Institute of Actuaries of India

Subject SA3 – General Insurance

September 2017 Examination

INDICATIVE SOLUTION

Solution 1:

i)

Including flood cover on policies sold in future increases the loss exposure sold and hence will increase the cost of providing cover. This will be reflected by increase in premium for home insurance policies sold in future.

Risk premium included within the insurance premium charged will have to be adjusted for the increase in loss exposure due to flood claims. The areas with a greater susceptibility to flood losses pose a higher risk relative to others and premiums for homes in those areas should accordingly see a greater increase to avoid adverse selection.

On the other hand, there would be areas with little or no flood risk. The additional loading for homes in these areas should be minimalistic so as to avoid losing out on these 'good risks'.

The loading on these 'good risks' will have to be very competitive to the market so as to avoid losing them to competitors.

At the same time, the additional loading for areas with high flood risk should not be too high as this may result in individuals choosing not to purchase insurance if they consider it to be very expensive.

Since the driver behind compulsorily including flood cover on home insurance policies is a push from the government, it is likely that the regulator will have a close eye on the rise in future premiums and may impose limits/controls and/or additional disclosure requirements justifying the increase.

There may be an additional cost for expenses incurred as a result of

- increased reporting requirements,
- hiring specialist underwriters,
- flood claim handlers,
- specialist brokers,
- seeking external advice on flood pricing,
- purchasing external data such as flood maps, historical claims data from other insurers writing flood insurance etc.

as the company has no prior experience or data in respect of underwriting flood cover.

These costs too will have to be built in the office premium, in addition to the increase in risk premium mentioned above.

Note the insurance company (and possibly most other home insurers in the market) has no prior experience of writing flood risks. It will need to be very careful in identifying the low risk, high risk and extremely severe risk properties so as to fairly price each risk.

Where the insurer is unable to reasonably accurately quantify the additional risk on a property, the premiums may be increased to include an implicit margin.

The company may decide to reinsure losses in respect of floods to avoid making major changes to its net portfolio in the near future. There may be a further need to buy CAT cover. The cost of additional reinsurance will have to be built in the premiums. This would also depend on the form of reinsurance purchased – proportional or excess of loss, layers reinsured etc. Given the increased demand for flood reinsurance across the market, it may be available at very high rates or possibly be unaffordable for the company.

Alternatively, should the company elect to hold additional capital in respect of the increased loss exposure, then the profit loading within the premiums charged is expected to be increased to reflect a greater return required on capital.

[7]

ii)

+ Making insurance compulsory will increase the number of policies sold from before and revenues for insurers.

+ The increased volume of business underwritten may translate to greater profits and lower overall per-policy expenses.

+ This may also result in less opportunity for anti-selection, as people are forced to buy a policy.

+ Waterland is susceptible to flooding every year. Compulsory home insurance including flood cover for Waterland will ensure protection for all following a flood event of limited or severe proportion.

+ Compulsory insurance allows for cross subsidising high risks with low risks thus making insurance widespread and more affordable for high risks.

+ To keep premiums charged in check, the government may be incentivised to invest more in flood risk mitigation measures.

- It may possibly result in greater risk of moral hazard. For example, if people are forced to buy a policy, they may be tempted to claim fraudulently in order to get something back for their premiums. The loss experience on home insurance may deteriorate due to fraudulent or overstated claims.

- Further moral hazard may result from people building homes in high risk areas where there is a greater chance of flooding as they now have insurance cover for the same.

- Though the volume of business written by insurers may go up, this could also be coupled with increased losses on the portfolio due to their inability to price flood risks appropriately, increased expenses, increased cost of reinsurance etc.

- The government or the regulator may impose constraints on a maximum level of premium that may be charged or a maximum percentage increase in premium rates. This may not be deemed sufficient by some insurers for the very high risk properties.

- Ensuring all properties in Waterland have purchased home insurance, monitoring renewals year on year and checking for any lapses will be an additional exercise to undertake that would come with cost, time and effort required to be expended.

- Making home insurance compulsory only for properties in Waterland and not for the rest of the country will be questionable morally by the general public, social welfare organisations etc.

- Selective treatment of Waterland properties may also be questioned by insurers as it greatly limits the opportunity to cross-subsidise across a much larger pool of low risks spread all over the country.

[5]

iii) The overall amount of subsidy is expected to be required only on a few extremely high risk properties in Waterland.

Premiums charged for the zero or low risk properties would be entirely reflective of the risk exposure and will not need to be subsidised by the government. Premiums for the high risk properties will increase in line with the increased risk exposure.

Only for the extremely high risk properties the commercial premiums would be very high in the absence of any subsidy. These incidentally are the very risks with the greatest need for flood cover. Without any subsidy, the insurers would be either forced to write unprofitable business or the take-up rate of insurance would be little or zero for these properties.

Capping the maximum limit on the additional flood risk loading will make premiums more affordable, especially for the high risk properties in more flood prone areas within Waterland.

At the same time, insurers will be subsidised by the government for writing these risks as they would not wish to make a loss on selling flood cover at a premium which is below the expected level of loss on these properties.

Levying a cess on all home insurance policies across the country will generate revenue for the government to subsidise the excess flood risk premiums in Waterland, effectively passing the cost of subsidy back to the people of the country.

A very small proportion of the total number of household policies sold all over the country would need to be subsidised, so the amount of cess per policy will be very small.

However, it is a very difficult task to pre-empt the number of policies in Waterland requiring the subsidy or the overall level of subsidy required. Furthermore, estimating the cess would require the expected number of home insurance policies sold across the country to be estimated and the total premium charged (if estimating the cess as a percentage of premium as opposed to a flat load per policy sold).

Cross-subsidising the very high flood risk properties in the state of Waterland by household policies sold over the entire country may not be considered fair by most homeowners outside Waterland.

Though the amount of cess per policy is expected to be modest, homeowners from states outside Waterland would rather welcome an additional cess for getting some additional cover on their own policy than for funding very high risk properties specifically in Waterland. The additional cess, howsoever small, comes to them with no additional benefit.

Some homeowners, especially those outside Waterland, may be discouraged from purchasing or renewing their usual homeowners cover.

Since the government will be funding the subsidy back from the people, there would be no extra burden for it to bear. This may reduce its incentive to invest in flood risk mitigation measures or pass any laws dissuading construction or sale of homes in the very high flood risk areas of Waterland.

[7]

iv) Short-term measures that general insurers could take each year in response to the resulting adverse claims experience from increased risk of flooding in Waterland, assuming flood cover is made compulsory:

- increase premiums, either overall or for certain risks
- change benefits structure offered e.g. limit cover from floods to a certain maximum level
- incentivise low flood risk homeowners, such as those situated on higher levels, with better overall rates on their household policies relative to high flood risk homeowners situated on lower levels

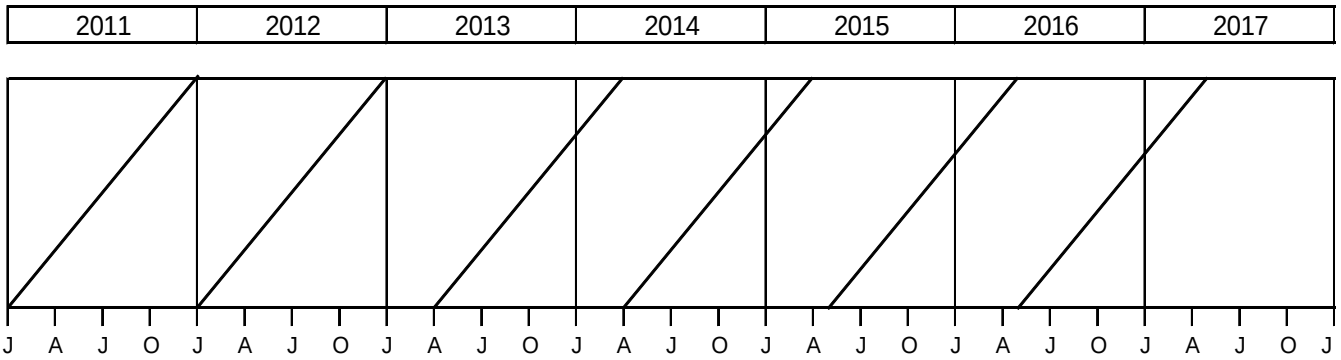
- strengthen underwriting or claims control measures
- restricting or attracting a different target market, e.g. stop marketing in certain high-risk locations / increase advertising in low-risk areas
- strengthening its reinsurance programme
- holding additional capital or a flood specific CAT reserve

[3]

[22 Marks]

Solution 2:

i)



Exposure Year >>

Effective Date	Expiry Date	2011	2012	2013	2014	2015	2016
1-Jan-11	31-Dec-11	50.00%	50.00%				
1-Jan-12	31-Mar-13		50.00%	71.88%	3.13%		
1-Apr-13	31-Mar-14			28.13%	68.75%	3.13%	
1-Apr-14	30-Apr-15				28.13%	74.65%	5.56%
1-May-15	30-Apr-16					22.22%	72.22%
1-May-16	30-Apr-17						22.22%

- The XoL treaties are written on a risk-attaching basis with a uniform spread of risk/loss throughout the years
- The 2012 and 2014 treaty years are for duration more than 1 year and the above earned % account for the corresponding increase in exposure
- Totals for each complete exposure year add up to 1 unit

For example: 2014 has earned exposure from 2012, 2013 and 2014 XoL treaties
From 2012 XoL treaty = 1/2*1/4*1/4
From 2013 XoL treaty = (1/4-1/2*1/4*1/4) + (1/2-1/2*1/4*1/4) or
= (1/4-1/2*1/4*1/4) + (3/4-1/2*3/4*3/4) or
= (1/4-1/2*1/4*1/4) + 1/2*(1+1/4)*3/4
From 2014 XoL treaty = 1/2*3/4*3/4
(0.5 mark for each %ge = 7)

				Exposure Year >>					
XoL Treaty Year	XoL Treaty Layer	Placed (%)	Annual Ceded Loss in Layer*	2011	2012	2013	2014	2015	2016
2011	90k xs 10k	50%	2,00,000	50,000	50,000				
2012	90k xs 10k	40%	2,00,000		40,000	57,500	2,500		
2013	80k xs 20k	35%	1,00,000			9,844	24,063	1,094	
2014	80k xs 20k	30%	1,00,000				8,438	22,396	1,667
2015	70k xs 30k	25%	70,000					3,889	12,639
2016	70k xs 30k	20%	70,000						3,111
		Total		50,000	90,000	67,344	35,000	27,378	17,417

* Annual modelled ceded loss in layer for each XoL treaty:
Reinsured layer 90k xs 10k (1-80%) of Rs.10,00,000
Reinsured layer 80k xs 20k (1-90%) of Rs.10,00,000
Reinsured layer 70k xs 30k (1-93%) of Rs.10,00,000

Placed % is the sum of signed lines for each XoL treaty

Exposure Year	Modelled Ceded Loss	Modelled Ceded to Gross factor	Selected Gross Ultimate Loss	Selected Ceded Ultimate Loss
2011	50,000	0.050	9,00,000	45,000
2012	90,000	0.090	9,50,000	85,500
2013	67,344	0.067	11,00,000	74,078
2014	35,000	0.035	9,50,000	33,250
2015	27,378	0.027	10,50,000	28,747
2016	17,417	0.017	10,00,000	17,417
Total	2,87,139		59,50,000	2,83,992

[14]

ii) No explicit margin is kept for adverse development and liabilities cannot be discounted.

Estimate the ***unpaid ceded losses*** due from each reinsurer as at year-end 2016 as per the outwards reinsurance purchased. This includes outstanding reinsurance recoveries due on reported claims as well as pure IBNR for claims expected to be reported in future for each year of exposure.

Analyse unpaid reinsurance balances by reinsurer and age of debt.

Using the ceded paid loss development pattern, generate ***future cashflows*** in respect of ceded recoveries due from each reinsurer for each exposure year.

Estimate ***probabilities of reinsurers defaulting*** on their obligations, for each individual reinsurer or group of reinsurers with same credit ratings. These probabilities of default may be sourced externally from credit rating agencies or reinsurance brokers.

Apply probabilities of each reinsurer's default at successive calendar years to expected cashflows for the calendar year.

Estimate the ***loss given default*** basis the recovery rates for each reinsurer.

RI bad debt provision is estimated by adding up for each reinsurer
the ceded recoveries due times the expected loss given default percentage
times the likelihood of reinsurer's default at successive years of development
in respect of the aggregate earned exposures for each accident year

[3]

iii) Ceded ultimate loss as at year-end 2016 for accident year 2014 = 33,250
This can be traced back as coming from treaty years 2012, 2013 and 2014
(from solution to part (i))

XoL Treaty Year	AY 2014 Ceded Ultimate
2012	2,375
2013	22,859
2014	8,016
	33,250

For example: Accident Year 2014 ceded loss from 2012 XoL treaty is
2,375 = 33,250 * 2,500/35,000
Calculating the share of each participating reinsurer based on signed lines:

- 2012 XoL treaty is 40% placed between Q Re at 30%, S Re at 5% and T Re at 5%
- 2013 XoL treaty is 35% placed between Q Re at 25%, S Re at 5% and T Re at 5%
- 2014 XoL treaty is 30% placed between Q Re at 25% and S Re at 5%

XoL Treaty Year	AY 2014 Ceded Ultimate	Q Re	S Re	T Re
2012	2,375	1,781	297	297
2013	22,859	16,328	3,266	3,266
2014	8,016	6,680	1,336	0
	33,250	24,789	4,898	3,563

Ceded loss as at year-end 2016 for accident year 2014:

	Total	Q Re	S Re	T Re
Ultimate	33,250	24,789	4,898	3,563
Paid	14,000	10,438	2,062	1,500
Unpaid	19,250	14,351	2,836	2,063

Gross Paid loss percent developed at year-end 2016:

2016	2015	2014	2013	2012	2011	2010
15.0%	35.0%	50.0%	65.0%	80.0%	90.0%	100.0%

Ceded loss development lags by 6 months
Ceded Paid loss percent developed at year-end 2016:

2016	2015	2014	2013	2012	2011	2010	2009
7.5%	25.0%	42.5%	57.5%	72.5%	85.0%	95.0%	100.0%

Cashflow projections by reinsurer for ceded unpaid loss at year-end 2016 for accident year 2014:

	2017	2018	2019	2020	2021	Total
AY 2014	5,022	5,022	4,185	3,348	1,674	19,250

Q Re	3,744	3,744	3,120	2,496	1,248	14,351
S Re	740	740	617	493	247	2,836
T Re	538	538	448	359	179	2,063

Probability of default:

	2017	2018	2019	2020	2021
Q Re	1.0%	1.0%	0.9%	0.9%	0.9%
S Re	0.7%	0.8%	0.8%	0.8%	0.7%
T Re	2.0%	2.5%	2.0%	1.5%	1.4%

Loss given default:

Q Re	60%
S Re	50%
T Re	100%

RI Bad Debt provision for accident year 2014 unpaid ceded loss at year-end 2016:

Q Re	82
S Re	11
T Re	41
Total	134

[8]

iv)

- Issues around ***estimating the ceded unpaid balances***:

  - Uncertainty within the gross claim projections due to variability in actual claims experience from expected
  - Uncertainty when estimating ceded IBNR, especially on claims not yet reported
  - Complexity within reinsurance program purchased for the book of business
    - Changes over time in the reinsurance cover obtained - - type of cover proportional/non-proportional

- different limits and attachments
- different percentage placed
- facultative arrangement or treaty
- facultative-obligatory or obligatory-obligatory basis

    - Multiple reinsurers involved with varying shares of participation
    - Reinsurance purchase basis not the same as basis for policies sold e.g. risk-attaching RI covers on loss-occurring policies…
    - …which will also often result in reinsurance cover dates that are not in sync with exposure years/accident years for the business written
  - Allocation of ceded IBNR to individual reinsurance contracts given the variations and complexity in the reinsurance structure as outlined above
  - Any disputes on expected reinsurance recoveries on reported claims adding further to the ceded unpaid balances

- ***Complexity of the approach/methodology*** in view of uncertainties involved:

  - Parameter uncertainty - actuarial assumptions made may not play out in practice
  - Process uncertainty - multiple methodologies available to estimate the ceded losses
    - gross to net ratios, gross to ceded ratios, distribution fitting and parameterisation

- Uncertainty due to the range of possible distributions to fit and parameters chosen for the selected loss distribution
- Simple deterministic approach to estimating ceded to gross factors based on historical data may not be credible

- Issues around estimating the ***cashflow projections***:

- Limited ceded data, especially for higher layers, to credibly assess duration of reinsurance recoveries and payment patterns
- Difference in actual versus expected loss development patterns on the portfolio
- Difficult to estimate ceded loss development which is often delayed relative to gross loss development
- Past data may not be reliable if there are significant changes in the RI covers over time

- Issues with estimating ***credit ratings*** and associated ***probabilities of default***:

- Credit ratings produced by rating agencies may not be available for all reinsurers worldwide
- There may be variation in ratings for the same reinsurer due to different rating mechanisms of different credit rating agencies
- Ratings may not be updated in the light of any recent developments
- Alternatively, they may include an element of judgment due to insider information not made public just yet
- Difficult to incorporate qualitative factors such as management competence, company culture and values within ratings, though management decisions are often behind insolvency

- Estimating the ***loss given default*** for failed reinsurers can be a difficult task

- Basing recovery percentages on past data of reinsurers gone insolvent may not be a reliable guide to future experience or relevant for the current set of reinsurers
- Any anticipated recoveries from insolvent reinsurers on reported claims may come with an increased duration of payment
- Any recoveries from insolvent reinsurers on future claims may be zero or at a substantially reduced recovery rate

- Allowing for increased risk of reinsurance failure in ***extreme loss scenarios***
- Published ratings may reflect the current economic conditions or an average default rate, rather than the likelihood of reinsurance default at the more extreme tails

- Allowing for the impact of ***systemic risk events*** on reinsurance recoveries
- Ratings for individual reinsurers is unlikely to capture the risks of a systemic failure across reinsurers
- Failure of one globally systemically important company may trigger an increased probability of default and lower recovery rates of others

- ***Extent of diversification*** between reinsurers, across exposure years and layers
- For instance, does the company have a particularly large exposure to one or more individual reinsurers? How to account for increased concentration of risk with a particular reinsurer?
- Probability of default and loss given default assumed in the calculations for catastrophe risk cover may be different for the same reinsurer covering lower loss layers

- ***Balances due*** to reinsurers or ***collaterals held*** to secure future payments
- There may be justification to reduce the ceded recoverable balances by any collateral or letter of credit held with a bank

- The credit rating of the holding bank may need to be considered when making the adjustment, further complicating the process

- If liabilities were to be discounted then there are additional requirements of the ***discount factor to use*** and economic changes affecting interest rates
- Estimating any ***risk margin for adverse development*** over and above the best estimate

- Any ***retrocession arrangements*** purchased by the reinsurers may affect their creditworthiness and likelihood of default
- Details on these may be difficult to procure and any analysis of the same further complicates the process

- ***Data requirements***
- A huge amount of data is required to perform a detailed analysis of RI bad debt
- This includes not just the ceding company's data but several elements to assess the financial soundness of reinsurers
- Several assumptions are needed to estimate the amount and duration of reinsurance recoveries
- Further data is required to assess the likelihood of payment in future when due and the estimated recovery in case of default

- ***Time and cost constraints***
- Time, cost and effort expended is likely to be higher than that for estimating other claim and expense provisions
- Such a detailed analysis would require sufficient time to complete and this contrasts with the tight timelines available for estimating other technical provisions
- The extent of analysis undertaken should be reflective of the size of the RI bad debt provision relative to other technical provisions

- Monitoring actual future experience on reinsurance recoveries against the provisions estimated for RI bad debt may reveal ***changes required to assumptions and/or methodology***

[13]

[38 Marks]

Solution 3:

i) The criteria can be grouped into the following categories:

- Statistical
  - **Statistical significance** - The rating variable should be a statistically significant risk differentiator. In other words, the expected cost estimates should vary for the different levels of the rating variable, the estimated differences should be within an acceptable level of statistical confidence, and the estimated differences should be relatively stable from one year to the next.
  - **Homogeneity** - the groups should be defined such that the risk potential is homogeneous within groups and heterogeneous between groups. If a group of insureds contains materially different risks, then the risks should be subdivided further by creating more levels of an existing rating variable or by introducing additional rating variables.
  - **Credibility** - the number of risks in each group should either be large enough or stable enough or both for the actuary to be able to accurately estimate the costs.

- Operational
  - **Objective** – It sounds logical that the rate for Motor insurance should be driven by the skill of the driver. However, the skill level is difficult to evaluate and may be subject to manipulation.
  - **Inexpensive to administer** – Operational cost to get information to properly classify and rate a given risk should not be high, otherwise it defeats the benefit by increasing the overall cost.
  - **Verifiable** – The level of the rating factor should not be easily manipulated by the distribution channel or the customer, to get lower rate. These should be verifiable by the insurer.

- Social
  - **Affordability** - The company may be willing to accept the subsidy in recognition of the fact that the policy will be profitable in the long run as the teenager ages. Alternatively, companies have developed new insurance products that can support a lower rate for high-risk insureds by offering less coverage.
  - **Causality** - From a social perspective, it is preferable if rating variables are based on characteristics that are causal in nature. In lack of this relationship it may be difficult to convey to the customers the fairness of the rating system.
  - **Controllability** – Insured can be motivated to improve risk characteristic and consequently reduce his rate. These incentives in rating scheme may help the insurer by reducing the expected risk cost.
  - **Privacy concerns** – There can be significant privacy concern associated with the use certain rating factors. These could be reviewed considering how strongly the society feels about it. e.g. using the GPS information of the car to rate the driving quality of the insured. If not considered this could impact the success of the product.

- **Legal** – It is imperative that the rate classification system be in compliance with the applicable laws and regulations of jurisdiction in which a company is writing business.

- Any other valid factor

[10]

ii) Risk Factor – A factor that is expected, possibly with the support of statistical evidence, to have an influence on the intensity of risk in an insurance cover.

Rating Factor – A factor used to determine the premium rate for a policy, which is measurable in an objective way and relates to the intensity of the risk. It must, therefore, be a risk factor or a proxy for a risk factor or risk factors.

Uses of risk factor for competitive advantage of the company

i) For targeting customers through
   (1) Customised selection of distribution channel – e.g. If age and education level has a bearing on the risk and also if well-educated younger adults are likely to have better health condition. Then for health insurance policy, one could use online sales channel to target them.
   (2) Media planning – More advertisement on electronic media in above example will help to attract the lower age and well-educated customers at effective cost than advertising on television. Even in digital marketing, more specific category of websites could be selected.
   (3) Message – The understanding of the segment can help to design messages which appeal to the above target market.

ii) Underwriting - Factor which cannot be used for rating but has bearing on risk can be used for underwriting purposes, like policy break-in for motor insurance.

iii) Product design – Special products may be designed which appeal to specific segment of the market. e.g. If the risk factor study shows that people with more than one car are likely to be a better risk, products can be designed to specifically capture this market.

iv) Any other valid points

[8]

iii) Model validation

i) Out of Sample test - Validation samples of, say, 20% of the total data can be withheld from the modelling process. A range of tests can then be undertaken on this validation sample comparing actual experience with that predicted by the selected model.

(1) Comparison of Actual vs. Expected - Actual versus predicted claims, grouped by predicted claim amount band can be compared.

(2) Lift curves - One approach is to rank all policies in the validation dataset in order of expected experience (according to the model being tested), and then to group the policies into bands of equal exposure based on this ranking. The actual experience for each group can then be calculated and displayed as a curve. The steeper the curve, the more effective the model is at distinguishing between high and low experience because there is a greater differentiation between the good and bad risks.

(3) Gains Curve - With this method the data are sorted high to low according to the fitted model values, and then the chart shows the cumulative values from the fitted model and the cumulative observed values from the data. A statistical measure for the lift produced by the model is called the Gini coefficient. The Gini coefficient is a measure of statistical dispersion that can range from 0 to 1. This can also be thought of as the area enclosed by the model curve and the diagonal line as a ratio of the triangle above the diagonal. The higher the Gini coefficient, the more predictive the model.

ii) Residual analysis – Various measures of residual can be derived to show for each observation how the fitted value differs from actual observation. Observing scatter plots of residual against fitted value can give indication of appropriateness of the error function which has been assumed.

iii) Consistency test - Fitted parameters to whole data can be compared by either fitting the model to data sub-sets derived by randomly distributing data in sub-set or by time period. The parameter estimates should be broadly consistent for each sub-set and the whole data.

iv) Inclusion / exclusion test – A factor which has been selected can be removed from the model and its impact assessed. Conversely, a factor which has been excluded could be included and its impact on overall model studied. This could help to identify insignificant factor in the model or significant factor which may have been missed by the model.

[6]

iv) Risk cost should be trended to adjust figures to level expected in future. Monetary inflation, increasing medical costs, and advancements in safety technology are examples of factors that can drive loss trends. Social influences also impact risk costs like increasing litigiousness of the society can impact frequency of claims. [2]

v) Trending procedures estimate future values by analyzing changes between exposure periods (for example, accident years or underwriting years). A trending procedure does not encompass the process commonly referred to as 'development' which estimates changes over time in losses (or other items) within a given exposure period.

[2]

vi) Factors to consider while trending:

1) **Determination of trending period** - This is the period of time from the average loss occurrence date of each experience period (typically a calendar-accident year) to the average loss occurrence date for the period in which the rates will be in effect (a policy year or years). This latter period is referred to as the forecast period. The loss trend period depends on both the term of the policy and the expected duration for the new rates, typically chosen as one year.

2) **Selection of trending procedures:** The procedure for trending should be selected based on consideration of
   a. available data
   b. previous procedure, helps in comparison of result
   c. established precedent or industry practice etc

3) **Evaluation of trending procedures –** More than one trending procedure may be applied and their results compared for reasonableness. For e.g. Comparison of linear vs. exponential trending.

4) **Social influences -** The impact of societal changes such as changes in claim consciousness, court practices, and legal precedents, as well as in other noneconomic factors should be considered while trending the risk cost.

5) **Selecting internal data vs. external data for trending:** The ratemaking actuary should use judgment in deciding whether the historical data is overly volatile or otherwise inappropriate for trending purposes. For example, the data may be too sparse or reflect nonrecurring events that cannot be appropriately adjusted. Alternatively, the statistical goodness of fit of the trending procedure may be called into question. One option is to supplement the loss trend data with multi-state, countrywide, or industry trend data and consider weighting the results. Alternatively, the actuary may consider non-insurance indices, if available. e.g. CPI, WPI, etc

6) **Effect of Limits on Severity Trend** - When the loss experience being analyzed is subject to the application of limits, it is important that the leveraged effect of those limits on the severity trend be considered.

7) **Treatment of expenses**: - Variable expense vs. fixed expenses. Variable expenses are, by definition, assumed to be a constant percentage of the premium. For example, commissions may be 15% of premium. The variable expenses will automatically change as the premium changes, so there is no need to trend the variable expense ratio. Fixed expenses, on the other hand, are assumed to be a constant. If the fixed expense inflation/rate of change is same as other components of premium then no need for separate adjustment, else they need to be separately adjusted in expense loading.
8) **Other valid points**

[12]
[40 Marks]

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