Project 5

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Problem 1

Use the data in problem1.csv. Fit a Normal Distribution and a Generalized T distribution to this data.

Calculate the VaR and ES for both fitted distributions.

Overlay the graphs the distribution PDFs, VaR, and ES values. What do you notice? Explain the differences.

Solution

NORMAL DISTRIBUTION

VaR = 0.080

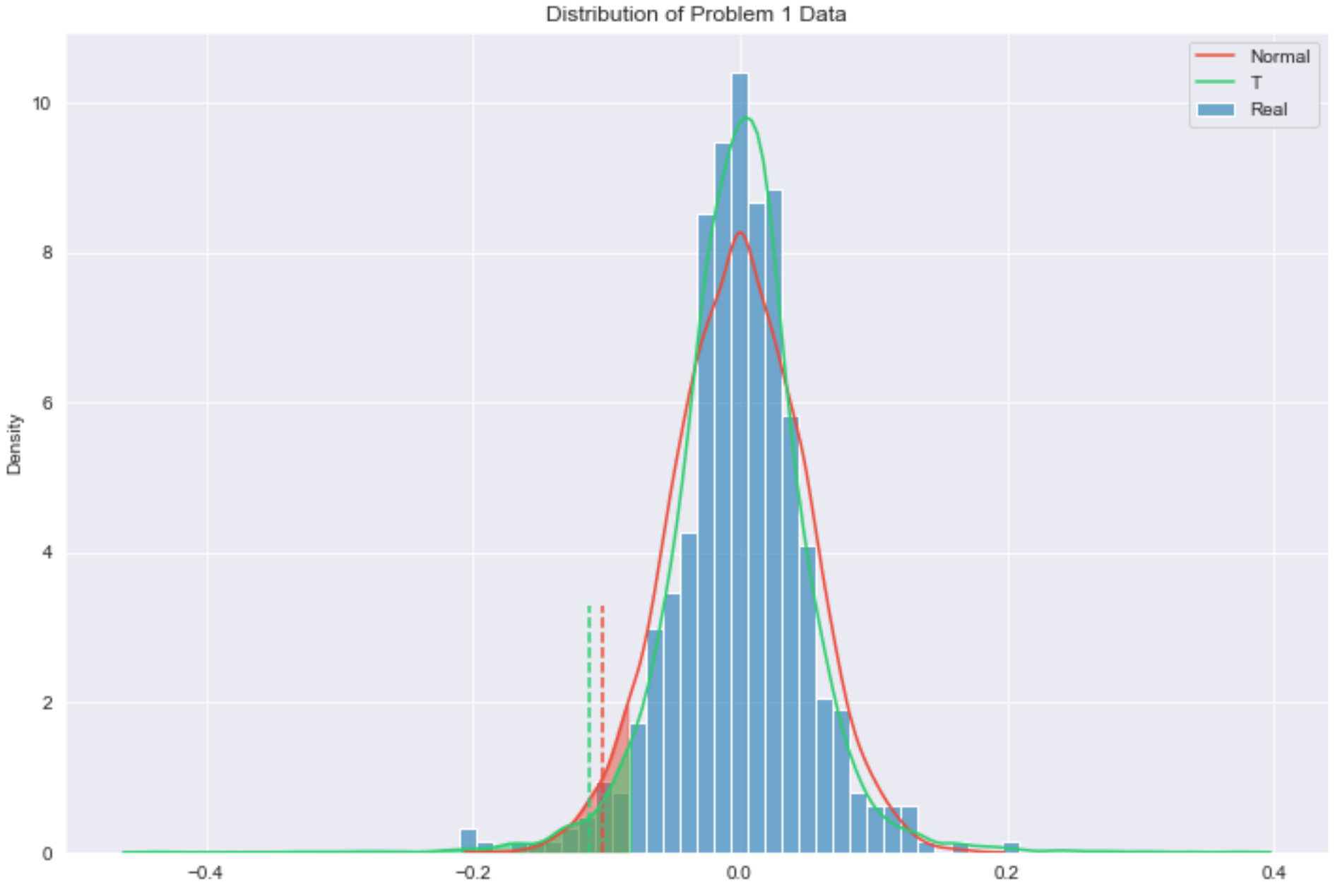
Expected Shortfall = 0.099

T DISTRIBUTION

VaR = 0.077

Expected Shortfall = 0.115

The data are fitted using MLE. The t distribution describes the data better.


Distribution of Problem 1 Data
Normal
T
Real
Density
10
8
6
4
2
0
−0.4
−0.2
0.0
0.2
0.4

Problem 3

Use your repository from #2. Use Portfolio.csv and DailyPrices.csv. Assume the expected return on all stocks is 0. This file contains the stock holdings of 3 portfolios. You own each of these portfolios.

Fit a Generalized T model to each stock and calculate the VaR and ES of each portfolio as well as your total VaR and ES.

Compare the results from this to your VaR form Problem 3 from Week 4.

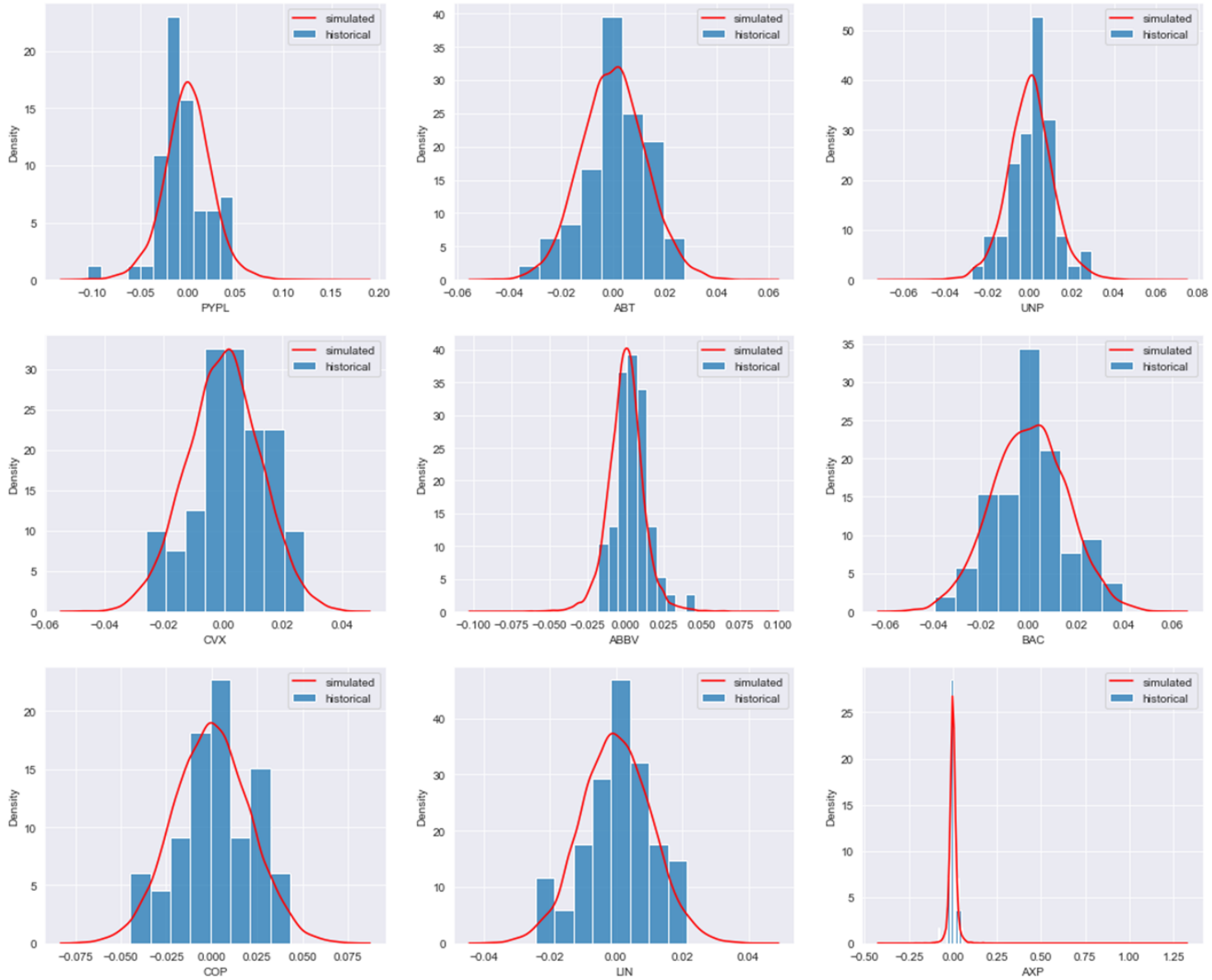
Solution

Use Gaussian Copula to simulate more data under the original distribution.

The simulated data has the nearly identical distribution of the original data. The Frobenius Norm between the covariance matrices is 0.003.

	A	B	C	Total
Monte Carlo VaR	6137.98	4757.21	3930.60	14299.30
Monte Carlo ES	8059.25	6492.65	5312.53	19148.15
Historical VaR	5606.12	5613.08	3432.37	13790.83
Historical ES	7622.93	7231.08	4881.32	19735.33

Distributions of Stock Returns



Distributions of Portfolio Value Changes