# ECON 3350/7350: Applied Econometrics for Macroeconomics and Finance

## Tutorial 7: Volatility Models - I

1. Consider the daily share prices of the Commonwealth Bank (CWB) for the period September 5, 1996 - August 30, 2006 in the data file `cwb.csv`. Let $\{y_t\}$ denote the time series of the share prices.

   (a) Draw the time series plot of $\{y_t\}$ and compute the ACF and PACF. Does $\{y_t\}$ appear to be stationary? Explain your answer.

   (b) Perform ADF tests to determine if $\{y_t\}$ has a unit root.

   (c) Identify (select) and estimate an appropriate model (e.g., ARMA$(p, q)$) for the expectation of the log return $r_t = \log(y_t/y_{t-1})$. Report the estimated model.

   (d) Draw the time series plot and correlogram of the squared residuals saved in the estimation run in Part (c). Comment on your findings.

   (e) Test if the errors in your chosen model contain ARCH or GARCH effects.

   (f) Identify at least two plausible models for the conditional variance function of $r_t$. Select a preferred model, estimate it, and report the estimated model in a standard format. Hint: Use the `arch` command.

   (g) Forecast (one-step ahead) the volatility for the four days following the end of the sample. Hint: Use the `predict` command with the `variance` option.

2. The data file `exrates_daily.csv` contains the daily exchange rates data series for the Australian dollar, Euro, Pound and Canadian dollar in the period March 1, 2000 - December 23, 2008. Repeat (a)-(f) in Question 1 for the series - Australia dollar (i.e., `aust`).