

# Project Week05

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## 1 Problem 1

### 1.1 Question

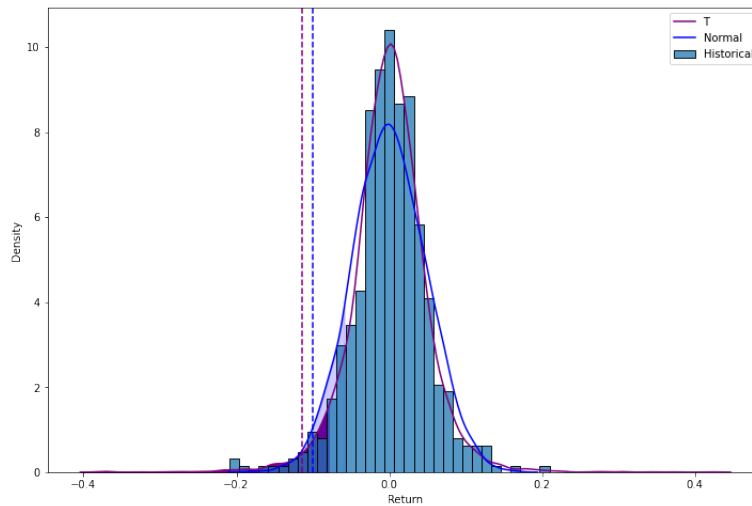
Use the data in problem1.csv. Fit a Normal Distribution and a Generalized T distribution to this data. Calculate the VaR and ES for both fitted distributions. Overlay the graphs the distribution PDFs, VaR, and ES values. What do you notice? Explain the differences.

### 1.2 Answer

Here is the answer:

$VaR - Normal$	8.04%
$VaR - T$	7.70%
$ES - Normal$	10.04%
$ES - T$	11.45%

The following graph contains the information of Normal, Generalize-T distribution and the Value of VaR, ES. The dashed lines represent ES, and the filled areas represent VaR. We can easily found that, the absolute value of ES is always larger than that of VaR, if following the same distribution.



## 2 Problem 2

### 2.1 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.

## 2.2 Answer

I created a python package named 'riskmgmt' contains all of the above functions. If this package has been installed to the correct path, the user can import and use its functions, just like other famous open source packages, such as pandas and numpy. By the way, I am also planning to submit it on pypi.org, so that everyone in the world can use the package by 'pip install'.

I have written problem2.ipynb, which includes the content of previous projects. I implemented the functions of the package I wrote in the file.

## 3 Problem 3

### 3.1 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.

### 3.2 Answer

I use the same financial theory with project 4. But in this project, I use generalized T distribution rather than historical method. The following is the answer:

VaR - A = \$5957.81  
VaR - B = \$4549.88  
VaR - C = \$3088.05  
VaR - Total = \$12807.44  
ES - A = \$7411.69  
ES - B = \$6574.63  
ES - C = \$4241.02  
ES - Total = \$17764.04

Because the answer is gotten by simulations, each calculation yields a slightly different answer. The absolute value of VaR is smaller than that of project 4.