University of California, Los Angeles
Department of Statistics

Statistics C183/C283 **Instructor: Nicolas Christou**

Project
Due: On or before Monday, 23 May

Select at least 25 stocks (plus the market $S\&P500$) from `http://finance.yahoo.com`. Make sure you select stocks from at least 5 sectors. To find the sector in which each stock belongs go to `http://biz.yahoo.com/ic/ind_index.html`. For most of the questions use the `stockPortfolio` package.

To answer the questions of part (A), use ONLY data for the period 31-Dec-2008 to 31-Dec-2013 (you will get returns from 31-Jan-2009 to 31-Dec-2013):

Part A: Constructing optimal portfolios:

1. Assume short sales are allowed. Choose an appropriate value of R_f to find the composition of the point of tangency (Use historical means, variances, and covariances). Also compute the expected return and standard deviation of the point of tangency. Draw the line and show the point of tangency on the line.
2. Refer to part (1). Choose two values of R_f to trace out the efficient frontier. The `stockPortfolio` package can do it using the `portPossCurve` function.
3. Equally allocate your funds into your stocks. Calculate the expected return and standard deviation of this portfolio. (Use historical means, variances, and covariances).
4. Assume that the single index model holds and that risk-free lending and borrowing exists. Use the excess return to beta (you can work with unadjusted or adjusted betas) ratio to find:
   a. The composition of the optimum portfolio, its expected return, and its standard deviation when short sales are not allowed.
   b. The α and β of the optimum portfolio of part (a).
   c. Repeat (a) and (b) when short sales are allowed.
5. Use the constant correlation model and the same risk-free rate as in part (4). Based on the excess return to standard deviation ratio find:
   a. The composition of the optimum portfolio, its expected return, and its standard deviation when short sales are not allowed.
   b. Repeat (a) when short sales are allowed.
6. Use the multigroup model, short sales allowed, and the same risk free rate as in (4) and (5), to find the composition of the optimum portfolio, its expected return, and its standard deviation.
7. Place all the stocks you have used and all the portfolios you have constructed on the space expected return against standard deviation.

Part B: Portfolio performance:
Compute now the monthly returns for each stock for the period 31-Dec-2013 to 30-Apr-2016 and use them to compute the monthly return for each of the following portfolios that you have constructed above:

a. Equal allocation (part 3).
b. Single index model with no short sales allowed (part 4a).
c. A portfolio that consists of 50% of the portfolio of part 4a and 50% of the risk free asset.
d. Constant correlation model with no short sales allowed (part 5a).
e. Multigroup model (part 6).

Plot the returns of portfolios (a-e) on the space return against time for the period 31-Jan-2014 to 30-Apr-2016. Also on the same graph plot the return of the market $S\&P500$. Which of these portfolios performed the best (highest return)? Which portfolio was the worst (lowest return). What is the average return of each portfolio in this period (31-Jan-2014 to 30-Apr-2016)? Compare the performance of each portfolio with the market $S\&P500$. In you portfolio performance analysis include the Sharpe ratio, differential return with risk measured by standard deviation, Treynor measure, and differential return with risk measured by beta (Jensen differential performance index). Write 1-2 paragraphs discussing your findings.

Please submit by email (due on Monday, 23 May, at 20:00) the following:

1. `R` code.
2. One page description, results, discussion of your project.

Good luck!