Project ----- Week05
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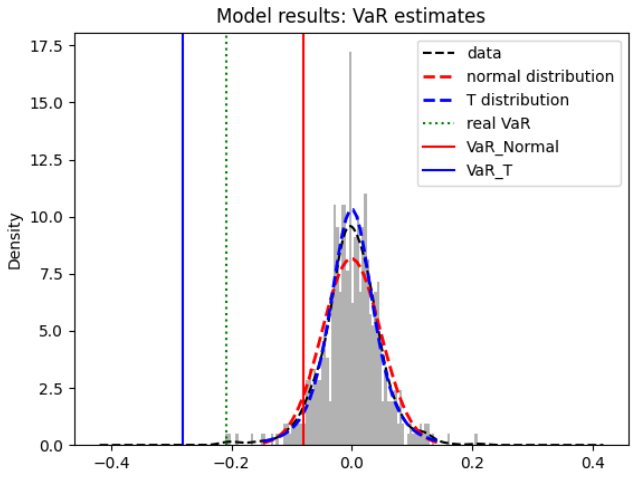
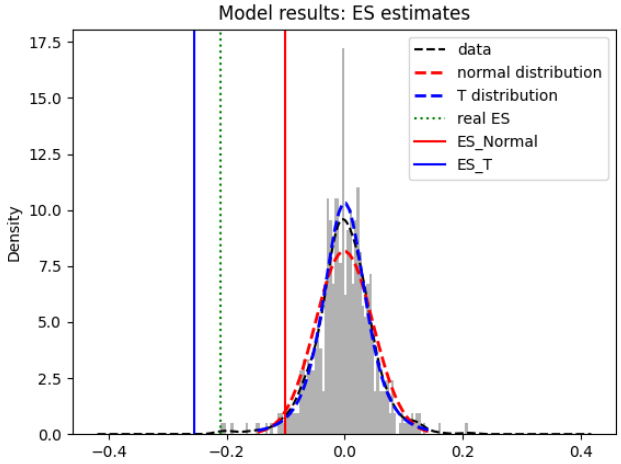
Problem 1

Fitted the data into normal and t distributions respectively. Use the normal distribution to calculate parametric VaR and ES values, and simulated the t distribution with fitted parameters to get estimated VaR and ES.

Plot the distributions and model results of VaR and ES values together.





It can be observed that the normal distribution assumption results in underestimating both VaR and ES. The T distribution will overestimate risk for this data, especially for ES. From the PDF graph, t distribution performs better than normal distribution in capturing the fat-tail characteristic in the data, which is also why it gives a larger risk indication.

Problem 2

Created “RiskMgmnt” package. Including modules:

covEstimate, expWeighted, getES, getPSD, getVaR, Simulations

Problem 3

Utilizing modules from problem2, simulate and estimate VaR and ES for portfolios. Results:

```
----Portfolio 1----
VaR[Return] -3.19%
VaR[portfolio Value]: (a loss of)  $ 11616.509224385087
ES[Return] -3.26%
ES[portfolio Value]: (a loss of)  $ 11900.470389949704

----Portfolio 2----
VaR[Return] -4.97%
VaR[portfolio Value]: (a loss of)  $ 16246.275351216203
ES[Return] -5.76%
ES[portfolio Value]: (a loss of)  $ 18834.30573633723

----Portfolio 3----
VaR[Return] -2.54%
VaR[portfolio Value]: (a loss of)  $ 8309.13712362581
ES[Return] -2.78%
ES[portfolio Value]: (a loss of)  $ 9090.50452408571

----Total----
VaR[Return] -3.30%
VaR[portfolio Value]: (a loss of)  $ 33551.49030077997
ES[Return] -3.68%
ES[portfolio Value]: (a loss of)  $ 37462.44857930807
```

Comparing with results from last week:

```
----Portfolio 1----
VaR[Return] 1.65%
VaR[portfolio Value]: (a loss of)  $ 5853.61689664975

----Portfolio 2----
VaR[Return] 1.46%
VaR[portfolio Value]: (a loss of)  $ 4668.638078005463

----Portfolio 3----
VaR[Return] 1.10%
VaR[portfolio Value]: (a loss of)  $ 3300.227646298663

----Total----
VaR[Return] 1.38%
VaR[portfolio Value]: (a loss of)  $ 13469.51153658128
```

The new results estimate the risk to be significantly larger.