

MTH6157 Assessed Coursework 2

Please paste your R code and output for parts (a), (b) and (c) into a Word document along with your typed answers to parts (d) and (e) and submit that Word document via the submission point in QM Plus by 5pm UK time on Friday 24 November 2023 (week 9). Please make sure that you submit your own work and that you are aware of QMUL policies on collusion and plagiarism.

Question

Three small life assurance companies: Amber Life, Diamond Inc and Sapphire plc agree to cooperate and combine their recent mortality experience for the modelling of mortality rates. All three companies use a 2-State model. The data for this analysis is found in three CSV files on QM Plus, Amber.csv, Diamond.csv and Sapphire.csv each of which contains deaths and number of insurance policies by age. The IT systems of these three companies are all different. The data in each CSV file is summarised below:

Amber

4 columns with the number of deaths in 2022 and number of policies on 1 January 2022, 30 June 2022 and 31 December 2022. Age defined as age last birthday.

Diamond

14 columns with the number of deaths in 2022 and number of policies on 1 January 2022 and then at the end of each month in 2022. Age defined as age last birthday.

Sapphire

3 columns with the number of deaths in 2022 and number of policies on 1 January 2022 and 31 December 2022. Age defined as age next birthday.

- (a) Import these three csv files into R assigning each column of data to a suitably named vector. [2]
 - (b) Calculate and display estimates of the force of mortality at ages $60\frac{1}{2}$, $61\frac{1}{2}$, $62\frac{1}{2}$, ... $79\frac{1}{2}$ combining the data from the three insurance companies. Include details of any assumptions you make as comments in your R script. [15]
 - (c) Plot the estimates calculated in (b) above by age in a suitably labelled graph. [4]
 - (d) Comment briefly on the main features of the graph in (c) above. [3]
 - (e) What are the advantages and disadvantages of combining the data of these three companies into a single set of estimates. [6]
- [Total 30]

Your mark out of 30 will be converted into a percentage to be compatible with the mark from the first assessed coursework.