Introduction to Financial Econometrics Fall 2017
Assignment 2: Returns

The following time series are saved in the successive columns of the EXCELworksheet DATA in the file IE_DATA.XLS and FF_DATA.XLS available also in CSV format with the extension CSV. (data sources are Kenneth French's online library and Bob Shiller's website)

The time-series in the IE_DATA.XLS files		The time-series in the FF_DATA.XLS files	
identifier	description	identifier	description
P	S&P composite index	exret_mkt	excess ret from the mkt portfolio
D	S&P dividend (at annual rate)	SMB	difference of the av ret on Small and Big portfolio
E	S&P earnings	HML	Difference of the av ret on High and Low portfoli
CPI	US consumer price index	RF	risk free rate
GS10	YTM of 10-year US Treasuries	RMW	difference of the av ret on Robust and Weak port
CAPE	cyclically adjusted PE ratio	CMA	difference of the av ret on Conservative and Aggr
		MOM	momentum
		PR_{ij}	return on portfolio (i,j) of the 25 FF portfolios

1. Update the data to the most recent available observations
2. Load the data into R studio. Label the time-series appropriately.
3. Compute for the possible largest sample
   - **(a)** exact linear monthly stock returns with and without dividends
   - **(b)** log-monthly stock returns with and without dividends
   - **(c)** log-linearized monthly stock returns
   - **(d)** log-monthly returns on long term bonds
   - **(e)** annual and 10-year stock returns
4. Analyze over time the performance of 1 dollar invested in 2000:1 in
   - **(a)** the stock market including dividends,
   - **(b)** in the stock market excluding dividends,
5. Generate the following graphs
   - **(a)** a time-series plot of total monthly stock market returns and log-linearized monthly stock market returns
   - **(b)** a cross-plot of total monthly total monthly stock market returns and log-linearized monthly stock market returns
   - **(c)** a time-series plot of total annual stock market returns and log-linearized annual stock market returns
   - **(d)** a time-series plot of the 10-year returns on the bond and the stock market.

(e) a scatter plot matrix of the 1-month, 1-year and 10-year stock market returns (i.e. a 3x3 matrix with scatter plot of a series on itlself on the principal diagonal and scatter plot of the series i on the series j as off-diagonal elements)

6. Generate a 24x3 matrix X containing a column of 24 ones, the last two years of observations of monthly returns, the last two years of observations on annualized monthly returns.

   (a) compute $T = X\prime X$.

   (b) By using matrix operations only compute the mean of observed returns monthly returns and annualized monthly returns, their covariance and their correlation.

   (c) Is T invertible ? If your answer is no explain why this is the case.

   (d) You have a vector u such that $X\prime u = 0$, what is the mean of u?