**Quantitative Portfolio Management HW #1**

Notes:

* Data is provided in Box title portfolio.xlsx. The data is EXCESS RETURNS.
* Data is provided but if you want to learn how to source it, the code is under ‘stockdata.ipynb’.
* Would recommend making a function to calculate the Mean-Variance Portfolio at the beginning.

**Section 1 – Traditional Mean Variance Allocation**

1. Portfolio Summary Statistics
   1. Calculate the following statistics for each of the assets and display in one Data Frame.
      1. Mean
      2. Standard Deviation (Volatility)
      3. Sharpe Ratio
   2. Calculate the portfolio’s covariances
   3. Which assets have the highest mean returns and which assets have the highest Sharpe? List the top 5 of each.
2. Mean-Variance Frontier
   1. Compute and display the tangency portfolio weights.
   2. Compute the Mean, Volatility, and Sharpe for the tangency portfolio. Add it to the original Data Frame.
   3. How does the mean return and Sharpe compare for the tangency vs other assets?
3. Adjusting Allocation
   1. Compute and display the weights of MV portfolio with target mean return of .01.
   2. Calculate Mean, Volatility, and Sharpe for the adjusted portfolio. Add it to stats Dataframe. How have they changed?
4. Sensitivity
   1. Create a dataframe with just Moody’s (MCO) and Verizon (VZ).
   2. Calculate MV portfolio for these two assets.
   3. Make an adjustment of +.005 to Verizon’s returns. Calculate the MV portfolio for the adjusted returns.
   4. How has the allocation changed? What does this suggest about the MV sensitivity to returns.
5. Adjustments (Diagonalization)
   1. Recalculate the allocation of the entire portfolio except when calculating the covariance matrix (Sigma), diagonalize the covariance matrix (meaning zero out all non-diagonal elements of the covariance matrix).
   2. Display the weights. What do you notice?
6. Normal vs Diagonalization
   1. Split the data into two dataframes (beginning to ‘2012-12-31’ and ‘2013-01-01’ to end).
   2. Calculate the normal mean-variance portfolio and diagonalized portfolio for in-sample data.
   3. Calculate the mean returns, volatility, and sharpe for the normal mean-variance portfolio for both the in-sample and out-of-sample data. How do they compare? What do you notice?