Assignment 1

DUE DATE: Tuesday 12^{th}, February 2019.

I pledge to the Honor Code and to obey all rules for taking and performing homework assignments as specified by the course instructor.

Full name _____ **Student ID.** _____

All data are downloadable from BE moodle

1.(50 points) Consider the daily simple returns of Caterpillar (CAT) stock, CRSP value-weighted index (VW), CRSP equal-weighted index (EW), and the SP composite index (SP) from January 3, 2007 to December 31, 2016. Returns of the three indexes include dividends. The data are in the file d-cat0716-3dx.txt and the columns show permno of CAT, date, VOL, RET, vwretd, ewretd, and sprtrn, respectively, with the last four columns showing the simple returns. In the file, VOL and RET denote trading volume and return, respectively .

(a) Compute the sample mean, standard deviation, skewness, excess kurtosis, minimum, and maximum of each simple return series.

(b) Obtain the empirical density function of the simple returns of Caterpillar stock. Are the daily simple returns normally distributed? Perform a normality test to justify your answer.

(c) Transform the simple returns to log returns. Compute the sample mean, standard deviation, skewness, excess kurtosis, minimum, and maximum of each log return series.

(d) Test the null hypothesis that the mean of the log returns of Caterpillar stock is zero. Do the same test for S&P composite index.

(e) Obtain the empirical density plot of the daily log returns of Caterpillar stock and the equal-weighted index.

2.(50 points) Answer the same questions as Problem 1 but using monthly returns for Procter Gamble (PG) stock, CRSP value-weighted index (VW), CRSP equal-weighted index (EW), and S&P composite index (SP) from January 1961 to December 2016. The returns include dividend distributions. Data file is m-pg6116-3dx.txt with column names PERMNO of PG, date, RET, vwretd, ewretd, and sprtrn, respectively,

where RET denotes the PG simple return. [Note that, in the questions, replace CAT by PG.]

3. (30 points) Consider the daily log returns of Caterpillar (CAT) stock from January 2007 to December 2016 in Problem 1. Perform the tests and draw conclusions using the 5 % significance level.

(a) Construct a 95% confidence interval for the daily log returns of CAT stock.

(b) Test $H_0 : m_3 = 0$ versus $H_a : m_3 \neq 0$, where m_3 denotes the skewness of the return.

(c) Test $H_0 : K = 3$ versus $H_a : K \neq 3$, where K denotes the kurtosis. (Excess kurtosis = 0.)

4. (30 points) Consider the daily log returns of S &P composite index from January 3, 2007 to December 31, 2016 as in Problem 1. Perform the following tests:

(a) Test the null hypothesis that the log return is symmetric with respect to its mean.

(b) Test the null hypothesis that the excess kurtosis of the returns is zero.

(c) Construct a 95 % confidence interval for the expected daily log return of the S &P composite index.

5. (40 points) Consider the daily log returns of Amazon stock from January 2, 2008 to December 31, 1012 as in the file d-amzn3dx.txt.

(a) Perform the following tests: (i) Test the null hypothesis that the log return is symmetric with respect to its mean; (ii) Test the null hypothesis that the excess kurtosis of the returns is zero; (iii) Construct a 95 % confidence interval for the expected daily log return of Amazon stock

(b) Compute ACF and PACF of the daily log returns of Amazon stock and Test $H_0 : \rho_1 = ... = \rho_{12} = 0$ versus $H_a : \rho_i \neq 0$ $\exists 1 \leqslant i \leqslant 12$. Draw the conclusion.

6. (40 points) Daily foreign exchange rates (spot rates) can be obtained from the Federal Reserve Bank in St Louis (FRED). The data are the noon buying rates in New York City certified by the Federal Reserve Bank of New York. Consider the exchange rates between the U.S. dollar and the Euro from January 4, 1999 to March 8, 2013. See the file d-exuseu.txt.

(a) Compute the daily log return of the exchange rate.

(b) Compute the sample mean, standard deviation, skewness, excess kurtosis, minimum, and maximum of the log returns of the exchange rate.

(c) Obtain a density plot of the daily long returns of Dollar-Euro exchange rate.

(d) Test $H_0 : \mu = 0$ versus $H_a : \mu \neq 0$, where μ denotes the mean of the daily log return of Dollar-Euro exchange rate.