INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

18 April 2023 (am)

Subject SP7 – General Insurance Reserving and Capital Modelling Specialist Principles

Time allowed: Three hours and twenty minutes

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator.

If you encounter any issues during the examination please contact the Assessment Team on T. 0044 (0) 1865 268 873.

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1 The general insurance companies in Country D are currently self-regulated by a committee comprising of a few of the Chief Executive Officers (CEOs) from the member companies.

The government of Country D has proposed setting up a new statutory regulatory body for the companies with Gross Written Premium (GWP) below the median GWP in the market. The larger companies (with GWP above the median GWP) will continue to be self-regulated.

Discuss the advantages and disadvantages of the government's decision for:

(a) insurance companies. [4]

(b) policyholders. [4]

[Total 8]

2 An established motor insurance company, Company T, has set up a new automated claims settling process using Machine Learning (ML) technology for all claims with settlement values less than the company's historic median claims settlement value.

The reported claims are reviewed and either approved or rejected by a pre-programmed ML algorithm based on the photographs of the incident submitted by the insured. Company T aims to settle 90% of the claims within 12 hours of being reported.

(i) Discuss how the new automated claims settling process will affect the estimation of the Incurred But Not Reported (IBNR) reserves. [7]

(ii) Outline how Company T's operational risk will be impacted by the new automated claims settling process. [3]

[Total 10]

3 (i) Describe the role of a member in the context of the Lloyd's market. [3]

Company Q owns and fully controls a Lloyd's member that participates in various syndicates.

Company Q's shareholders are pressuring to reduce participation in the Lloyd's arrangement, commenting that the results of the arrangement are too volatile and profitability has reduced in recent years.

The following table shows the historical results, as at 31/12/2021, of the syndicates Company Q is currently participating in.

Syndicate	*Current split of total participation (%)*	*Underwriting year projected Combined Ratio (CR) (%)*					*Average CR (%)*
		2017	*2018*	*2019*	*2020*	*2021*	
A	25	71	88	110	105	93	93
B	15	98	105	101	99	97	100
C	20	86	90	94	93	97	92
D	40	88	76	141	120	107	106

Company Q's management have suggested that the company should no longer participate in Lloyd's syndicates that have an average CR of 100% or more over 5 years.

(ii) Comment on the management's suggestion. [3]

(iii) Discuss the factors Company Q should consider when deciding on its participation in the Lloyd's arrangements for the following underwriting year. [4]

[Total 10]

4 Company M is a Personal Accident (PA) insurance company, selling PA insurance cover to individuals. Recently, the insurance cover was extended to include coverage for infectious respiratory diseases, where a fixed benefit is payable if a policyholder is diagnosed as infected by the specified diseases.

The actuarial manager at Company M is reviewing the adequacy of the current reinsurance arrangements for this extended PA coverage.

(i) Explain why Company M may want support from its reinsurer when reviewing the adequacy of reinsurance for this product. [4]

Just 1 month before the company's year-end reserving exercise, a global pandemic caused by a respiratory disease has occurred. This has resulted in Company M experiencing a significant increase in the number of claims on its extended PA product. The CEO of Company M has asked the actuarial manager to provide an estimate for the year-end reserves.

(ii) Discuss the factors to consider when assessing the year-end IBNR reserves for the pandemic event. [8]

Over the following 12 months, the reported claims from Company M's extended PA product's liabilities to its reinsurer have been steadily increasing due to ongoing infections across the country. Company M has decided to commute the extended PA liabilities to its reinsurer, where the commutation premium to settle all current and future claims would be the value of the ultimate liabilities on an agreed basis.

Company M and the reinsurer have independently calculated their estimate of the commutation premium for this transaction.

(iii) Discuss the factors that could cause differences in the commutation premiums calculated by Company M and its reinsurer. [7]

[Total 19]

5 Reinsurer B has recently started to write Excess of Loss (XoL) reinsurance covers for insurance companies operating in Country Z. A major hurricane hit Country Z on 19 May 2021, causing widespread devastation. The actuarial team at Reinsurer B use the reported claims data as at 31 May 2021 for its mid-year valuation exercise. The chief actuary at Reinsurer B has suggested the company should reserve for claims from this hurricane separately.

(i) Explain why the chief actuary has made this suggestion. [3]

Reinsurer B has been advised that the hurricane will give rise to a recovery on one of the XoL policies underwritten. The following details are available:

- Covers losses occurring during 1 December 2020 to 30 November 2021
- Layer attachment point: $100m
- Layer limit: $100m
- One reinstatement payable at 100% additional premium pro-rata to amount reinstated
- Rate on line: 20%
- Full premium is payable upfront on 1 December 2020
- Ground up loss: $160m.

(ii) Calculate, showing all workings, the reinstatement premium payable from the loss. [2]

Reinsurer B's company policy is to earn the full premium (excluding reinstatement premium) evenly over the policy duration.

(iii) Determine the earned and unearned premiums (including reinstatement premium) for this policy as at 31 May 2021. [3]

[Total 8]

6 A general insurance company, Company L, has two overseas branches (Branch A and Branch B).

Branch A underwrites multiple lines of business in a mature insurance industry. The country is exposed to natural perils. The CR of Branch A has remained stable at around 90% for the past 15 years and it does not purchase any reinsurance.

Branch B started writing only property home contents business 2 years ago in a country where the insurance industry has just started. It uses reinsurance extensively. The CR of Branch B was 45% and 63% respectively for the first and second years.

Capital requirements are determined individually for each branch, using Company L's group internal model, which is calibrated to a 1-in-200-year risk tolerance level. The Available Capital (AC) for each branch is fixed by Company L at $600m, irrespective of the business being underwritten. The following information has been provided:

		Group internal capital model	
		Branch A ($m)	*Branch B ($m)*
[a]	Catastrophe and accumulation risk	150	50
[b]	Reserving risk	100	50
[c]	Underwriting risk	20	90
[d]=[a]+[b]+[c]	Total insurance risk	270	190
[e]	Market and credit risk	5	80
[f]	Operational risk	20	120
[g]=[d]+[e]+[f]	Total Required Capital (RC)	295	390
[h]	AC	600	600
[i] = [h]/[g]	**Solvency ratio = AC/RC**	**203%**	**154%**

(i) Discuss possible reasons for differences in the total RC between Branch A and Branch B, by considering each of the risk components. [8]

The group Chief Financial Officer (CFO) is concerned about the solvency ratios of the two branches, stating that:

'Since the target solvency ratio at the group level is 105%, the solvency ratio for both branches A and B should also be close to 105%'.

(ii) Comment on the CFO's statement. [5]

[Total 13]

7 A large plastic toy company based in Europe that has recently started its operations is considering purchasing insurance for various aspects of its business operations. It has manufacturing hubs in two different countries and exports the toys globally through its own logistics division. It also sells toys through its own network of retail shops in Europe, but it partners with local toy sellers in the rest of the world.

(i) Suggest, with reasons, the main types of insurance products the toy company may require. [7]

(ii) Outline key actions the toy company can take to minimise the cost of insurance. [3]

Company X is a small property insurance provider whose Chief Underwriting Officer (CUO) has offered to underwrite the liability-related insurance products identified in part (i), stating:

'Writing this cover will provide good diversification benefit for Company X's business, reducing its capital requirements'.

(iii) Comment on the CUO's statement. [4]

[Total 14]

8 Company G has been writing health insurance since 2017. Company G calculates its best estimate reserves as the difference between the ultimate claim amounts calculated using the paid chain-ladder method and the claims paid to date.

Company G is also required to calculate its reserves on a statutory basis. The statutory basis is prescribed by the local regulator and requires the following components in addition to the best estimate reserves:

(a) Discounting of best estimate reserves using a yield curve prescribed by the regulator

(b) A provision for risk margin, which is calculated as the difference between the mean and the 80th percentile of the statistical distribution of the discounted reserves.

The following table shows the inception-to-date payments and premiums as at 31 December 2021:

Figures in $m		
Accident year	*GWPs*	*Paid claims*
2017	135	105
2018	160	95
2019	165	72
2020	190	45
2021	220	20
Total	**870**	**337**

The following incremental link ratios from the portfolio's paid claims triangle are provided:

	1–2	2–3	3–4	4–5	5–ult
Weighted average link ratios	4.00	2.20	1.31	1.15	1.00

The following spot yield curves have been prescribed for the discounting of reserves:

Financial year	*Spot yield (p.a.) (%)*
2022	3.1
2023	4.0
2024	4.5
2025	5.0
2026	5.2

(i) Calculate, showing all workings and stating any assumptions made, the discounted best estimate reserves as required on a statutory basis. [12]

It is assumed that the discounted reserves follow a lognormal distribution with mean equal to the discounted best estimate reserves and with a coefficient of variation of 25%.

(ii) Calculate, showing all workings and stating any assumptions made, the risk margin as a percentage of the discounted best estimate reserves calculated in part (i). [6]

[Total 18]

END OF PAPER