ISyE/Math 6783 Homework 3

Due **12:05pm**, Tuesday, March 1, 2016.

Problem Description.

1. Use the data sets that are attached in this assignment:
   m_sp500ret_3mtcm.txt and m_logret_10stocks.txt.
   The first file contains monthly returns of the S&P500 and the rates of the 3-month U. S. Treasury bill from January 1994 to December 2006. The second file contains the monthly log returns of ten stocks.

2. Perform a factor analysis on the excess returns of the ten stocks. Show the factor loading and rotated factor loadings via maximizing the *varimax* criterion. Explain how you choose the number of factors.

3. Consider the model
   $$r_t^* = \beta_1 \mathbf{1}_{\{t<t_0\}} r_M^* + \beta_2 \mathbf{1}_{\{t\geq t_0\}} r_M^* + \epsilon_t,$$
   where $r_t^* = r_t - r_f$ and $r_M^* = r_M - r_f$ are the excess returns of the stock and the S&P500 index. The model suggests that the β may vary over the time. Taking February 2001 as the month t_0, test for each stock the null hypothesis that $\beta_1 = \beta_2$.

4. Estimate t_0 in the previous item via the least squares criterion.