Tutorial 1

1. (a) Calculate and plot the discrete net daily returns of given stocks (MSFT, AAPL, IBM) as well as the portfolio of those stocks with the following constant weights:

\[ x_{MSFT} = 0.3, x_{AAPL} = 0.3, x_{IBM} = 0.4. \]

(b) Calculate and plot the log-returns of DAX and S&P 500.

2. Assume that DAX and S&P 500 daily log-returns are normally distributed. Check whether this assumption is reasonable by looking at Kernel density and QQ plots. Confirm your result with Jarque-Bera (JB) test statistic.

3. Check if Student’s t distribution, as an alternative to normal distribution, would assure a better fit of the given data on DAX and S&P 500 daily log-returns.

4. Estimate and explain the sample autocorrelation functions of daily log-returns and squared log-returns of DAX as well as S&P 500.

5. Given the historical daily prices of 7 different stocks (MSFT, AAPL, IBM, JPM, HSY, WMT, GE) make an investment decision. Namely, which 2 stocks out of 7 suggested would you choose for a portfolio based on the dependence between stock returns?

6. Using the log-differenced monthly data on DAX and S&P 500, prove that dependence structure between the market indices is asymmetric. Use the exceedance threshold \( \theta = 0.04 \) for bull market and \( \theta = -0.04 \) for bear market. What can be implied by the result?