

week5

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Question 1 Question:

- 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.

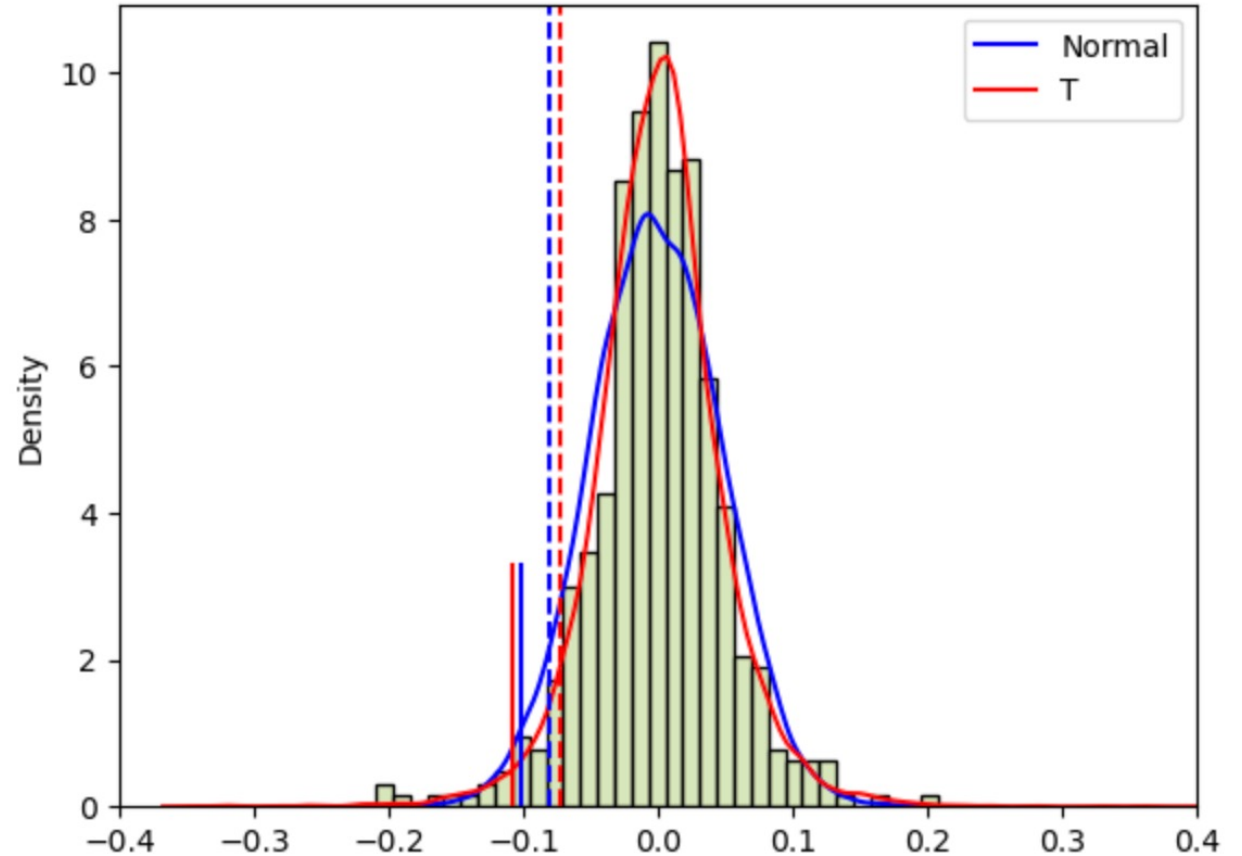
Question 1 Answer

| | Normal distribution | T distribution |
|--------------------|---------------------|---------------------|
| VaR | 0.08083001649793141 | 0.07341047133790324 |
| Expected Shortfall | 0.10155666084239018 | 0.10820008042369983 |

Question 1 Answer

From the plot on the right, we can see that T distribution clearly better describes the dataset.

For T distribution, VaR is larger than normal distribution, and ES is smaller than normal distribution.



Question 2 Question

- 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

Question 2 Answer

- Please refer to the risklib.py file for all functions created.
- The test case for each functionality is in the week5 ipynb.

Question 3 Question

- 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.

Question 3 Answer

| | Portfolio A | Portfolio B | Portfolio C | Total |
|----------------------|--------------------|--------------------|--------------------|--------------------|
| Historic VaR | 8805.507754785509 | 6981.307577790557 | 5496.294533012176 | 21076.418322771406 |
| Simulated Var with T | 2006.4609446966533 | 1882.9713069221045 | 1581.5563530839136 | 3150.4144172653027 |
| Historic ES | 10438.09016614881 | 8945.79531744502 | 7436.626667146727 | 26687.791306205963 |
| Simulated ES with T | 2529.3345196176138 | 2368.122887611612 | 2054.84685017911 | 3990.1516833426354 |

Question 3 Answer

- For historic data, the result is quite close to the one from week4 question 3.
- For simulated data, the result is quite different since we fit a Generalized T model to each stock. In general, they are smaller than the result from week4 question 3.