Week5 Project

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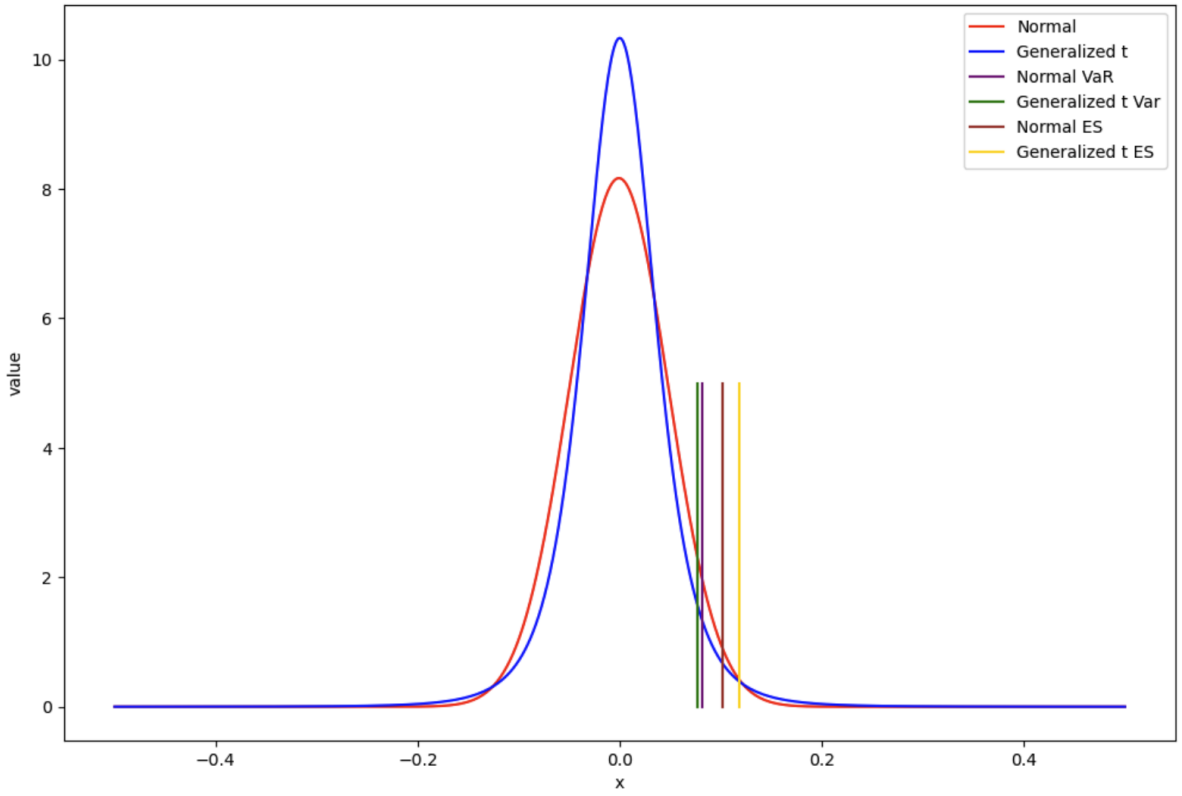
Q1:
First, we fit normal distribution and calculate VaR and ES. By using the inverse of CDF which is PDF, we calculate VaR. Then, use the ES equation
$-\mu + \sigma * norm.pdf(norm.ppf(\alpha))/\alpha$ to calculate ES.
Second, we fit the T distribution and use -t.ppf() to calculate VaR. Then, using rvs() to generalize T distributed random variables, and use it to calculate ES.

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0.08125483171032237 0.1016733248909801
0.07647602684516216 0.1182755250959445
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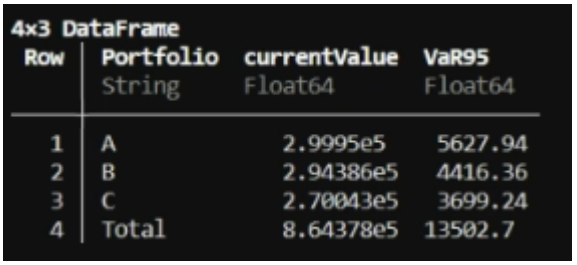
We can see that VaR under normal distribution is greater than T distribution, which corresponds to data for T distribution being more centralized in the middle. Since T distribution has a fat tail than normal distribution, the ES under T distribution is greater than normal distribution.

Q2:
I created a directory called MRisk and put modules into it.

Q3:
First, calculate the return for each stock at each time. Then using a for loop to calculate each stock's parameters under T distribution and calculate each stock return rate CDF. After that, we use Copula to simulate 10000 times to get simulated returns. Read the portfolio and calculate the value of each portfolio. Finally, for each portfolio, calculate its VaR and ES at a given confidence level (95%).
The VaR value of each portfolio under T distribution is relatively higher than week 4. But the structure still remains the same, VaR of A is the highest, B is second, and C is the lowest. Moreover, ES is also ordered with the size of portfolio.



4×3 DataFrame

Row	Portfolio	currentValue	VaR95
	String	Float64	Float64
1	A	2.9995e5	5627.94
2	B	2.94386e5	4416.36
3	C	2.70043e5	3699.24
4	Total	8.64378e5	13502.7

	VAR	ES
A	8058.882756	10518.465094
B	6688.852618	8787.503889
C	5663.670548	7440.814856
total	20119.930595	26355.470426