VU UNIVERSITY AMSTERDAM

Faculty of Economics and Business Administration

Empirical Finance 3.2

– Group Assignment 5 –

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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 Rubic

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. Forecasting Value-at-Risk.

(a) For the final 5 years of the sample, generate daily return and volatility forecasts using an AR(1)–GARCH(1,1) model that is re-estimated every 20 trading days with a suitably chosen and well-motivated estimation window. Track and plot the

estimated GARCH parameters across all re-estimations, and briefly discuss how and why they evolve over time.

(b) Compute $VaR(0.05)$ forecasts for the second five years of the data and for each of the methods listed below:

i. The AR(1)-GARCH(1,1) forecasts from Question 1(a).

ii. An EWMA model with $\lambda = 0.94$ and initial mean and variance computed on the first 30-days.

iii. Historical Simulations with W=1000.

Then, plot the three $VaR(0.05)$ series against the realized returns and shortly interpret the main observations.

Q2. Backtesting Value-at-Risk

(a) Compute the violation ratios for the three $VaR(0.05)$ series from Question 1(b). Then perform unconditional coverage tests and export all results to a formal table. Shortly interpret.

(b) Perform an independence test and joint test for each of the three $VaR(0.05)$ series. Export the results into a table and interpret the results.