges in managing, e.g. Loss of corporate knowledge or claims leakage

May impact correlations, e.g. if related legislative changes / growth in PPOs creates additional shared drivers

May need to allow for additional risk of regulatory changes

The new settlement basis may not be reflected in the pricing of new business
..therefore underwriting risk could increase.

Liquidity risk could reduce as payments made over longer period.

Impact of changes in risk will depend on the time horizon of the model
..if modelling one year will be less than modelling capital to ultimate.

Uncertainty as to expected lifespan of individual/accuracy of medical evidence.

[6]

(v) *Advantages*

Gives more certainty as claim can be settled and closed much earlier..
..possibly reducing capital requirements.

Removes longevity risk that claimant lives longer than expected.

Reduces admin costs of obtaining regular updates from insured.

Avoids risk of adverse legislation changes increasing cost unexpectedly..
..for example ability to increase the annuity once it is being paid.

Market positive perception of reducing these liabilities

Remove exposure to wage inflation being higher than expected

Could avoid need to change investment policy / operations

Depending on cost may or may not be capital freed up / additional committed

Avoid reinvestment risk

If sufficient quantity, a bulk purchase solution may be attractive

Disadvantages

Claimant may die much earlier than expected...

...meaning that the reinsurer would not get the benefit of lower claim cost.

Retrocession provider may not agree leading to any recoveries being disputed.

Will lose the investment return on reserves held for the claim.

Of course depends on the reasonableness of the commutation quote..

..or even whether option to enter commutation is available.

[5]

[Total 27]

Varying quality, and a remarkably wide range of approaches adopted. Many candidates seemed out of time on this question and just fudged an obvious simplification (or alternatively didn't read the question).

END OF EXAMINERS' REPORT