# FIN 500
# Intro to Finance
# Homework 3

Ideas: Diversification; Valuation*

Due: 10 December 2018.

The purpose of this homework is to let you flex your skills at analyzing financial data in *R*.

As before: you may discuss ideas with one another, but not to the point of reaching an answer. You *must* do your own work and not use someone else's code or writeups. That also means not lettting someone else use your work.

The *R* code in the text (and which you should use and modify) is available from the textbook webpage: `www.q36llc.com/think/investments`. You should grab data for the data range 20141001–20181001.

## Problems

1. For the first exercise, we will do some of the exercises from Chapter 9. This will let you see how you can play with using an optimizer from *R*. Unfortunately, optimization often has more potential for errors — because optimizing is usually done by means of external *solvers*. For this reason, *install the appropriate R packages and try to do this problem as soon as possible.* Modify the Chapter 9 code to work with data since the start data (given above).

(3) (a) Exercise 9.1: Just report the Sharpe ratios for the three portfolios.

(6) (b) Exercise 9.2: discuss how the portfolios holdings are unusual or differ from what most individuals hold.

(3) (c) Exercise 9.3: This just means repeating the previous two questions with different portfolio constraints – and quickly summarizing the changes in weights and results.

2. We will do an abbreviated version of the Litterman and Scheinkman analysis. Use code from previous homeworks to get yields for US Treasuries over the above-mentioned date range. You should get the following yields:
3M, 6M, 1Y, 2Y, 5Y, 10Y, 20Y, 30Y.

   Use the code from the Chapter 12 exercises to do a principal components analysis of yield changes. Look at the first five principal components.

*Dale W.R. Rosenthal, `daler@illinois.edu`

(5) (a) The eigenvalues indicate the fraction of variation explained. Report the top 5 eigenvalues and corresponding eigenvectors.

(5) (b) Discuss the eigenvectors: note what their meaning seems to be. Keep in mind that the results may be noisy — and that some eigenvectors might be just noise.

3. We can explore the CAPM by modifying the code from Chapter 14. Create excess log-returns (as described in the exercises) and then we will try to look at the 8 specified stocks.

(12) (a) For each stock, estimate a CAPM using the S&P 500 only, Russell 2000 only, and both. Create a table summarizing your results (estimates, $t$-stats) for each of the three CAPMs.

(8) (b) Comment on your findings: what is surprising, how much variation there is among similar stocks and different models, and how to interpret (a) differences in significance, and (b) the meaning of the multi-index results.

4. Use the Chapter 15 code (or modify your HW2 code) to get the factors for a macro factor model: Chen-Roll-Ross.

(10) (a) Estimate the model and report the results for the 8 stocks as well as the two equity indices.

(5) (b) Comment on which parts of the model seem most useful and any unusual/surprising findings.

5. Use the Chapter 15 code to estimate a micro factor model: the GARCH-in-mean model.

(10) (a) Estimate the model and report the results for the 8 stocks as well as the two equity indices.

(5) (b) Are the results consistent with what we would expect? If not, what might explain what you see?

6. Use the Chapter 15 code to fit the Fama-French 3-factor model for the 8 stocks.

(8) (a) Report the results.

(6) (b) Comment on how these results agree with or disagree with your multi-index CAPM results.

(6) 7. Use the code from Chapter 18 to look at the USD/JPY FX rate. Plot the difference from Exercise 18.1 and compute the mean, standard deviation, skewness, and kurtosis of the difference. What would seem to explain the difference?

8. Chapter 22, Exercise 3 (The Land of Grace Exceeds the Grace Period)

(3) (a) Part (c): report your estimated $\hat{p}$, $\hat{L}$, and sum of squared errors.

(2) (b) Part (d): Where does the model perform well versus poorly?

(3) (c) How might you improve the model to address the differing quality of model fit?

(3 (bonus)) (d) How would you find standard errors for $\hat{p}$ and $\hat{L}$ without changing your estimation process? (In other words: without bootstrapping.)