

EMPIRICAL FINANCE 3.2

– GROUP ASSIGNMENT 4 –

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General Instructions

Availability

Each week's coding assignment is available from Friday 00:00.

Deadline

The deadline to submit is the following week's Monday 23:59, no exceptions!

Tutorials

Each Friday at 13:30, the tutorial session is dedicated to the assignment. Justus will walk you through the assignment. You will receive useful coding tips. You can ask questions and get troubleshooting support.

Canvas Submission Requirements

Each group submission must include:

1. A PDF with written answers that includes: (a) a cover page with group number, member names and student ids, (b) answers to questions Q1 and Q2 below, and (c) an Appendix with the printed replication code.
2. A replication code file that is fully self-contained and allows to reproduce all results in R-Studio.

Important

If the assignment is not submitted by the deadline, you will receive 0 points.

If the replication code is not submitted by the deadline, you will receive 0 points.

If the code does not replicate the provided answers, the assignment will receive 0 points.

Clear cases of fraud will be reported to the exam commission.

Groups

You will work in groups of four. No extensions will be granted. Plan ahead and make it

work. Document your workload division via e-mail or Canvas group page to insure against slacking.

Weighting

Each assignment counts for 5% of the final grade (total of 30% across all six assignments).

Grading Each assignment can earn a maximum of 10 points (see grading rubric below) and the grade is equivalent to the points earned. Any questions about the grading must be asked within 48h of publishing the grade on Canvas.

Table 1: Grading Rubric

Q1(a) - Output	1 point
Q1(a) - Analysis	1 point
Q1(b) - Output	1 point
Q1(b) - Analysis	1 point
Q2(a) - Output	1 point
Q2(a) - Analysis	1 point
Q2(b) - Output	1 point
Q2(b) - Analysis	1 point
Layout and Writing	1 point
Best Coding Practices	1 point

Preparations

Navigate to the excel file 'Group Assignment Stocks' and identify the stock associated with your group number. For your assigned stock, independently obtain the stock ticker. For the indicated date range, import the stock prices using the tidyquant package. Load the stock prices into R and calculate the **simple returns** for the indicated years.

Questions

Q1. Parametric Risk Measures

- (a) Using the first 5 years of the data (simple returns), estimate an AR(1)-GARCH(1,1) model under the assumption of normally distributed errors. Plot your forecasts as well as the realized returns and analyze.

- (b) Using the AR(1)-GARCH(1,1) model you estimated earlier, obtain parametric 1% Expected Shortfall (ES) estimates for the second 5 years of the data. Plot the ES estimates against the VaR(0.01) estimates and the simple returns. Interpret the plot and analyze the differences between the VaR and ES estimates.

Q2. Nonparametric Risk Measures

- (a) For the second 5 years of the data, choose 4 interesting dates on which you obtain VaR(0.01) forecasts using historical simulations with a suitable estimation window (Motivate!). Report the forecasts in a table and interpret the results.
- (b) Using the estimation window size from Q2(a), obtain nonparametric ES(0.01) estimates for the same dates as before. Report the results in a table and shortly interpret the values and as well as the differences to the estimates in Q2(a).