Week 05 Homework Report

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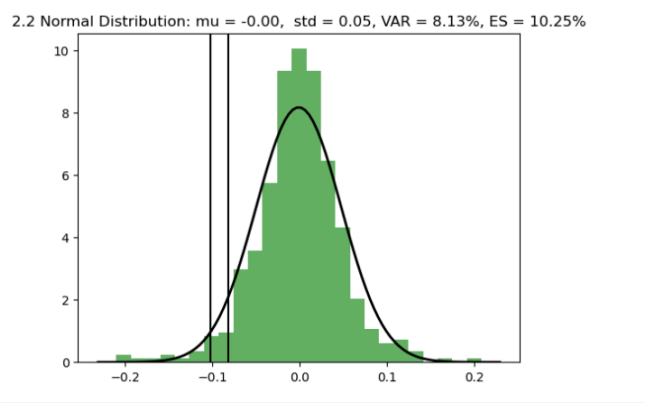
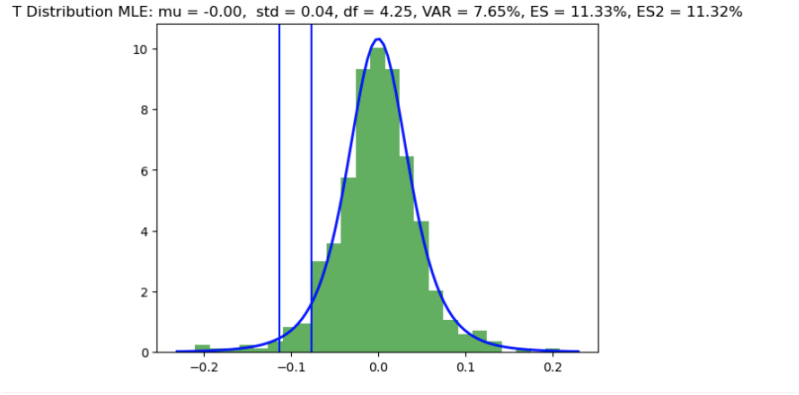
Problem 1

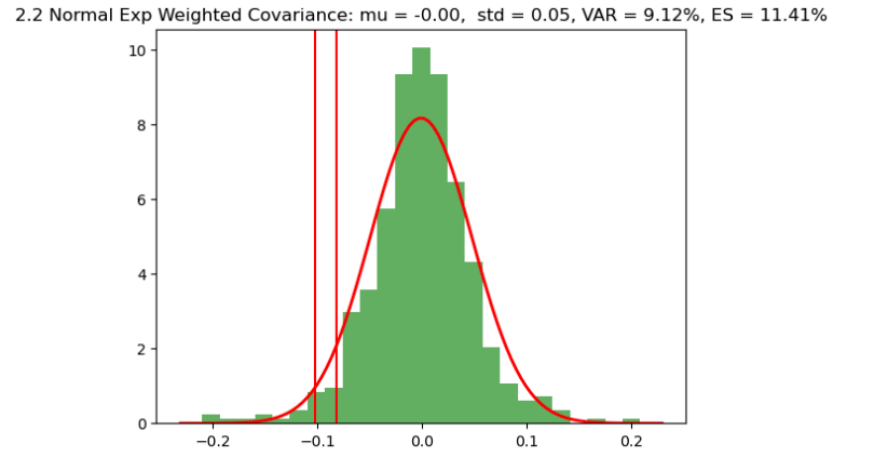
See tests/ directory.

run_tests.py # script to run tests
run_checker.py. # script to validate test outputs
utils.py # library code

Problem 2

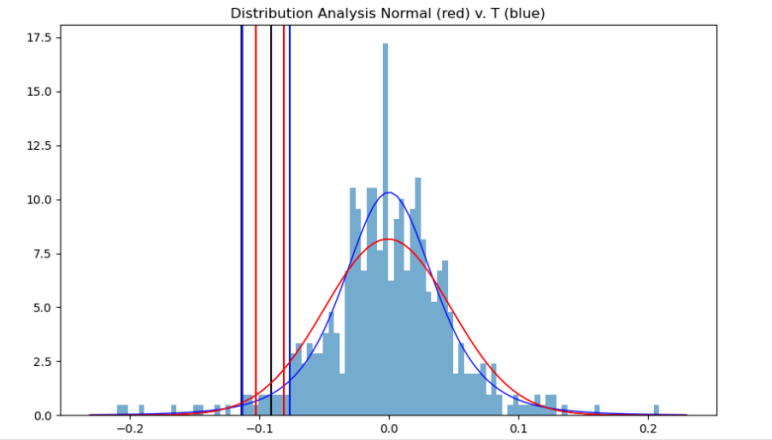






T-Distribution (depicted in blue in below graph) has fatter tails, which increase the magnitude of expected shortfall as compared to standard Normal distribution (red). T-Distribution has higher peak and steeper slope in distribution curve around the mean, which decreases the magnitude of VaR as compared to standard Normal distribution.

Note, from left to right we see:
T ES (blue), Normal ES (red), Normal VaR (red), T VaR (blue)



Normal distribution with exponentially weighted covariance like Normal distribution has VaR greater in magnitude than T-distribution VaR (9.12 v 7.65%) and coincidentally has ES very close to T-distribution ES (11.41 v 11.32%). Historic Simulation has VaR close to T-distribution (7.82%) and ES close to ES for T-distribution and Normal with EW Covariance (11.52%).

Problem 3

Portfolio	Current Value	Var95	ES
A	299950.059074	8092.137939	10683.204833
B	294385.590818	6828.551079	9012.376011
C	270042.830528	5863.653974	7338.764282
Total	864378.480419	20629.305003	26702.690640

This week we used a combination of T-distribution and normal distribution to fit the stock models. Last week, we used normal distribution with exponentially weighted covariance to fit all stock models. Given that we used a T-distribution, we needed to use copula this week. The

normal distribution is often preferred due to its simplicity and efficiency, however, it is very sensitive to outliers, meaning that extreme values can disproportionately influence parameter estimates. In addition it not as flexible for modeling data with heavier tails and accommodating smaller sample sizes. In practical application, different stocks may fit different models well, and with the copula method we can now run simulation with combinations of various models to more accurately assess quantitative risk.