STA9713 Financial Statistics
FINAL PROJECT INSTRUCTION

Due on 23:59pm of December 21, 2014

You are required to participate in a group project which aims to facilitate your skill set of data processing, model development, data analysis, programming, presentation and writing. A group may consist of about 2 to 5 participants, each contributing to the project report and presentation. The report is due on 23:59pm of December 21 and should include the following parts.

0. A title page, with the title of the project and each participant's name and specification of his/her contributions.

1. An introduction describing the study and the data.

2. Main objectives and a plan about how to achieve them.

3. Description of your analysis, including methods, formulae being used and, possibly theory behind them.

4. Results of statistical analysis, with your own interpretation. In presenting your results, you may want to use summary tables/figures.

5. Conclusions.

6. Attachments: programming code and a selection of computer outputs.

The main part should be no more than five pages long, but there is no page limit on the attachment.

Potential topics to be considered (Creativity is highly encouraged and you should try to find your own topics.)

1. Look at returns of certain stocks, mutual funds and S&P 500, the US T-bill rates. Estimate mean and covariance matrix, possibly using different methods. Construct a portfolio. Estimate its mean and standard deviation, using standard, bootstrapping, PCA and possibly other methods. Compare the returns of your portfolios with the benchmark such as the S&P 500 index based on mean returns, Sharpe's ratio, maximum draw-downs, turn-over rate and etc. Discuss any discrepancy and provide explanations, if possible.

2. If you are comfortable with time series models (ARCH, GARCH etc.), you may conduct time series analysis of stocks, interest rates etc.

3. Use copula method to calculate VaR and ES of a portfolio, say 20 stocks. Compare the result with the empirical findings, especially during the credit melt-down period. Perhaps suggest alternative ways to better capture the dependence structure among the equities in the portfolio.

4. Fit the term structure for US treasury bonds by cubic-spline method or hybrid methods such as tension-spline, quasi-cubic hermite spline (this one is used by the US department of Treasury); developing trading strategy based on the fit. Data source: Yahoo Bond.

5. Co-integration strategies for stocks. For example, how to trade stocks in S&P500 so as to make money as well as maintaining a high sharpe ratio and low maximum draw-down.

6. Use copula method to construct the joint probability of S&P500 (SPX) price and market volatility index (VIX). How about the joint probability of SPX and VIX future prices?