Institute of Actuaries of India

Subject ST7 – General Insurance: Reserving & Capital Modeling

September 2016 Examination

INDICATIVE SOLUTION

Solution 1:

Restrictions on the type of business e.g. Classes of business authorised to write
Restrictions on countries authorised to write business
Initial authorisation for new companies

Limits or controls on Premium rates insurance companies can charge, rate filing etc.

Mandatory covers and minimum obligation to write a particular class of business

Restrict the information that can be used to price products
Maintaining minimum level of solvency
Solvency measured in a prescribed manner
Risk based capital calculations
Hold capital at a given percentile level

Restrictions on the types of assets or the amount of a particular asset that a general insurer can take into account for the purposes of demonstrating solvency.

Restrictions on the currency, domicile and duration of assets allowed to demonstrate solvency (or mismatching reserves)
A requirement to use prescribed bases for calculating premiums and for valuing the general insurer's assets and/or liabilities when demonstrating solvency.
Restriction on discounting of liabilities and discounting rates that can be used

Restrictions on individuals/qualification requirements on those holding key roles in companies.

Close the company to new business.
Restriction on the type of reinsurance that may be used.
Purchase more reinsurance to reduce risk
Limiting the maximum business ceded to one reinsurer and to use reinsurance companies with a high credit rating
Requirement to increase reserves held
Requirement to hold catastrophe/contingency reserves
Minimum policy requirements
Restrictions on how products are sold
Requirement for automated information systems and distinct roles
Disclosure / transparency of reporting requirement

Requirement for Financial Condition Report (FCR) to be prepared by an Appointed actuary.

Requirement for reserve figures and internal controls to be audited

Requirement to embed capital modelling into the risk management process (use test)

Requirement to demonstrate understanding of the impact of company decisions on risk
Expense Management
Commissions to be paid to brokers. Agents etc.

[5 Marks]

Solution 2:

(i) Claims triangulations data
for each class of business, type of cover, territory, major currencies
Reinsurance and retrocession
Separate incurred and paid triangles
Individual Large losses above a threshold, determined by reinsurer / cedant
Data pertaining to individual large losses include date of loss, cause of loss, policy dates, cession pattern, Sum Insured / PML, incurred or paid claims development etc.
Aggregate claims data in respect of Nat CAT events, such as date of loss, cause of loss / peril, cession pattern, incurred or paid claims development
Historical Premiums and projected, rate changes etc.
changes in terms and conditions, reinsurance conditions
underwriting strategy, business mix etc.
Risk Profile data such as sum insured/PML band, no of risks, total sum insured and total premium in each band, loss ratio

[5]

(ii) Possible Groupings within claims and premium data

Class of business
e.g. property, casualty, aviation, marine, etc.
Claims cohort
Short tail vs long tail
Run-off vs ongoing
Type of reinsurance contract: facultative, treaty, finite reinsurance
Type of cover: quota share, surplus, risk excess, per event excess, aggregate excess, stop loss etc.
Basis of cover: losses occurring, risks attaching, claims made
Territory, e.g. USA, W. Europe, Asia-Pacific, South/Central America
Currency, e.g. US$, C$, EUR, GBP, Other
Type of cedant: small, large, pools/associations, regional, multinational
Reinsurance vs retrocession
Peril
Unusual known losses or contracts that distort the claims development e.g. natural catastrophes such as Gujarat EQ, Hudhud cyclone, or any other alternative relevant example
Expenses v claims payments
Paid claims v incurred claims
Gross of retrocession, retrocession (split by type), net of retrocession

[5]

(iii) The information provided by cedant may not be detailed enough to be subdivided into these groupings.
Reinsurer's IT system may not be capable to capture all the contract details given
Heterogeneous nature of the business,
Insurer may only provide loss data on aggregate basis e.g. proportional treaty.
For multi-class reinsurance contracts it may be difficult to split premiums to line of business even if the claims information has been categorised by class.
There may be sparse/no data for a particular grouping and so it may not be credible to project at that level.
For non-proportional business, e.g. if not many claims have arisen, it may be difficult to derive development patterns.
Insufficient benchmark information available.
There may simply be too many categories to make it cost-effective to select assumptions and do separate valuations for every category.

[3]

(iv) Reserving using data gross and net of reinsurance

+ Can compare the resulting gross and net projections with the difference being the reserves for reinsurance.
+ Simple to apply and understand
+ Simple to add to semi-automated reserving process
+ Can be used to assess the volatility of the net outcomes
+ Suitable method for proportional covers, low working layers and very high excess reinsurance
+ Appropriate if reinsurance has been stable over a number of years
+ Can be adjusted to allow for major catastrophes
- Possibility of inconsistent (including negative) reinsurance recoveries

- Full historic triangulations of net data may not be available at the equivalent granularity
- especially if there are whole account or multi-class covers
- Lack of direct link between gross and net experience could lead to inconsistent results for capital/ERM purposes.
- Does not permit accurate assessment of credit risk

Applying net/gross ratios to gross reserves
+ Simple to apply, particularly for proportional covers
+ No need for full triangulations of net data – just latest positions
+ Ensures consistency of gross and net results (no negative recoveries)
- May be difficult to derive a single ratio that is appropriate for a particular class of business.
..Particularly when non proportional reinsurance treaty are purchased.

In both the methods suggested by AA
Cannot accurately allow for some features of reinsurance such as aggregate limits, aggregate retentions and profit commissions.

Cannot accurately allow for claims that exhaust vertical cover.

[9]

(v) Assess reserve adequacy in absolute and relative terms

Provide management with information as to the strength of the booked reserves
Monitor accuracy of best estimate of reserves over time
Compare the reasonableness of different sets of reserve estimates.
It avoids the impression that there is one "right answer"
Compare different datasets.
Monitor performance to see if claims movements are material.
Determine capital. Quantifying reserving risk is a key component of insurance companies' capital models.
Provide information to investors and comply with accounting rules.
Inform discussions with regulators on solvency.
Assist in pricing insurance and reinsurance policies.
Assist in reinsurance purchasing decisions
To meet the requirements of professional standards
It may support tax discussions (e.g. transfer pricing)
It may assist in determining investment strategy

[3]

(vi) Applying a net to gross ratio may give some indication of a net range
but is likely to be too crude to give a reasonable range
particularly towards the tails of the distribution
May be higher recovery rate at higher percentiles as retention eroded on any aggregate excess of
loss reinsurance protection so additional gross losses are fully recoverable.
.or lower if significant reinsurer default due to a large market event
..or through top of programme
Therefore deriving a distribution of net/gross ratios to apply at different percentiles could be appropriate..
which may be done by simulating recoveries from different combination of gross losses
Need to consider possibility of future management actions such as purchase of further reinsurance after large event
..to model these dynamically would require much more complex methodology

[4]
[29 Marks]

<u>Solution 3:</u>

New business levels / total premium volume
premium rates charged if obtainable / industry premium levels
market share within each class of business
product offerings - features, strengths and market perception
portfolio movements

policy conditions
benchmark underwriting and products with those of competitors
Frequency and Average Cost trends
by Accident year, U/W year and Financial year
to highlight any potential new developments
cost per unit exposure analysis
large loss ratio
Probably only have statutory accounts and returns available
Need to investigate reserving trends in conjunction with the claims related trends
e.g. UPR, (A)URR, OSCR, IBNR
compare with previous years. Are there any noticeable trends?
Also, investigate trends in
claims handling costs and associated reserve.
solvency levels and free reserves
statutory solvency requirements / levels of coverage
the asset mix and any associated changes
Other accounting ratio investigations important
Loss/Claims ratio, Expense/Combined ratio, Commission rates, Investment returns, Profit margin, Return on capital employed, Share price / p.e. ratio
reinsurance purchased, recoveries made, reinsurers security
current regulations pertaining to travel and health insurance products
Investigate recent or possible future legislation changes that may impact the business.
Check for any trends in the wording of audit statements has there been any apparent weakening in the sign-off
Investigate the credit standing of the company
Investigate the combined model office
Investigate the synergies that the combined operation will have.
Investigate the effect upon the benefit schemes of the two organisations.
Investigate the impact upon IT systems and data requirements
Investigate any savings in claims handling expenses
Investigate the benefit of any diversification by products, geography etc.
Funding of the takeover
Alternative use of funds
goodwill
taxation and regulation

[10 Marks]

Solution 4:

The terms define how deductibles / limits of an excess of loss contract applies to losses and recoveries from the contract are determined.
The difference due to the above terms is evident in case of Risk excess of loss contracts when a loss event affects multiple large losses.
Consider a Risk XL contract with following structure INR 400mn x/s INR 100mn and a CAT

event occurs with 3 large losses above INR 100mn i.e. INR 250mn, INR 400mn and INR 500mn.
In case of contract wording "each and every loss", recoveries for all the three large losses above INR 100mn can be made from the Risk XOL subject to enough reinstatements available in the contract.
However, in case the contract wording "each and every loss occurrence", recoveries in respect of any one large loss above INR 100mn from the event can be made from the Risk XOL subject to enough reinstatements available in the contract.
If the Risk XOL contract inures to the benefit of CAT XOL contract, the loss presented to the CAT XOL contract is different.
Risk XOL reinsurer use the terms to limit their exposure to large risk losses due to cat events

[3 Marks]

Solution 5:

(a) A form of total loss, defined by the Marine Insurance Act 1906.
Actual total loss is deemed to occur in one of three ways.
i) The insured item is totally destroyed.
ii) The item is so damaged that it can no longer be classed as the type of object originally insured.
iii) The insured is irretrievably deprived of the insured item.

(b) An expression defined by the Marine Insurance Act.
Constructive total loss is where the insured abandons the insured item because an "actual total loss" is unavoidable
or because the costs of preventing a total loss exceed the value saved

(c) A reinsurance arrangement whereby a reinsurer agrees,
in return for a premium,
to cover the ultimate settled amount of a specified block of business above a certain pre-agreed amount.

[3 Marks]

Solution 6:

(a) First loss is a form of insurance cover for which the chosen sum insured is restricted, with the insurer's agreement,
... to a figure less than the full reinstatement-as-new value of the property.
...The insured therefore has to bear any loss in excess of the sum insured.
This may be appropriate in circumstances where:
the insured considers that a loss in excess of the sum insured is extremely unlikely the item is effectively priceless, e.g. a stately home, for which there may be no possibility of the building being reinstated
the insurance is against water damage (where only the ground floor areas may be affected)

(b) Where property is damaged, this covers the cost of repair (less an allowance for betterment if the repair considerably improves the pre-loss condition of the property).
Where property is lost or destroyed, it generally covers the market value of the property as at the date and place of the loss.
Example - For commercial contents the cover is usually for pure indemnity, i.e. the full depreciated value of the contents is covered.

(c) This insures property on a “new for old” basis.
In the event of loss, the insurer will pay the cost of replacing the property or restoring the damage to a condition no better or more extensive than new, without deduction for depreciation.
The pre-loss condition of the property is not relevant. The insurer may retain the right to provide a replacement item rather than provide monetary compensation.
Moral hazards will be greater with replacement cover.
Example - Generally provided for home content insurance

[6 Marks]

Solution 7:

(i) Generally cyber risks fall into first party and third party risk covers. Insurance products exist to cover either or both of these types of risk.
First –party insurance covers your business’s own assets. This may include:
• Loss or damage to digital assets such as data or software programmes
• Business interruption from network downtime
• Cyber exhortation where third parties threaten to damage or release data if money is not paid to them
• Customer notification expenses when there is a legal or regulatory requirement to notify them of a security or privacy breach
• Legal Fees
• Remedial PR costs
• Provide loan equipment/Pay to replace equipment for the duration of any policy investigation
• Cost of restoring the damaged data
• Coverage for the costs of notifying customers or a security or privacy breach
• Coverage for any investigation costs into attacks
and defense costs and/or civil damages arising from breach
• Cover compensation policyholder has to pay
• Reputational damage arising from a breach of data that results in loss of intellectual property or customers
• Theft of money or digital assets through theft of equipment or electronic theft
Third-party insurance covers the assets of others, typically your customers. This may include:

• Security and privacy breaches, and the investigation, defense costs and civil damages associated with them
• Multi-media liability, to cover investigation, defense costs and civil damages arising from defamation, breach of privacy or negligence in publication in electronic or print media
• Loss of third party data, including payment of compensation to customers for denial of access, and failure of software or systems

[3]

(ii) Exclusions could include:
• Losses due to insured negligence like updating the software, failure to apply security patches, etc.
• Failure to encrypt data
• Bodily Injury
• Directors & Officers: performance or non-performance of their duties as a director, officer, trustee or employee.
• Fraud or Dishonesty
• Prior acts exclusion: excludes coverage for any claims based upon wrongful acts that occurred before a certain date – often the inception date of the policy.
• Act caused by an employee of the company
• War / Terrorism
• State sponsored
• Reputational / Goodwill
• Failure to notify insurance company / agencies / customers within a specified time
• Excess applicable
• IP related loss
• Loss in a particular jurisdiction
• Losses covered by other insurances

[3]

(iii) Challenges in underwriting cyber insurance
- Accruing useful data
- While having access to data on historical cyber breaches is valuable, the threat is constantly evolving, such that previous attacks may rarely be a good indicator of future events. Even a small shift in the balance between the capabilities of hackers and cyber defenses could lead to a significant shift in the frequency and severity of cyber-attacks.
- Accessing the tangible and intangible assets to determine possible losses and threats of the Companies.
- Aggregation of risk and accumulation management: Cyber risk has significant potential for aggregation – catastrophic losses across many policyholders as a result of a single event, e.g. a major cloud provider suffering an outage or a hack.
- Skills -Cyber is a highly complex and technical field

- Assessing company's attitude towards cyber security
- Increasing level of flexibility provided to employee like mobility, bring your own device, etc. makes it difficult to assess the level of IT security in the company. As the security is as strong as its weakest link
- Rely on availability of reinsurance / reinsurer help to underwrite
- Inter-connection of risk, makes its assessment difficult and challenges some of the basic principle of insurance

[4]

(iv) Rating Factors

- Industry/business sector
- Geographical Jurisdiction
- Annual revenue
- Revenue dependent on internet
- Deductibles/ retentions and limits
- Past history of cyber security breaches

Risk Factors

- Breach of privacy potential like personally identifiable information maintained by enterprise maximum during year
- Cyber security level of the insured
- Critical dependency of business process on IT
- Presence of worth protecting intellectual property like know-how, patent, and otherwise valuable information
- Level of professional qualification of the IT employees.
- Environmental and physical hazard present at insured's location
- Risk management system in place

[6]
[16 Marks]

Solution 8:

(i) Regulatory capital is the amount of capital that the regulator requires to be held. Regulator aims to protect policyholders so calculates capital differently.

a) Only certain assets are admissible – only good quality, secure assets can be used in calculation of assets
b) Since it protects policyholders, technical reserves are calculated according to the regulatory regime requirements. It may be at best estimate plus risk margin, or undiscounted, or using another method
c) subordinated debt can be used towards regulatory capital but traditional debt cannot since it ranks before policyholders' liabilities.

Economic capital is the sufficient surplus to cover potential losses, at a given risk tolerance level, over a specified time horizon. The loss profile, risk tolerance and time horizon is determined based on company's view. Economic capital could include or exclude debt capital.

[2]

(ii) a) There is business interest in establishing right level of capital so that :

i. The capital on which the shareholders are expecting to earn a risk return is not too high, since this will lead to excessive cost of insurance

ii. The capital is not too low, since this leads to unacceptable risk of insolvency

b) Company may believe that the formulaic approach of the regulator may not appropriately reflect companies process and procedure of effectively managing risk

c) Regulatory and Rating Agency Capital may actually not allow for some of the risks a company faces, including whole range of operational risks

d) Economic Capital can more directly be compared across lines of business and jurisdictions for multinational organization.

e) The economic capital requirements could be used as a unified framework to run business with strategies evaluated for its impact on return on economic capital

f) Economic Capital framework enables insurers to comply with growing rating agency requirements. Rating agencies increasingly regard it as an indicator of best practice

g) emergence of comprehensive insurer risk management practices, economic capital provides one single measure helping ins a disciplined approach to improve the understanding and management of company's risk;

[8]

(iii) Role of board in economic capital assessment:

a) Approve firm's risk tolerance and time horizon for capital assessment

b) Understand and question the breadth of risks faced by the company and ensure that the capital framework reflects the risk management practice followed by the insurer.

c) Assign clear accountability and monitor capital assessment.

[2]

(iv) Capital models can be used when investigating:

- Reinsurance
- Investment
- Pricing
- Reserving

- business planning
- strategy
- risk management
- Merger and acquisition

[4]

[16 Marks]

Solution 9:

(i) This is a short-tail class consisting of property damage claims (e.g. for lost luggage) and medical expense claims. The claims are mainly small in size although some medical expense claims can be substantial. Property damage claims tend to be linked to price inflation. Medical expense claims are linked to the increase in medical costs over time (tends to be higher than price inflation). The majority of property damage claims are likely to be settled on return from the destination in the domestic currency, but some property damage claims and the medical expense claims will need to be settled in an overseas currency.

[4]

(ii) Risks faced by the company

i) Inadequate Reserve

ii) Inadequacy of Premium to meet liabilities

iii) Aggregation of claim

iv) Operational risk like failure of IT system, fraud, etc.

v) Currency risk: As the claims may arise in overseas currency, the company asset may not be match to that currency.

vi) Market risk: Lower than expected investment returns.

vii) Liquidity risk : The company may not have liquid assets to meet a large claim and may require liquidating investment assets at unfavorable term

viii) Credit Risk : Failure of counterparty like reinsurer

[4]

(iii) Factors to that may be considered while determining investment strategy of the company are: The risk appetite of the company

i) Characteristics of the liability:

a) Nature, fixed or increasing with inflation or super-inflation

b) Term

c) Currency

d) Amount

ii) Regulatory restriction on investment:

a) Restrictions on the type or amount of certain assets allowed to demonstrate solvency.

b) Restrictions on the currency, domicile and duration of assets allowed to demonstrate solvency (or mismatching reserves).

iii) Level of free reserve, if the company has plenty of free reserve it may determine not to match liability or invest higher proportion in risky assets.

iv) The level of underwriting profit: If the company is making underwriting losses, an unmatched position may be taken to try to make investment profits to offset these losses.

[4]
[12 Marks]

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