



Project 05

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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.



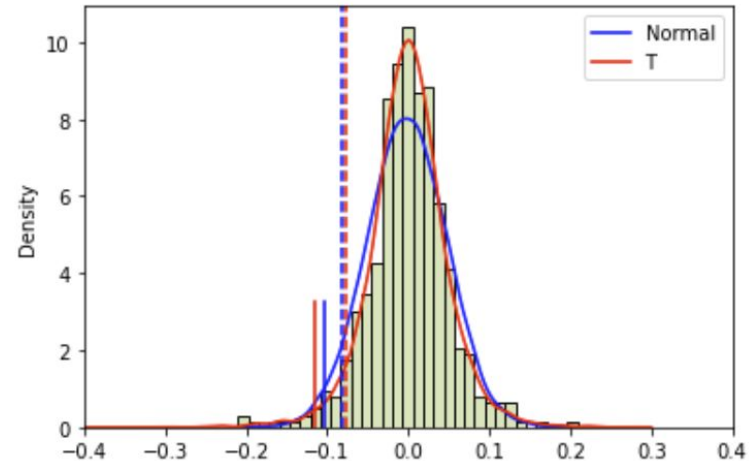
Problem 1 Solution

	Normal distribution	T distribution
VaR	0.08267218711386384	0.07642875255222724
Expected Shortfall	0.10335807374245087	0.11435293426049195

Problem 1 Solution

From the plot, we can see that the T distribution could better describe the original data.

With T distribution, the VaR is larger than normal distribution, while the ES is smaller than normal distribution.





Problem 2

In your main repository, create a Library for risk management. Create modules, classes, packages, etc. as you see fit. Include all the functionality we have discussed so far in class. Make sure it includes

1. Covariance estimation techniques.
2. Non PSD fixes for correlation matrices
3. Simulation Methods
4. VaR calculation methods (all discussed)
5. ES calculation

Create a test suite and show that each function performs as expected.



Problem 2 Solution

See the file risklib.py for all functions needed.

The test suite is included in the ipynb code.



Problem 3

Use your repository from #2.

Using 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 from Problem 3 from Week 4.



Problem 3 Solution

	Portfolio A	Portfolio B	Portfolio C	Total
Historic VaR	5588.638	5752.314	3701.363	13406.885
Simulated VaR with fitted T model	2090.633	1747.941	1582.582	3220.546
Historic ES	7882.311	7403.569	5262.461	20548.341
Simulated ES with fitted T model	2778.229	2447.741	2271.900	4444.138



Problem 3 Solution

For the historical data, the result is very similar to the result in Problem 3 from Week 4.

For the simulated data, since we fit a generalized T model and assume a T distribution, the result is different. Generally they are smaller than the result in Problem 3 from Week 4.