

This is the expansion of the project that you started in Ma 418. This semester you will focus on developing more sophisticated policies, computing their premiums and policy values, and profit testing your policies. The project will be collected in multiple stages: multiple state model, independent joint lives model, and profit testing. You should plan to complete relevant portions of the project prior to the in-class test on the corresponding material.

Due to the time investment necessary for this project as well as the significant contribution it can make to your learning, it will be worth 375 points, 125 points respectively per section.

There are several goals for this assignment.

- To help you develop your understanding of advanced policies and the computations involved in premium determination, policy valuation, and profit testing.
- To help you develop your ability to handle larger, less well-defined problems than homework and exam problems provide.
- To help you develop your Excel skills.
- To help you develop your communication skills.

You can effectively be graded on the first and last goals based on what you submit. The cost for failure to develop the second and third goals will not primarily be academic - the cost will be your time (now and on future projects).

For each submitted assignment, you are also to submit a work log (see template provided) that documents the days/times you worked on this project and what you accomplished. You must keep up with it as you work (don't assume you'll remember what happened later).

MULTIPLE STATE MODEL - STANDARD SICKNESS-DEATH POLICY:

1. Start with the life tables and policy that you developed for Ma 418. Using your life table, define and develop a standard sickness-death policy (see your textbook for the model). Use your model for μ_x^{02} from Ma 418 instead of the model given in the book.
2. You may assume that no person will change state more than one time in any given month. You may also assume a constant interest rate of 5% unless otherwise stated.
3. You are to present a table including μ_x^{ij} , ${}_{\frac{1}{12}}p_x^{ij}$, and ${}_x p_0^{ij}$ for all possible i, j combinations.
4. Assume a payment of \$2500 will be made at the end of each month in which the insured is ill until age 72. Add the actuarial present value of this annuity to your table.
5. Assume a payment of \$100,000 will be made at the end of the month in which the insured dies. Add the actuarial present value of this insurance to your table.
6. Present your tables neatly formatted, easy to read, preferably one page wide for each table.
7. Compute the following premiums:
 - (a) net premium if $i = 5\%$.
 - (b) gross premium (you will need to define your expenses) if $i = 5\%$.
8. Determine a distinct valuation basis. Compute the policy value at the time the policy is issued and after the 10th year for both of the premiums that you computed.
9. Submit work log, life table, and two written documents. Include a one page summary (predominantly in English however formulas are allowable) outlining how the probabilities, annuity and insurance present values were found. Assume your audience for this is knowledgeable in the area of actuarial mathematics, just unfamiliar with your work. Be sure to define all notation even if it is standard notation (typed or neatly handwritten is fine, typing will not intrinsically earn a better grade). The second is a report to your manager succinctly summarizing the policy and the computed values (typed). Presentation and clarity matters in both reports.

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INDEPENDENT JOINT LIVES POLICY:

1. Define a non-trivial independent-lives insurance policy for a married couple. Assume individual mortality follows the tables that you developed in Ma 418.
2. You are to create a joint life tables with a column corresponding to each column in the LTAM Tables as well as a column for a pure endowment payable in 10 years. Assume a fixed interest rate of 5%. You are NOT permitted to do any additional online research on specific life tables. This includes the life table workbook provided with the LTAM tables.
3. Present your life table neatly formatted, easy to read, one page wide.
4. Submit work log, life table, and a one page summary (predominantly in English however formulas are allowable) outlining how the probabilities, annuity and insurance present values were found. Assume your audience for this is knowledgeable in the area of actuarial mathematics, just unfamiliar with your work. Be sure to define all notation even if it is standard notation (typed or neatly handwritten is fine, typing will not intrinsically earn a better grade). Presentation and clarity matters.

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PROFIT TESTING:

1. Clearly state the basis for and the details of your Ma 418 life policy and your Multiple States Policy.
2. Construct a cash flow table for each policy.
3. Compute the profit signature for each policy.
4. Compute the various profit measures and draw conclusions about the profitability of your policies based on your work.
5. Submit work log and two written documents. Include a 1-2 page summary (predominantly in English however formulas are allowable) briefly outlining how the the various values were computed. Assume your audience for this is knowledgeable in the area of actuarial mathematics, just unfamiliar with your work. Be sure to define all notation even if it is standard notation (typed or neatly handwritten is fine, typing will not intrinsically earn a better grade). The second is a report to your manager succinctly summarizing the policy and the computed values (typed). Presentation and clarity matters in both reports.

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