

Introduction to Actuarial Models Assignment-1

By – Aarya Dantara
Roll no. – 15

1. The key steps I would take in the development of the model are

–

- Review the regulatory guidance.
- Define the scope of the model, for example which parameters need to be modelled stochastically.
Collection of Data from valid sources, i.e finance department.
- Collect any data required, for example historic losses.
- Choose parameters. For economic factors should be able to calibrate to market data.
- Existing worst case scenarios. Since the estimates are already made discussion of those estimates is necessary to understand them better.
- Decide on the software to be used for the model.(Spreadshhets, R, Database, Other Models)
- Input the correct values.Write the programmme
- Debug the program, for example by checking the model behaves as expected for simple, defined scenarios.
- Test the sensitivity of the model to small changes in parameters.
- Calculate the capital requirement.
- Communicate findings to management and document them.

2. Items to be mentioned include -

- Models will be chosen which it is felt give a reasonable representation of the real world processes, but this may not turn out to be the case as getting the real world workings to the exact match is a myth.

- The model may be very sensitive to parameters chosen, and the parameters are estimates because the true underlying parameters cannot be observed.
- Sampling error may result from running insufficient/inaccurate simulations in comparison to the real world workings. (It should be possible to give a confidence interval for the error that could result from this source.)
- The management actions assumed may not match what would happen in extreme circumstances.
- Policyholder behavior, such as take-up rates for options, may differ in practice.
- There may be future events, such as changes in law which affect the interpretation of the policy conditions, which have not been anticipated in the modelling.
- There may be errors in the coding of the model. The model is likely to be complex and difficult to validate completely.
- The model relies on input data, which may be grouped rather than being able to run every policy. Any errors in the data could cause the output to be inaccurate.

3. The stages we would go through in identifying an appropriate model are -

- Clarify the purpose of the exercise. Why does the government want forecasts of mortality?
- Consult the existing literature on models for forecasting mortality, and consult to experts in this field of application (Turing). We should consider using or adapting existing models which are employed in other countries.

- Establish what data are available (e.g. on past mortality trends in the country, preferably with deaths classified by age and cause of death).
- On the basis of what data are available, define the model you propose to use. If the data are simple and not detailed, then a complex model is not justified. Will a deterministic or a stochastic model be appropriate in this case?
- Debug the program or, if existing software is used, check that it performs the operations you intend it to do.
- Test the sensitivity of the results to changes in the input parameters.
- Analyze the results.
- Write a report documenting the results and the model and communicate the results and the output to the government of the respective country.

4. The key items I would include in the documentation on the model are -

- How the model might be adapted or extended.
- Purpose or objectives of the model.
- Assumptions underlying the model.
- Simulations performed to validate the results of the model.
- Validity of the input data.
- Any outliers of parameters used in the model identified (e.g. potential unreliability).
- Basis on which the form of the model chosen (e.g. deterministic or stochastic)
- References to any research papers or discussions of the model with appropriate experts (Turing).

- Summary of model results.

5. Advantages of this strategy -

- The model is simple to understand and to communicate.
- The model takes account of one major source of variation in consumption rates, specifically age.
- The model is easy and cheap to implement.
- The past data on consumption rates by age are likely to be fairly accurate.
- The model can be adapted easily to different projected populations or takes into account future changes in the population.

Disadvantages of this strategy:

- Past trends in consumption by age may not be a good guide to future trends.
- Extrapolation of past age-specific consumption rates may be complex or difficult and can be done in different ways.
- Consumption of chocolate may be affected by the state of the economy, e.g. whether there is a recession.
- Consumption may be sensitive to pricing, which may change in the future.
- A rapid increase in consumption rates is unlikely to be sustained for a long period as there is likely to be an upper limit to the amount of Scrummy Bars a person can eat.
- The proposed strategy does not include any testing of the sensitivity of total demand to changes in the projected population, or variations in future consumption trends from that used in the model.

- Unforeseen events such as competitors launching new products, or the nation becoming increasingly health-aware, may affect future consumption.

6. The possible reasons for such differences might be:

- One or both of the runs (the original or the new) may have been incorrect as, for example, the second student may not have been fully aware of the set-up (for example he or she may not have followed the procedure correctly, or may have used different assumptions).
- The difference between the two runs may not have only been the parameter change.
- The assumption that the model was not sensitive to this parameter could have been incorrect.

7. The appropriateness of the proposed modelling approach depends on the following -

- The model should be easy to apply.
- The data collected should be collected from viable sources.
- Although it is possible that the starting point for the planned population may be wrong.
- Unpredictable events may take place such as a national epidemic which change the rates.
- The model is relatively straightforward to explain to the developers.
- Should consider whether there are trends in fertility rates, rather than simply using current rates. As trends may give more accurate results to know the changes in the rate due to the various events known and unknown that may affect them.
- Mortality rates unlikely to be significant relative to the uncertainty in the projection, because rates at ages with

non-zero fertility rates should be small and child mortality rates should be low.

- Should consider experience of similar new towns.
- Migration may affect the profile of the population, for example older families moving away and younger families buying their houses may mean the age structure remains relatively constant over time regardless of mortality and fertility rates.
- The approach does not take account of non-state schooling or the possibility of children going to boarding school.

8. The factors which the company should take into consideration when developing the model are -

- The nature of the existing sickness data the company possesses. The model can only be as complex as the data will allow it to be.
- Whether the company has made any previous attempts to model sickness rates among its employees, and how successful they were.
- The complexity of the model, e.g. whether it should be stochastic or deterministic. More complex models will be costlier to prepare and run, but eventually there may be diminishing returns to additional complexity.
- General trends in sickness at the national level may need to be built in.
- The definition of sickness and level of benefits payable under the scheme.
- Does the company plan to change the characteristics of the employees?
- The ease of communication of the model.

- The budget and resources available for the construction of the model.
- By whom will the model be used? Will they be capable of understanding and using it?
- Does the model need to interface with models of other aspects of the company's business?
- The independence of sickness rates should be taken into account e.g. in the event of an epidemic claims cannot be considered independent.

Thank You

