MATH590-02 – Spring 2022

Homework #6

March 30, 2022

Instructions:

1. Due 7:00pm, Friday, April 15, 2022. Late submissions will not be accepted.
2. If you can type math, then typed solutions are greatly appreciated. Handwritten solutions, however, are acceptable provided your handwriting is easy to read and you can clearly digitize with a scanner or phone camera. Please upload the files to Sakai.
3. Don't forget to print your name.
4. You may speak to others, but anything you hand in must be your own work including computer code and spreadsheet.

Homework

1. Calculate the expected PV of profit of the GMWB rider for a 55-year-old single life in the VA pricing model given. Use the 25 equity return scenarios given and assume withdrawal delay = 120 months.
2. Determine the rider fee of a GMWB rider for a 55-year-old spousal case (husband 55, wife 52) such that the expected PV of profit is the same as the single life case in 1. Use the 25 equity return scenarios given and assume withdrawal delay = 120 months.
3. Add a GMDB (Guaranteed Minimum Death Benefit) rider to the existing contract. Determine the rider fee of this GMDB for the same 55-year-old single life. The goal is profit neutral meaning the expected PV of profit combining the GMWB and GMDB riders is the same as 1. The death benefit is initial premium guaranteed until withdrawal begins. Use the 25 equity return scenarios and assume withdrawal delay = 120 months.
4. Redo 1 using the 25 equity return scenarios and the withdrawal cohort assumption.
5. (bonus: 25% extra credit for HW6) Redo 3 using the 25 equity return scenarios and the withdrawal cohort assumption. Note here profit neutral means the expected PV of profit combining the GMWB and GMDB riders is the same as 4.