INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

22ⁿᵈ July 2022

Subject SP7 – General Insurance Reserving and Capital Modelling

Time allowed: 3 Hours 30 Minutes (14.30 – 18.00 Hours)

Total Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. *Please read the instructions to examinees sent along with hall ticket carefully and follow without exception.*

2. *The answers are not expected to be any country or jurisdiction specific. However, if Examples/illustrations are required for any answer, the country or jurisdiction from which they are drawn should be mentioned.*

3. *Mark allocations are shown in brackets.*

Q. 1) You are working with an Indian General Insurer having exposure to an index-based Weather Insurance Product. Your friend from Internal Audit Team has asked you what data she would need to audit reported claims in a particular State during a particular Kharif / Rabi season.

List the required data items and how these data fields will help her to cross check the level of reported claims.   **[8]**

Q. 2) **i)** Government in a particular country is working towards

- reducing Motor Accidents
- quicker reporting of Motor Third Party Liability cases to achieve faster claims settlement
- reduce number of uninsured vehicles in the country

Discuss briefly possible actions the Government can take to achieve fewer accidents and associated reduction in deaths and injuries on roads due to Motor Accidents.   (5)

ii) How would Government initiatives as mentioned in part (i) will impact Insurers?   (5)

[10]

Q. 3) A general insurer has achieved 10% annual growth in business volumes over last 10 years - say over FY 1 to FY10.

Financial Year is denoted by FY and Accident Year is denoted by AY

You observe that

- The general Insurer has prudently created Reserves over all prior years with Margin for Adverse Deviation (MAD)
- The general Insurer's Financial Year Loss Ratio (FYLR) has stayed at 70% over last 8 years (FY 3 to FY 10)
- Release from prior two Accident Years contributes towards constant FYLR of 70% (and reserve release % has stayed at constant levels as mentioned below)

Reserve Release Observation applicable over FY 3 to FY 10

During any FY (i), for (i) between 3 to 10

Total reserve release would be 10% of premium earned during FY (i)

- 90% of the total reserve release would be from AY (i-1) and
- balance 10% of the total reserve release would be from AY (i-2)

e.g. for i = 3,

Total Reserve Release during FY 3 is 10% of premium earned during FY 3

- *90% of the total reserve release is from AY 2 and*
- *balance 10% of the total reserve release is from AY 1*

Answer the Following questions using above information.

i) You are required to calculate how implied Ultimate Loss Ratio would have moved for AY 4, AY 5 and AY 6 over FY 4, FY 5 and FY 6.

Complete the following grid of implied Ultimate Loss Ratio based on your calculations and stating any assumptions.
(Note: The value for implied Ultimate Loss Ratio for each item in the grid can be provided separately.)

	AY 4	AY 5	AY 6
At the end of Development Year 0			
At the end of Development Year 1			
At the end of Development Year 2				(6)

ii) You are further given that the general insurer's payment pattern is 80%, 10%, 10%. Hence, Calculate the Paid Loss Ratio for FY 6 stating any assumptions. (3)

iii) You have been told that claims Paid in FY 6 by the general insurer were 100 Crores.
Use this information to answer part (a) to part (d).

  a) Calculate total outstanding claims at the end of FY 6. (3)

  b) Calculate MAD at the start of FY 6 stating any assumptions. (2)

  c) Calculate Written Premium in FY 6 stating any assumptions. (1)

  d) Insurer invests its technical reserves such that,

   • Average MAD during FY 6 generates 10% investment income and
   • balance average Technical reserves during FY 6 generates 8% investment income

   Calculate total Investment income earned during FY 6 by the general insurer stating any assumptions. (5)

[20]

Q. 4) You are working with an Indian General insurer writing multiple segments. Your company has recently hired a new Chief Risk Officer (CRO) who is new to Insurance domain. CRO observes that Gross and Net Financial Year Loss Ratio (FYLR) is different across multiple segments. What could be the possible reasons that could lead to difference between Gross and Net FYLR. **[12]**

Q. 5) You work as an Actuary to a new tech-based Indian GI that writes personal lines only. They have come up with an innovative policy with following features:

Term of policy = 3 years.
Policy is sold in units, and a policyholder may buy upto 100 units.
Premium for each unit = Rs.1,000, payable at the start of the term.
Upon unemployment due to an accident causing permanent disability / death:
Each unit pays out monthly income of Rs.10,000, payable at each monthly anniversary of the policy from the date of unemployment till the end of the term or In case of death during term of the policy, the benefits are payable to the nominee till the end of the term.
Commission ratio = 10%
Assume the plan is profitable
Ignore discounting and reinsurance.

i) How does this innovative policy differ from Employers Liability (EL) insurance?   (5)

ii) What are the different type of technical reserves that the insurer needs to hold for this policy?   (2)

iii) How would you set technical reserves for this policy?   (14)

[21]

Q. 6) **i)** What are the 2 most common types of Risk Measure used in stochastic capital modelling? Explain each of them and highlight the key difference between the two.   (4)

You work as a Capital Actuary for a large multinational insurance company. Your company uses sophisticated internal models for stochastic capital modelling. The company is required to hold capital at the 99.5th %ile. The internal models calculates capital required for each LoB separately before combining all LoBs using "LoB correlation matrix". For a particular LoB, the capital to be held before applying "LoB correlation matrix" is estimated at 3000 units.

ii) What are the different types/levels of diversification applicable for this company. Explain each of them.   (3)

For a particular LoB, you are provided with the VaR and +/-5 simulations for the respective risk type.

Simulation	Reserve Risk	UW risk	Cat risk	Market risk	Credit risk	Operational risk
-5	585	883	1875	675	95	190
-4	588	886	1900	680	96	192
-3	591	889	1925	685	97	194
-2	594	892	1950	690	98	196
-1	597	896	1975	695	99	198
VaR	600	900	2000	700	100	200
+1	603	904	2025	705	101	202
+2	606	910	2100	710	102	204
+3	609	918	2200	715	103	206
+4	612	925	2400	720	104	208
+5	615	950	5000	725	105	210

(amounts in units)

iii) Calculate the risk diversification benefit for the LoB from the information provided.   (3)

iv) The company is considering moving to TVaR approach. The proportion of diversification benefit as a % of LoB capital before applying "LoB correlation matrix" has coincidentally remained the same. Calculate this revised capital amount. State any assumptions.   (9)

v) Comment on the change in the risk capital required and any suggestions for improvement that you might have. Calculate the capital required under any modified approach that you may suggest assuming that the diversification benefit as % of risk capital required remains the same. Comment briefly on its pros and cons.   (10)

[29]

****