Problem1:
Test case and steps and outputs for problem1 is in week5 project/testfiles/data week05.ipynb
The library is under week5 project/library

Problem 2:
Calculation in week5 project/testfiles/data week05.ipynb

VaR_normal: -0.09028951366738855
ES_normal: 0.11322669274257177 VaR (T Distribution): -0.07647602684516216
VaR_T: 0.076476
ES_T: 0.113218
VaR (Historical Simulation): -0.07598069069686242
ES (Historical Simulation): -0.11677669788562187

The VaR and ES under Normal and T distribution is similar (although I assume Var for normal distribution should be smaller than VaR under T distribution). VaR and ES from historical simulation is significantly higher than the other two.

The differences in the Value at Risk (VaR) and Expected Shortfall (ES) calculations across the normal distribution, T-distribution, and historical simulation methods stem from the distinct assumptions each method makes about the underlying data distribution and how they handle tail risk.
The normal distribution method assumes a symmetric distribution with thin tails, which might not accurately capture the tail risks present in financial data, potentially underestimating the actual market risk.

The T-distribution approach, with its degrees of freedom parameter, offers a more flexible model for tail behavior, providing a more accurate risk estimate for financial data with heavy tails. However, the mentioned T-distribution VaR value should reflect maximum expected loss at a given confidence level, indicating sensitivity to tail risk.

Historical simulation, not relying on any specific distribution assumption and directly using historical data, reflects observed market conditions and extreme events, offering a straightforward risk measure but limited by the representativeness and range of historical data. The choice between these methods depends on the understanding of data distribution characteristics, the level of concern for extreme events, and risk management preferences.

Problem 3
Steps under week5 project/testfiles/data week5_problem3.ipynb

VaR of portfolio A is 8141.803692
ES of portfolio A is 10633.076615

VaR of portfolio B is 6970.138687
ES of portfolio B is 9244.929368
VaR of portfolio C is 5976.135057
ES of portfolio C is 7526.456653
VaR of portfolio All is 21088.077436
ES of portfolio All is 27404.462636

Result from week4:
Portfolio A VaR (Simple Returns): $15206.39
Portfolio B VaR (Simple Returns): $7741.25
Portfolio C VaR (Simple Returns): $17877.73
Total VaR (Simple Returns): $37972.29

Comparison:
Methodological Differences: In Week 4, the calculations were performed using an exponentially weighted covariance matrix with lambda = 0.94 and the arithmetic return system. The more recent calculations possibly involved generalized T distributions, normal distributions, and a copula model. These methods differ primarily in their handling of data and capturing correlations between assets. The exponentially weighted method gives more weight to recent data, while the copula approach can offer a finer depiction of inter-asset relationships, especially in tail risks.

For the results comparison,
Reduction in VaR: In the latest calculations, VaR estimates for all portfolios are lower than the Week 4 results. This could be due to the use of copula models, which may model asset correlations more accurately, potentially reducing overall risk estimates.

Comprehensiveness of Risk Assessment: The calculations using copula methods combined with generalized T distributions may better reflect the complex dynamics among assets in the portfolio. While the VaR values have decreased, this approach may reveal underlying risk structures, particularly under extreme market conditions.