

Problem 2:

EWMA VaR: 0.08941970526289929

EWMA ES: 0.11411908907743151

MLE t-distribution VaR: 0.075502211145701

MLE t-distribution ES: 0.04342225383293085

Historic Simulation VaR: 0.075861511162783

Historic Simulation ES: 0.11677669788562187

According to the data, we can see that data from EWMA method is close to that of historic simulation. Expected shortfall for MLE method is greatly different from others. Since EWMA is more responsive to recent data. It has a slightly higher VaR and ES, indicating the recent risk adjustments. The low value for the ES from MLE method may indicate that a fitted t-distribution may not explain more frequent and severe extreme events. Historic Simulation relies on the past data, capturing extreme events well.

Problem 3:

Result from this week:

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Portfolio A VaR: 4561.414572143556 ES: 6083.249248064481
Portfolio B VaR: 3511.0756736755347 ES: 4758.319457714375
Portfolio C VaR: 3415.1341255187995 ES: 4243.015616710371
Total Portfolio VaR (using copula): 10578.490065175461 ES: 14354.058888821763
```

Result from the last week:

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excluded: ['ELV', 'MMC', 'VRTX', 'REGN', 'CB', 'CI', 'ETN', 'SLB', 'PGR', 'BSX']
Portfolio A VaR (Historical, $): $17250.47
Portfolio B VaR (Historical, $): $11093.34
Portfolio C VaR (Historical, $): $21052.49
excluded: ['ELV', 'MMC', 'VRTX', 'REGN', 'CB', 'CI', 'ETN', 'SLB', 'PGR', 'BSX']
Total Portfolio VaR (Historical, $): $45598.76
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We can see clearly difference between two results. VaR values for this week are significantly smaller than that of the last week. This may be due to multiple reasons. The method I used for the last week was historic simulation, while for this week, I specify normal distribution and t-distribution. Also, I used a copula for calculating the total portfolio VaR.