Problem Set 2

1. (Portfolio Formation)
    For this exercise, **upload your finished Excel file to "Assignment 1" on our course's elearn site**.
    a. Repeat the exercise we did in class on Thursday for 3M (Ticker: MMM), Citigroup (C), General Electric (GE), MacDonald's Corp (MCD), Microsoft (MSFT) and Procter & Gamble (PG). For time period we shall go back to a time when things were better in the stock market—use data from May 1st 2003 to September 30th 2007. Assume that the monthly risk-free rate is 0.3%. *Limit shorting to at most 50% of your wealth*.
    b. Copy and paste the whole spreadsheet on a new sheet in your Excel file. Recalculate the Sharpe ratio for a *long-only portfolio*.
    c. Open a new sheet and download data for all series in the previous parts for the period of October 2007 to March 2009. Calculate the average return, standard deviation and Sharpe ratio *with the weights you found in part a and b—do not use the solver again*.

    We shall compare the return you get to the Dow Jones Industrial Average and S&P 500. To make the comparison more realistic, we are not going to compare our results with the actual indexes, but rather their electronic traded fund (ETF) implementations, which you can buy like a stock.

    d. Open a new sheet in your Excel file, and download the historical prices for DIAMONDS Trust, Series 1 (DIA) and S & P Dep. Receipts (SPY). Calculate the Sharpe Ratio for each of the ETF's, first for the time period in part a. and b., then for the time period in part c. Do the portfolios we formed have a higher or lower Sharpe ratio?

2. (CAPM: Market Variance)
    Suppose there are n assets in the market. Let r_i be the return for asset i, w_i the fraction of market portfolio invested in asset i and r_M the return for the market portfolio. So
    $$r_M = \sum_{i=1}^{n} w_i r_i$$
    a. Show that variance of the return for the market portfolio is
    $$\sum_{i=1}^{n} w_i Cov(r_i, r_M)$$
    Hint: Use $Var(x) = Cov(x, x)$ and $Cov(cZ, aX + bY) = ca \cdot Cov(Z, X) + bc \cdot Cov(Z, Y)$
    b. Using a., show that the fraction of market variance contributed by asset i is $w_i \beta_i$.

3. (Fama-French Three-Factor Model)

The following table lists financial data for six local firms (data source: Wong, K.M. 2011. "The Validity of the Fama-French Three-Factor Model in Hong Kong Stock Market".)

Firm Name	Year	Month	Price	Market Value	Book Value
VITASOY INTL.HDG.	2009	12	5.36	4748	1674
VITASOY INTL.HDG.	2010	12	6.46	6859	1589
CHINA GAS HOLDINGS	2009	12	4.22	10419	3053
CHINA GAS HOLDINGS	2010	12	3.39	16482	2909
ALIBABA.COM	2009	12	17.75	89878	4632
ALIBABA.COM	2010	12	14	78193	6370
NEW WORLD DEV.	2009	12	14.71	63677	89504
NEW WORLD DEV.	2010	12	13.92	66952	90775
KOWLOON DEVELOPMENT	2009	12	8.26	9786	21932
KOWLOON DEVELOPMENT	2010	12	8.95	10387	20532
BANK OF EAST ASIA	2009	12	29.09	50320	35168
BANK OF EAST ASIA	2010	12	31.86	70691	37708

a. In a table, outline the six Fama-French stock categories. Based on 2010 financial data, assign one stock to each category.
b. Calculate the two Fama-French factors based on these six stocks.