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Roll : 81

Actuarial Models

Q1

- a) Develop a well defined set of objectives that need to be met by the modelling process.
Objective - A cashflow model to project assets and liabilities of an insurer after one year such that there is less than a 0.5% chance of liabilities exceeding assets after a year.
- b) Plan the modelling process and how the model will be validated.
- c) Collect and analyse the necessary and valid data for the model. For example - past policy data from IRDAI, reinsurer, trade magazines etc.
- d) Define the parameters for the model and consider appropriate parameters values. Example - expenses, market data
- e) Define the model initially by capturing the essence of the real world system. Refining the level of details in the model can come at a later stage.
Consider existing "worst case" scenarios and their mortality rate being higher due to pandemic
- f) Involve experts on the real world system you are trying to imitate to get feedback on the validity of the conceptual model.
- g) Decide whether a simulation package or a general purpose language is appropriate for the implementation of the model. Choose a statistically reliable random number generator that will perform adequately in the context

Of the complexity of the model.

- n) Write the computer program for the model.
- i) Debug the program to make sure it performs the intended operations in the model definition.
For example - check for expected outputs for simple scenarios.
- j) Test the reasonableness of the output from the model. Ex - probability of worst case scenario.
- k) Review and carefully consider ~~on~~ the appropriateness of the model in the light of small changes in input parameters.
- c) Analyse the output from the model. Eg - Capital requirement.
- m) Communicate & document the result of the model.

2) Factors causing probability to be inaccurate:

- a) Models heavily rely on the input data.
If data lacks credibility, then output is likely to be flawed.
- b) Data may have errors or be "inaccurate" causing the output to be wrong.
- c) Model chosen initially in line with real-world process may not turn out to be reasonable.
- d) Some future events such as legislative changes which affect the interpretation of policy conditions couldn't have been anticipated in the modelling.
- e) Highly sensitive to the parameters chosen & they are estimates because the true underlying parameter can't be observed.

f) Too complex to be verified.

- 3) a. Develop a well defined set of objectives. i.e. To forecast future mortality.
- b. Plan the modelling process and how the model will be validated.
- c) Collect and analyse the data.
- d. Define the parameters and consider appropriate values. Like mortality rates, past trends, situations like pandemic.
- e.d. Define the model firstly by capturing the essence of the real world system. Refining the details can come later. i.e. identifying the main features of mortality.
- f) Involve people with expert knowledge of the real world system you are trying to imitate so as to get feedback on the validity of the conceptual model. i.e. there may be a gov. department that can help.
- g) Decide on whether a simulation package or a general purpose language is appropriate for the implementation for the implementation of the model.
- h) Write the computer program.
- i) Debug the program to make sure it performs the intended operations defined in the initial modelling process.
- j) Test the reasonableness of the output from the model.
- k) Test sensitivity.

- i) Analyse the output from the model
- ii) Ensure the any relevant professional guidance has been complied with. This may include standards on data, modelling and reporting
- iii) Document the results of the model and communicate these to the government.

4. Items that would be included under documentation:

- a) Summary of the output
- b) Objective
- c) Assumptions
- d) Definition of input
- e) Whether the model is stochastic/deterministic
- f) Reference of research papers
- g) Adaptation sources

5) Advantages

The model is simple to comprehend and run

- b) Inexpensive model
- c) Past data on consumption are closely accurate
- d) The model takes into account future behaviour of consumption and age

Disad:-

- ① Past consumption trend may not be appropriate to consider for future
- ② Extrapolation might be a complex
- ③ Competitive product might come in the market

Advantages:-

- (d) The projection of future may not be accurate.
- (e) The proposed strategy doesn't include any testing of the sensitivity of total demand to changes in period.

6. Results are different because:-

- (a) Either the first or the second or both of the runs may have been incorrect.
- (b) Expectation of sensitivity of the model to parameter could be wrong.
- (c) Data might have been amended over time.

7. Appropriateness for

- (1) The method used is direct to apply & understand.
- (2) Model doesn't take into a/c citizen migrating.
- (3) Output is reliable for short term.
- (4) There should be accurate age distribution data.
- (5) School going population may not equal to actual population of children because of factors like poverty or backward mindset.
- (6) Fertility rates will be specific to areas depending on health care conditions etc.

8. Factors:-

- (1) General sickness trend
- (2) Nature of existing sickness data of company

The complexity of the model - eg. whether it should be stochastic or deterministic. More complex models will be costlier to prepare and run but eventually there may be diminishing return to additional complexity.

- (d) Budget, resources and staff available for constructing the model.
- (e) Factors like Covid19 should be taken into acc^t.
- (f) Characteristics of employees such as age smoking/drinking habits.
- (g) The defⁿ of sickness and benefits payable under the scheme.