Population Ageing and Pension Economics

Choose one of the following two projects.

- Each project has compulsory questions worth 100 points + optional questions with bonus points.
    - The maximum score for each project will be capped at 100 points.
    - If you do both, the final score will be based on the higher of the two.
- All group members will receive the same score.
- Project submission: Please send only one email, mentioning all your group members.

Project I: Mortality Projection

Forecast the mortality rates by gender for Switzerland or any other country.

- Plot the historical mortality rates at ages 55, 65, and 75 by gender, and describe your results. (10 points)
- Forecast and plot the mortality rates at ages 55, 65 and 75 by gender from 2023 to 2050, then calculate and plot the period life expectancies at ages 65 and 75 from 2023 to 2050. Describe your results. (40 points)

  During the process, you will need to:

    - Use three mortality models (see below).
    - Select the ranges of data (age, period) to fit your models and to estimate the time series model for projection.
    - Check the goodness of fit, e.g., residual plots, for your models.
    - Select a measure of forecast performance and calculate the values.

  Mortality models

    - The Lee-Carter model (20 points)
    - Two other models mentioned in the slides (at least one with a cohort effect) (20 points)

        - [Optional] If you use better models not mentioned in the slides, you get 10 bonus points for each model. Please specify why these models are better.
- Compare the results of different models (40 points)
    - Justify your choices of data ranges to fit each mortality model, and to estimate the time series model. (5 points)
    - Comment on the estimated age, period, and cohort effects (if available) for each mortality model, and comment on the goodness of fit of the model. (10 points)
    - Justify your choice of forecast measure, and comment on the forecast performance of each model. (5 points)
    - How can you improve the forecast performance? (5 points)
    - Are the results robust across the models? Consider an approach to forecast mortality that takes into account model uncertainty (no need to implement it). How would you justify your approach? (5 points)
    - Which of the three models is the best, and why? What are the limitations and concerns of this model forecast if you are a pension planner? (5 points)
    - Based on your results, what can you say about the current pension system in this country? (5 points)
- The overall quality of the report or slides presenting your results (10 points)
    - [Optional] Reproducible research: If you use automated reports, e.g., in R it could be generated using the “rmd” file (no need to show your code here) (10 points)

Please also attach your code (not data) to the email.

Project II: Research Proposal

Identify a research question related to population ageing and pension economics and write a research proposal.

- The topic could be about evaluating the impact of certain reforms, behavioural issues, AI, ChatGPT, etc.
- Assume that your research is adequately funded and well supported by policymakers, i.e., you could run experiments without considering financial costs.

The proposal should generally include the following sections:

1. Background and motivation
2. Literature review and your contribution
3. Research design
    a. Data
    b. Method/model
    c. Experimental design (if available)
4. Expected results and implications

Scoring will be based on the following parts:

1. Motivation (5 points)
    - For example, how important your question is and why should we care?
2. Literature review (25 points)
    - For example, do you have a good knowledge of related studies? (20 points)
    - Is your contribution to the literature clear? (5 points)
3. Research design (50 points)
    - For example, does your research design show that you have a clear idea of the steps you need to take to complete your research? (5 points)
    - How good is your research design for estimating the effect? What are the potential endogenous issues and how can you solve it? (10 points)

- What data do you need? What are the variables? Does your data include all the information you need? (5 points)
- What are the challenges and limitations of the research design? (10 points)
- Write down the main model (10 points)
- What further analyses or robustness tests are needed to answer your question? (10 points)
- [Optional] If you choose to design an experiment – the complete process of the experiment (no need to write down the survey questions), the main experimental task (20 bonus points)
- [Optional] If you choose to do a life-cycle model, the previous criteria for estimating the causal effect using regression models do not apply. The scoring will be based on the model specification, e.g., the decision model, the budget constraints, the Bellman equation, the choice variables, and the state variables (30 points), the calibration of the model elements (30 points), and how you will solve the model (10 points).

4. Results and implications (10 points)
    - For example, what are your expectations? (5 points)
    - How could others, e.g., policymakers, use your results? (5 points)
    - [Optional] You have mechanisms from theory or empirical findings to form your expectations. (10 bonus points)
5. The overall quality of the proposal (10 points)