**MgtF 405: Forecasting**

**Assignment 4 (due on March 1, 2017)**

Part I. Cointegration analysis

Download the file gold\_silver\_price\_combined.xlsx from the Assignment 4 folder on Triton Ed. This file contains monthly gold and silver prices over the period 1970-2017. Use this data to answer the following questions.

1. Are gold and silver prices cointegrated?
2. Can you use past information on silver prices to predict future **changes** in gold prices?
3. Can you use past information on gold prices to predict future **changes in silver prices**?

Part II Volatility Forecasting

This assignment uses the file Shanghai\_SE\_composite\_price.xlsx in the Assignment 4 folder on Triton Ed. The data is downloaded from the Global Financial Data base. It contains daily closing values of the Shanghai SE Composite price index, SSECD from 1991 to 2017. We are interested in seeing whether there is evidence of volatility clustering in Chinese stock prices.

First compute the log first-difference to get the (continuously compounded) daily stock returns: rt = ln(SSECDt/SSECDt-1).

1. Looking at the autocorrelations, do you find evidence that daily stock returns, rt, are serially correlated?
2. Looking at the autocorrelations, do you find evidence that daily squared returns, , are serially correlated?
3. Conduct a test for ARCH effects in the return series rt. Do you find that there is evidence of ARCH effects?
4. Estimate a GARCH model for daily stock returns, rt. Report the estimates and comment on how persistent the return volatility is. You can model the mean of returns either as a constant or as a simple ARMA process.
5. Does a regular GARCH(1,1), an EGARCH(1,1) or a GJR(1,1) GARCH model best fit the Shanghai stock exchange returns series? Make sure to present any statistical evidence used to support your answer.
6. Save the residuals from your GARCH(1,1) model, εt. Then generate normalized residuals,  where  is the GARCH(1,1) estimate of the conditional variance at time t, given information at time t-1. If the GARCH(1,1) model is correctly specified, these normalized residuals should follow a standard normal N(0,1) distribution. Evaluate if this holds here.
7. Using the volatility forecasts from part 5, generate 50% and 95% interval forecasts for returns on the Shanghai stock index for the period 1/3/2017-2/10/2017. Plot the time-series of actual returns against these interval forecasts and comment on what you find.