# Homework 1

## FE-542

## Due: February 26, 2021 at 5PM

**Problem 1** (10pt)
An urn contains three type A coins and two type B coin. When a type A coin is flipped, it comes up heads with probability 1/3, whereas a type B coin is flipped, it comes up heads with probability 2/3. A coin is randomly chosen from the urn and flipped. Given that the flip landed on heads, what is the probability that it was a type B coin?

**Problem 2** (15pt)
In R create a report in pdf format using RMarkdown (or, if you choose to use Python instead, create a Jupyter notebook) to:

(i) Generate 100 observations from a normal distribution with mean 2 and variance 7.

(ii) Compute the sample mean, standard deviation, skewness and kurtosis (if *excess* kurtosis state that clearly).

(iii) Generate a Q-Q plot of the observations from (i) versus the standard normal distribution. Describe your plot in no more than 3 sentences.

**Problem 3** (35pt)
In R create a report in pdf format using RMarkdown (or, if you choose to use Python instead, create a Jupyter notebook) to:

(i) Download daily price data for January 1, 2017 through December 31, 2020 of Microsoft stock from Yahoo Finance. You may use the quantmod package in R for this purpose.

(ii) Generate a plot of the closing prices and of daily log returns.

(iii) Compute the sample mean, standard deviation, skewness and kurtosis (if *excess* kurtosis state that clearly) of the daily log returns.

(iv) Perform the Jarque-Bera Normality test (with 5% significance level) for daily log returns and interpret your results. Compare your result a visualization from a Q-Q plot.

(v) Compute and plot the lag-1 through lag-10 autocorrelation of the daily log returns.

(vi) Test if the lag-5 autocorrelation is non-zero (with 5% significance level). Interpret your results.

(vii) Perform the Ljung-Box test to test if the first 2, first 5, and first 8 lagged autocorrelations are non-zero (with 5% significance level). Interpret your results.