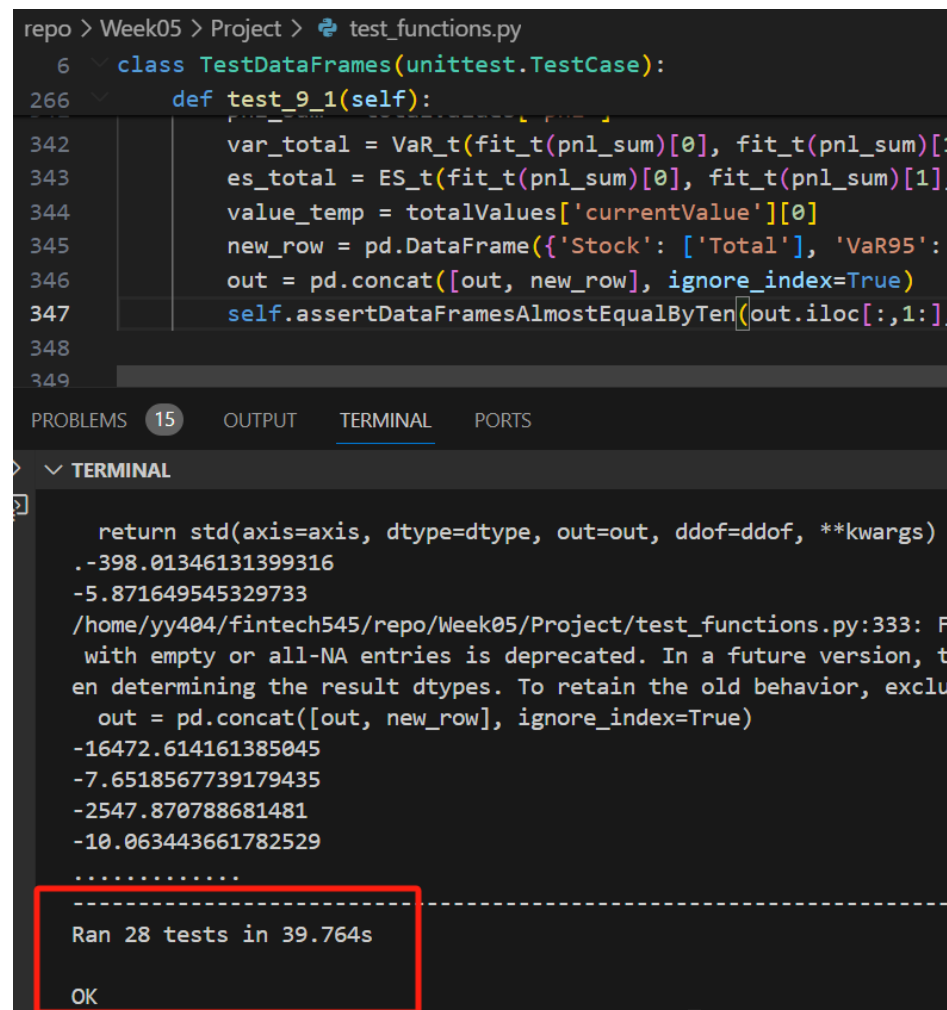


Project Week05 – Yue Yu(yy404)

Problem1

Pass all the tests.



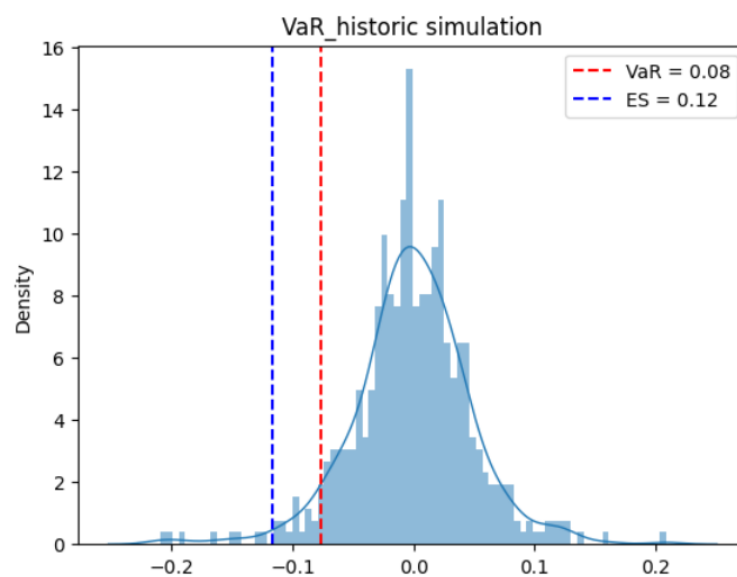
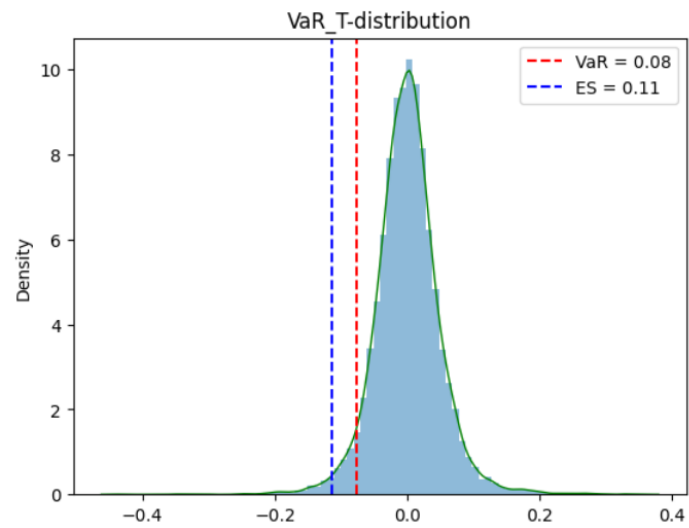
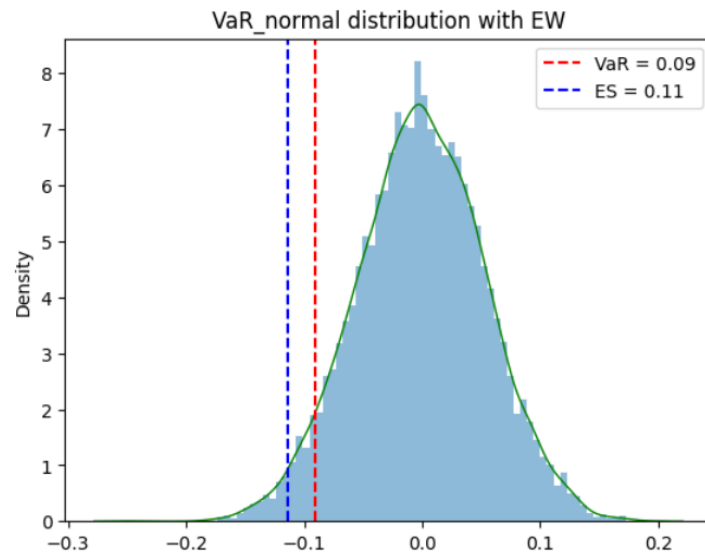
The screenshot shows a Jupyter Notebook interface. The top part displays a Python code snippet from a file named `test_functions.py`. The code defines a class `TestDataFrames` that inherits from `unittest.TestCase`. Inside the class, there is a method `test_9_1` which performs several operations: it calculates `var_total` and `es_total` using `VaR_t` and `ES_t` functions, extracts a `currentValue` from `totalValues`, creates a new row in a DataFrame, and finally asserts that the DataFrame is almost equal to a reference DataFrame.

The bottom part of the screenshot shows the output of the tests in the `TERMINAL` tab. It displays a list of numerical results, followed by a dashed line and the message `Ran 28 tests in 39.764s`, which is highlighted with a red box. Below this message is an `OK` status.

Problem2

Using the data in `problem1.csv`, the VaR and ES are calculated by 3 fitting methods as following:

	VaR	ES
Normal distribution with EW	0.0911693	0.1141065
MLE + t distribution	0.0764756	0.1132179
Historic Simulation	0.0759807	0.1167766



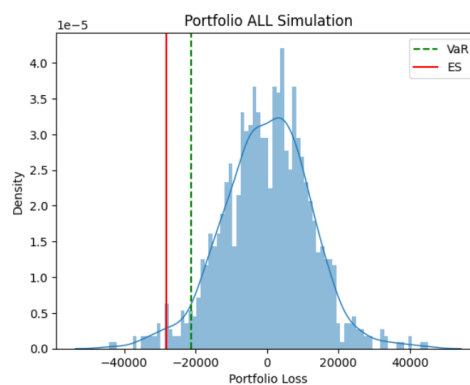
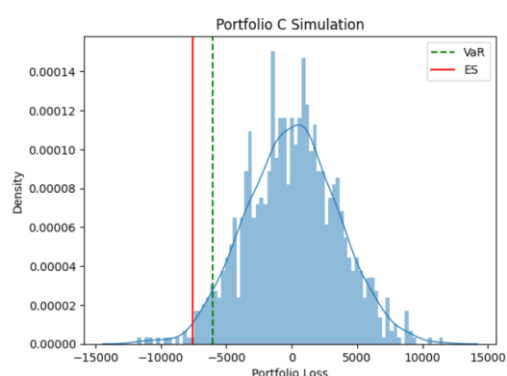
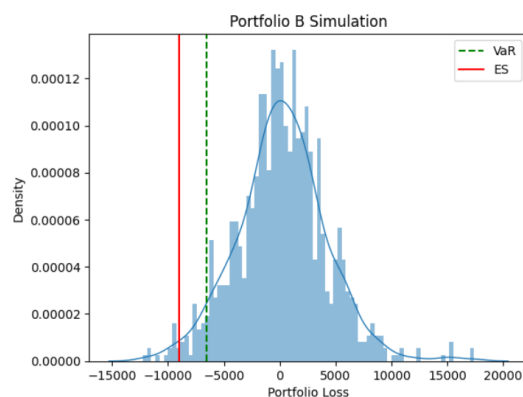
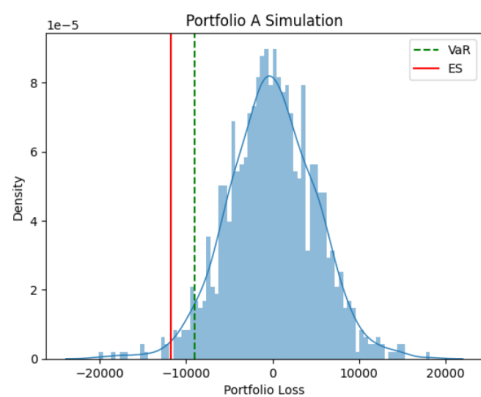
We can see that the VaR under the Normal Distribution with EW is noticeably the largest,

while the VaR under MLE-fitted t distribution and Historical Simulation are approximately similar. However, the ES estimates for these three fitting methods are very close. I believe this is because the Normal Distribution is more concentrated in the center, whereas the t Distribution has thicker tails. Moreover, from the graphical perspective, the t Distribution aligns better with Historical Simulation, and one could argue it is closer to real-world conditions.

Problem3

By fitting Generalized T model to portfolio A and B, and Normal distribution to portfolio ES, the VaR and ES as following:

Portfolio	VaR	ES
A	9022.89	11752.09
B	6886.91	8962.14
C	6217.31	7568.13
Total	21333.03	28153.62



By comparing the VaR from Copula with the methods last week, we can see the VaR is completely different, which due to the different portfolios and returns. I adventure a guess:

this simulation results are closer to the simulation results of the Historic simulation. Copula is suitable for portfolios with complex correlation structures due to their ability to handle non-linear dependencies and extreme situations.

Delta Normal is simpler but may overlook important risk factors, potentially resulting in less accurate risk management.

Portfolio	Copula	Delta Normal	Monte Carlo	Historic
A	9022.89	15426.97	14014.13	17933.41
B	6886.91	8082.57	7474.11	10983.46
C	6217.31	18163.29	16285.41	21409.75
Total	21333.03	38941.38	35642.05	49544.19