

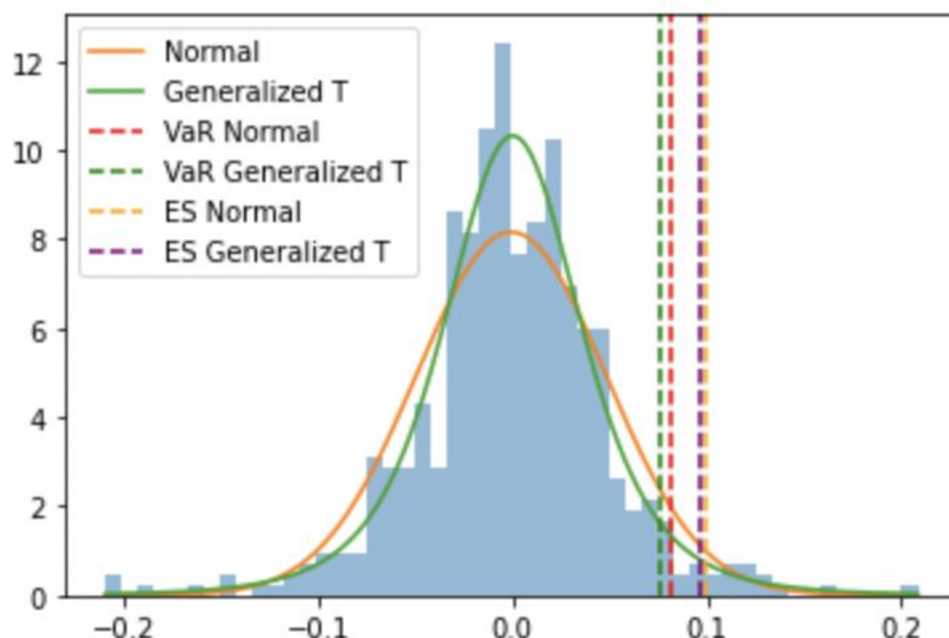
Fintech545-hw4
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Problem1:

First, we fit the data to normal distribution and generalized t distribution, using python scipy package. Calculate VaR and ES, get the output below:

Normal VaR: 0.0813
Normal ES: 0.0999
Generalized T VaR: 0.0765
Generalized T ES: 0.0962

Next plot the PDFs, VaR and ES values, we get the graph below:



From the output above, we can see that Normal distribution has greater VaR and greater ES, which indicates that the fitted normal distribution has greater minimum loss and greater expected loss.

Problem2

For problem2, using the function in previous assignment and notes, we get exponentially weighted covariance function, cholesky psd, near psd, higham psd, multivariate normal simulation and Delta norm VaR, Monte Carlo VaR and Historical VaR.

Problem3

First, we fit each stock with generalized t distribution, then using copula fitted

follow the routine in class note:

Fitting the copula:

1. For each variable $i \in 1 \dots n$
 - a. Transform the observation vector X_i into a uniform vector U_i with $u_i \in [0, 1]$ using the CDF for x_i , $F_i(x_i)$.
 - b. Transform the uniform vector U_i into a Standard Normal vector, Z_i using the normal quantile function.
2. Calculate the correlation matrix of Z

Then using the normality VaR method to get the VaR and ES, the output is below:

Portfolio A

VaR: 7919.4808

ES: 10555.3866

Portfolio B

VaR: 6616.3888

ES: 8851.9904

Portfolio C

VaR: 5570.5298

ES: 7492.2675

Portfolio total

VaR: 19750.8042

ES: 26475.2316

Comparing with last week output, all the outputs are greater than last week's Normal output. But the output is similar with Monte Carlo VaR.