MScFE 610 FINANCIAL ECONOMETRICS

Group Work Project # 2

See grading rubric here.

Scenario

The team did so well on the previous project that the portfolio managers and risk managers want more! The head of risk (or Spiderman's Uncle Ben) said, "With great power comes great responsibility." Your next responsibility will be to expand the list of best practices for multivariate time series.

These challenges are more difficult than the first set and include the following 5 items:

- Multicollinearity
- Joining time series with different frequencies
- Unit Root Testing
- Regime Change Models
- Feature extraction

Tasks

Your group will create a **best-practices handbook** that provides thoughtful guidelines for addressing some of these challenges. You will pick four (3) of the choices above and build a Jupyter notebook that addresses:

- **Definition:** Technical definition using formulas or equations
- **Description:** Written explanation (1–2 sentences)
- **Demonstration:** Numerical example using real-world data or simulated data
- **Diagram:** Visual example using real-world data (using same data as above)
- **Diagnosis:** How to recognize or test that the problem exists
- **Damage:** Clear statement of the damage caused by the problem
- **Directions:** Suggested models that can address this

Step 1

As a group of 3 members, the 3 students decide on the 4 items out of the 5 listed earlier and work together on writing the definition for each of the challenges.

If there are only 2 students in the group, then the pair selects only 3 items. Each member does 1 individually, and then you work together on the third one.

Step 2

Individually, each student is responsible for 1 challenge by writing exactly 3 pages, addressing its:

- **Description:** Written explanation (1–2 sentences)
- **Demonstration:** Numerical example using real-world data (or simulated data if not found).
- **Diagram:** Visual example using real-world or simulated data (using same data as above)
- **Diagnosis:** How to recognize or test that the problem exists
- **Damage:** Clear statement of the damage caused by the problem

For example:

- Team Member A works on Challenge 1
- Team Member B works on Challenge 2
- Team Member C works on Challenge 3

Note that each team member can explicitly refer to their own GWP1 if they believe that it contains relevant information for GWP2. In that case, when writing up GWP2, a reference should be explicitly written that refers back to GWP1. For example, "over-reliance on normal" in GWP2 can refer to "skewness" in GWP1. For example, the GWP2 project could contain: "some data analysis over-relies on the normal distribution: as we saw in Team Member B's GWP1 Skewness Challenge, skewness is strong evidence that the distribution is not normally distributed".

Step 3

As a group

- All members work together on the section called "Directions," which outlines the necessary steps to alleviate the problems in the "Damage" section. The team should jointly create the "Directions" section. Note that there may be more than

one step (or direction), so this is the purpose of the group collaboration: to find strategies to address the challenge.

- The team will complete all 6 items in a 3-page paper.
  - Be sure to identify which challenge was solved by the group.
  - The team will make explicit references to challenges from either GWP1 or GWP2.
- The team will create an additional 1-page paper that shows how two challenges can relate.
  - The team only needs to address the “Damage” and “Directions” sections but can add other categories if space permits. As an example, skewness and sensitivity to outliers certainly relate because they both have the tendency for extreme values that can distort results.
  - This section must be no more than 1 page.

Submission Requirements and Format

One team member submits the following on behalf of the entire group:

1) A **zipped folder** including:
   a) An executable Jupyter notebook* that addresses all the challenges
   b) A duplicate version of the Jupyter notebook code and output in PDF or HTML format.
      i) In order to include the output of the code, you must RUN the code before downloading the PDF.
2) **1 PDF document** with all sections EXCEPT ANY CODE. This PDF should just contain text, formulas, and graphs, but no Python or other code. In fact, this document should contain all the sections EXCEPT any parts or sections that have code. Please be sure that code only appears in the two files above.
   a) Use the available Report Template and fill out the required information in the first page.

***Use Google Colab or GitHub to collaborate** in completing the executable Python program.*

*The PDF file with the answers to the questions must be uploaded **separately** from the zipped folder that includes any other types of files. This allows Turnitin to generate a similarity report.*

Rubric

Your instructor will evaluate your group submission for GWP2 using the following rubric:

Quantitative Analysis (Open-Ended Questions) 40 Points	Technical and Non-Technical Reports 30 Points	Writing and Formatting 20 Points
The group is able to apply results, formulas, and their knowledge of theory to real-life finance scenarios by doing the following: ● Providing all the necessary information to support their arguments. ● Presenting arguments that reflect group discussion and research. ● Using authoritative references to support a position and provide updated information. ● Concluding with practical takeaways for more insightful financial decision-making.	Technical Reports contain 3 parts: 1) **code** for each question (be sure to explicitly state the question number), 2) the corresponding output of that **code**, and 3) **interpretations** and/or **recommended courses of action** that reasonably follow from those results. **Note**: Technical reports will include the technicalities of models, such as names, methods of estimation, parameter values, etc., and exclude generalities about the work done. It should NOT include names of Python code that were used.	A submission that looks professional should: ● Include the axes, labels, and scales in graphs. ● Be free of significant grammatical errors or typos. ● Be an organized, well-structured, and easy-to-read document. ● Include proper citations and a bibliography in MLA format.
	Non-Technical Reports contain 3 parts: 1) clear explanation of results; 2) the recommended course of action that follows; and 3) the identification of factors that impact each portfolio. **Note**: AVOID all references to model names, algorithms, and unnecessary details. Instead, focus on the investment decision.	