

Midterm Examination MA641

posted August 8, 2008
due August 20, 2008

This exam is a take-home examination. The exam is to be submitted by the due date at 10:00pm. **No exceptions!!!** You may submit it using the elearn site or, you may email it directly to me. The exam should be in the portable document format (pdf). Please let me know well in advance if you encounter difficulties converting to the above mentioned file format.

Please quote and organize the output that supports your view in an organized manner. Justify every step in your reasoning. Do not present the whole output with your actual report. You may attach it in an appendix. You will present work that should be read without referring to content outside the currently viewed page.

1. Choose one equity that you wish to study. Chose a stock that has reasonably high trading volume and market capitalization over 1 billion. Use daily data and as long a period as you believe to be necessary. Model the data as a time series using all that you learned during this class. Every step should be documented and the reasoning explained. Model the volatility as well using one of the models that you believe appropriate. Please submit the data that was used and the code in two additional separate files. Everything should be reproducible using these 2 files.
2. For this problem you will use the daily data that you previously downloaded for the midterm. However, instead of creating an oil index you will use individual equity. You will use the same time period as you used earlier. First, decide on 5 or more individual oil companies that would serve as explanatory variables. Then, calculate the automobile industry index and the airline industry index in the same way that you did last time. Pay attention to the airline industry since two of the stocks were missing data. Either replace them with other airline stocks or use only the three larger ones.
 - (a) Create two neural networks, one for each of the two indices. Use as inputs the oil stocks. The period specified earlier should be used for training these networks. Use as many hidden nodes as you think are necessary.

- (b) Create two new networks where the output is the individual stocks composing each index (i.e., the output would have more than one node).
- (c) Use the data after the midterm until present for forecasting. Use whichever criterion you wish to compare the networks.

Bonus Use the best ARIMA type model from the midterm to forecast this later period. Compare with the output obtained using the neural networks.

3. Assume that a time series r_t follows a GARCH(2,2) model. Use the usual notation for parameters from the textbook. Construct a recursive relation to forecast future volatility values.

Do not forget to write your name on the exam. Good luck!