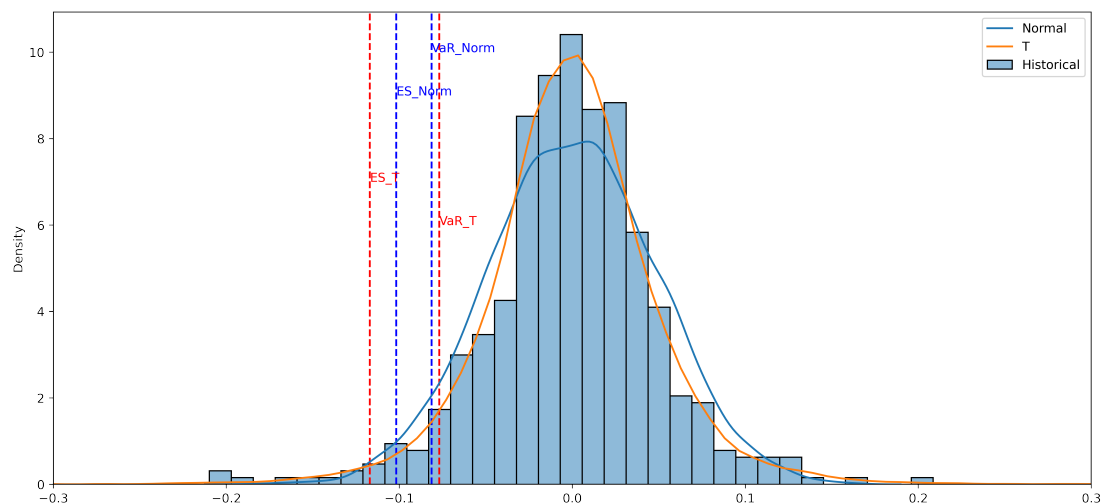


# Problem 1

Alpha=0.05, Sample\_Size=10000:

VaR fitted with Normal distribution is: 8.13 %  
ES fitted with Normal distribution is: 10.18 %  
VaR fitted with T distribution is: 7.64 %  
ES fitted with T distribution is: 11.7 %



From the graph, we can see that the t distribution matched the data pattern better compared to the normal distribution. The VaR from t distribution is higher than the VaR from a normal distribution, while the ES from t distribution is smaller than the ES from the normal distribution.

# Problem 2

Below is the test result for methods in the library, please refer to the code for more details on what the test case is.

```
near_psd test: True
higham_nearestPSD test: True
chol_psd test: True
```

```
[array([[0.00020597]]),
 array([[0.0006001]]),
 array([[0.00088298]]),
 array([[0.00215641]]),
 array([[0.00220015]])]

[ 0.04741425  0.04391629 -0.03772227 ...  0.10055403  0.02199464
 -0.0461866 ]
(4.257039900012378, 0.0461866)
0.08045355289454788 0.08816295294436155 0.07558778082771055 0.07483740378386802

x      0.115903
dtype: float64
```

## Problem 3

The first graph from below is from Week04, and the second is from this week. By comparing these two graphs we see that VaR calculated are similar between Copula method and delta normal method, where Copula method has a relatively larger VaR. I think that since Copula method has less dependency on the standard normal distribution assumption, it is a better method to use to calculate VaR.

VaR		Portfolio
5298.49	A	
5576.13	B	
3307.76	C	
12460.9	Total	

	SimVaR	SimES	Historical VaR	Historical ES
<b>A</b>	6033.02	7867.48	5329.25	7622.93
<b>B</b>	4735.39	6481.42	5579.83	7231.08
<b>C</b>	3835.51	5237.25	3320.22	4881.32
<b>Total</b>	14530.12	19563.65	12593.87	19735.33