Take-Home Miderm No. 1
Econ 40357 Financial Econometrics
University of Notre Dame
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Fall 2016

Test is open-book, open-note, open-internet. You can use any written sources that you like, but you may **not** consult with other human beings on any aspect of this test. You need to do this exam entirely by yourself. **You are bound by the Notre Dame honor code.** Write your answers in the comment section and 'publish' the Matlab program. Proof read your exam before handing it in. Do your best to present your answers in a way that is easy to read and to understand. Write your name on your exam. Test is due in my mailbox on the 4th floor of Flanner Hall by 5 p.m. Friday October 14. Late submissions (even by 1 minute) not accepted.

For questions 1-5, use the data in ProbSet02_Data3.mat These are monthly S&P index data from Robert Shiller's web page. I've constructed monthly gross returns and the dividend yield for you. Let P_t be the price of the index at t, $GR_t = (P_t + d_{t-1})/P_{t-1}$ be the gross return on the S&P index from month $t-1$ to t, and $dy_t = d_t/P_t$ be the dividend yield in month t. The data span from 1871.01 to 2016.06.

1. Plot the data and report relevant features. Run the ADF test to see if the dividend yield stationary.
2. Estimate the one-period ahead forecsting model of the S&P return
$$GR_{t+1} = \alpha + \beta dy_t + \epsilon_{t+1}$$
Estimate it over the full sample, reporting on anything that is relevant (slope, t-ratio, R^2).
3. Use the period 1990.1–2016.7 to conduct an 'out-of-sample' forecasting evaulation of your model. 1990.1 is the first date that you will try to forecast. Here, you will do a recursive forecast exercise (do not use any out-of-sample information). Assess the accuracy of your forecasts relative to the random walk with drift model of (log) stock prices by computing Theil's U statistic.
4. Evaluate the model's market timing ability by assessing the proportion of times it correctly predicts the sign of the rate of return.
5. Using the full sample, estimate the 36-month ahead forecasting model
$$GR_{t+36,t} = \alpha + \beta dy_t + \epsilon_{t+1}$$
where $GR_{t+36,t} = \prod_{j=1}^{36} GR_{t+j}$ is the 36-month ahead gross return. Look at the slope, the t-ratio and R^2 in comparison to the one-period ahead prediction model, and comment on what you think is interesting.

For the next set of questions, use the data in Midterm_Data01.mat. These are daily adjusted closing prices for the S&P index from 03 Jan 1950 to 07 Oct 2016.

6. Find the 1% Gaussian VaR (value at risk) for the market.
7. Provide an analysis as to whether S&P daily returns are normally distributed.
8. Find the 1% empirical VaR for the market.
9. Find the 10 days with the lowest returns. Identify the dates of those returns and the actual returns.
10. Suppose your grandfather or grandmother started a buy-and-hold strategy for your family starting at the beginning of the sample. How much would one US dollar invested in the index on 03 January 1950 be worth on 07 Oct 2016?
11. Find the 38 days with the highest returns. Identify the dates of those returns and the actual returns. What is the proportion of trading days represented by these 38 days?
12. Suppose you invested one U.S. dollar in the index on 03 Jan 1950, and were in the market **except** for those 38 days with the highest returns. How much would that $1 be worth on 07 Oct 2016? Is there anything interesting about your answer?