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Subject - Actuarial Model

Assignment 1

Question 1

Objective :

- To Develop a model to project assets and liabilities of insurer after one year on changes in regulatory capital requirement.
- To ensure Assets are greater than liabilities with a probability of 99.5% at the end of 1 year.

Data Collection :

For liability : We have internal data from the insurance company.

- I will collect the data from the insurance company for all the current assets and liabilities of the insurance company from its balance sheet. As no stochastic model is present, I will also collect data of all parameters and factors on which the model would depend.
- Assumptions : I will set out discount rates and inflation based on current scenario. The company has made investment in bonds and stocks.
- Parameters include :
Number of claims in a year
Claim Settlement Ratio
Total Premiums collected

Number of Active Policies

Number of Surrendered Policies

Interest Rates

Stock Market Performance

- I will make stochastic scenario-based model based on the parameter values in the real world in past 2-3 years.
- As we have estimates of worst-case scenario, I will consider a worst-case scenario of Ukraine-Russia war converting to third world war. In this case we will experience high interest rates.
- In the case of sudden high interest rates, the returns the insurer will make on new bonds also increase boosting the investments return. However, there is a short-term counter-effect as the high interest rates will lead to fall in price of bonds and thereby reduce the value of unrealised capital gains. This will cause a lag and the risk of liabilities exceeding asset value increases.
- I will simulate values in the stochastic model based on variables data taken as well as the worst-case scenario considered and generate a range of possible outputs
- I will involve experts and do a Turing test to understand if the model is apt
- I will make a computer code for the model
- Next, I will debug the program to make sure that it performs the intended operations in.

the model definition.

- I will test based on computer-run simulations that the chances of liability exceeding the assets is less than 0.5%.
- I will review the appropriateness of the model. I will also check sensitivity of the variables in the model. Based on this I will decide on which parameters are more significant and sensitive, thereby modifying the model if needed.
- I shall analyse the outputs from the model.
- I will ensure that relevant professional guidance has been compiled with.
- I will Communicate the model and it's results to the insurer.

Question 2

- Drastic change in the number of active policyholders, eg. If more number of policyholders surrender policy.
- Number of Claims in a year increase or decrease in a year due to Global events like Pandemic, country-related events or local events
- Premium amount collected by the insurance changes drastically with the change in active policies of the company.
- Claim Settlement Ratio of the Insurance company changes, example in Covid, the number of Claims settled has reduced. Many of the claims were declined initially especially before introduction of corona - Kavach policies.

- Interest Rates and Bond Rates change due to Global events, like pandemic, war scenario, etc or country-specific like budget release, elections, etc
- Stock Market Performance also based on above events
- Mortality Intensity changes like Pandemic, War, Natural Calamity as Floods, Earthquakes, etc.

Question 3

- Objective of the model should be to forecast future mortality.
- I will take into consideration that the model is primarily age-specific as it plays the most prominent effect on mortality.
- I will also take into consideration that the model is primarily age-specific
- I will also take into account other parameters that the model depends upon, like sex, health history, occupation, residential areas, mode of travel etc.

This is important because with model being only age-specific, the mortality of a new-born comes out to be zero which is not possible.

- Although other parameters are less significant, they will play a role in cases like chronic diseases, hereditary disorder, work at a factory

with asbestos release, riding a bike, residing near war prone area, etc.

- Also, I would consider whether the model has used epidemiological models of mortality for certain causes of death where key variables are known. Example: Death due to cancer, lung cancer dependence on tobacco-smoking.
- Forecast accuracy should also be considered. I would be giving a balanced weightage to fitness of model and forecast accuracy.

Question 4

Static Documents :

- Design
- Methodology

Non-Static Documents :

- Data
- Parameterisation
- A good executive summary
- Expert judgements and limitations
- Model Outputs
- Balance sheet: To calculate funds movement in the year.
- Risk coverage report
- Future Management actions plan

Question 5

Advantages

- Cheap and easy to communicate.
- It seems to not be complicated as it is based only on one-parameter
- Based on past data, so accuracy will be more
- It is based on age that significantly affects the consumption rate

Disadvantage:

- Increased competition if similar product is introduced by another brand will not be accounted for. In such case, the demand may fluctuate from estimated one.
- Changes in assumptions of population and consumers due to unforeseen events.
- Rapid changes in consumption rates
- Increase in demand will become stagnant after sometime. This is because there is population limit.
- If the economy of the country is in bad state, there might be demand for this product, but everybody of them will not be able to afford it.

Question 6

- Steps and methodology reported by the actuarial student were not done accurately to make it a reproducible research.
- It is possible that the first student makes some error which second student avoids or vice-versa. Human errors may have led to the difference in result.
- Parameter changed has a significant impact on the model.
- Method of approach opted by both of them may be different.
- Experience is different for both actuarial students.
- Time given to both the students must have been different. The prior would have got a longer duration to work on the model than the second one. This duration between two actuarial students could also have led to the difference in results.
- If there are changes made in the assumption based on changes in the parameter.

Question 7

- The model should be easier to understand.
- The assumption made on the current population should be true. A proper survey should be done to know the population of the town.
- It should be taken care of that the assumptions made regarding the fertility should have a strong

basis of number of youngsters in the village.

- Mortality rates should take care of lack of medical facilities that lead to death of infants and mothers.
- The economic and social background of the population will affect the number of children going to school.
- If the town does not have all facilities of higher education, after schooling the youngsters will move to the city and may never come back to the town. This will decrease the population.
- If famines, droughts, floods hit the area, the population number will fall, financial conditions of the family might deteriorate affecting the number of children seeking admission in the school.
- The model could include the experience of other similar small towns.

Question 8

- Objective: To develop a model on sickness rates among the company's employees.
- The model will take the internal data of the employee's sickness in the past decade.
- It has to be taken into account the sickness that the scheme would cover and the extend up to which it shall cover.

- It must also account the error that lies in the data, if there is breach of trust from the employee and a wrong excuse might be given for leaves.
- It must take into consideration the age group of the employees. Aged employees are more vulnerable to fall sick.
- The model should account for the income earned by the employee. A low-level employee should be subject to less return from the scheme.
- The sickness rates of different sickness are different.