

MScFE 610 FINANCIAL ECONOMETRICS

Group Work Project # 1

[See grading rubric here.](#)

Scenario

Suppose you are a team of newly hired quants on the derivatives desk. As your first responsibility, you will be tasked with modeling volatility for the traders and risk managers. This is a very important—and highly visible—role. Perform it correctly and your group's expertise will show competitive derivative pricing and hedging, which is attached to a robust revenue stream. Perform it incorrectly and...well, let's not do that. However, there are many problems that affect the modeling of time series.

The **relevant items** to consider for this Group Working Project are the following five:

- Skewness
- Kurtosis / heteroscedasticity
- Sensitivity to outliers
- Over-reliance on the Gaussian distribution
- Non-stationarity

Tasks

Your group will create a **best-practices handbook** that provides thoughtful guidelines for addressing some of these challenges. **You will pick four (4) of the items above** and build a Jupyter notebook that addresses:

- **Definition:** Technical definition using formulas or equations (Copy paste from external sources with or without acknowledging the source is not ok. The language should be your own. Turnitin will detect blocks of copy-pasted text)
- **Description:** Written explanation (1–2 sentences)
- **Demonstration:** Numerical example using either real-world data or simulated data. Real-world data is likely more interesting, but simulated data allows us to concentrate on the issues in isolation and thus create clear examples of what happens.

- **Diagram:** Visual example using the real-world data or simulated data that were utilized in the Demonstration.
- **Diagnosis:** Describe how to recognize or test that the problem exists
- **Damage:** Clear statement of the damaged caused by the problem
- **Directions:** Suggested models or methodologies that can address the particular issue(s) you considered.

Step 1

As a group of **3 students**, all 3 members decide on the 4 items and work together on writing a definition.

If there are **only 2 students in the group**, then the pair decides on 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 its:

- **Description:** Written explanation (1–2 sentences)
- **Demonstration:** Numerical example using real-world data or simulated data
- **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

Step 3

As a group, the team members work together on the section called “**Directions**,” which outlines the necessary steps to alleviate the problem(s) noted in the “Damage” section. The Directions section is the most important section in the handbook, as it points users as to how to proceed given these problems. This section should contain very clear, specific, practical, action-oriented.

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.

Note: Each challenge should consist of exactly two pages. One page is insufficient, and three or more pages is too long. The goal is not merely to dump as much information as you can but rather to organize your information using seven categories. Note that some categories may require very short responses (e.g., definition), but others could take a whole page (e.g., a detailed diagram).

You are encouraged to write as much original content as needed, but you should also use references. When you do, they must be cited or else that particular challenge will receive a grade of 0.

****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 GWP1 using the following rubric:

Quantitative Analysis (Open-Ended Questions)	Technical and Non-Technical Reports	Writing and Formatting
40 Points	30 Points	20 Points
<p>The group is able to apply results, formulas, and their knowledge of theory to real-life finance scenarios by doing the following:</p> <ul style="list-style-type: none"> • 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. 	<p>Technical Reports contain 3 parts:</p> <ol style="list-style-type: none"> 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. <p>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.</p>	<p>A submission that looks professional should:</p> <ul style="list-style-type: none"> • 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.
	<p>Non-Technical Reports contain 3 parts:</p> <ol style="list-style-type: none"> 1) clear explanation of results; 2) the recommended course of action that follows; and 3) the identification of factors that impact each portfolio. <p>Note: AVOID all references to model names, algorithms, and unnecessary details. Instead, focus on the investment decision.</p>	