

# Time Series Final Report

February 14, 2023

Read carefully the following: this report can be done by groups of 2 (minimum) to 4 (maximum) students. One single report per group will be sent to [f.ielpo@lombardodier.com](mailto:f.ielpo@lombardodier.com) with the 30th of March 2023 midnight CET as an absolute deadline. Every report submitted past this deadline for whatever reason will be granted the grade of 0. The report must be done as a Jupyter Notebook transformed as a pdf file. Every other format will not be considered.

Your report will be based on the excel spreadsheet named "data\_exam.xlsx". It contains different types of variance and volatility measures that you will try to improve first, before turning to their joint relationships. Column B contains the VIX level, column C parkinson estimates and column D squared returns.

Answer the following questions:

1. Explain the concept behind each column. What are these time series meant to represent? Transform these time series so that they are comparable in scale and order. (3 points)
2. Estimate an AR model on each of these time series. Determine the order of the AR process and show the estimates. What can you conclude from these estimations? (2 points)
3. Plot the fitted values for each model vs. the original time series. Why are these fitted values appealing for volatility measuring purposes? (2 points)
4. Estimate an HAR model on each time series. Present the estimated coefficients of the model and compare the loglikelihood of each model to the one obtained from the AR estimations. Which model do you prefer? (4 points). Retain the fitted values of the model you have selected for each of the three time series.
5. Test for the stationarity of the estimated time series. Comment your results. (3 points)
6. Estimate a VAR(p) model on your three stationary fitted values. Comment your results. (4 points)
7. Plot an impulse response function obtained from your VAR model and comment the results (4 points)