

## WESS 2016 Intermediate Econometrics

### Class Exercise 3: Time varying volatility and ARCH models

The data file arch.dta contains data on the UK/US exchange rate, UK and US stock prices and UK and US consumer prices. The data is all monthly and runs from 1980m1 to 2012m12. For this exercise we will use the UK/US exchange rate.

1. Create logarithms of the data and generate the first differences.
2. Plot the log exchange rate against time. What do you notice about the volatility or returns? Identify periods of big changes and periods of small changes.
3. Plot the histogram. Is the distribution normal?
4. Using the first-difference of the log-exchange rate test for the presence of first order ARCH (ARCH(1)) and state the conclusion of the test.
5. Estimate an ARCH(8) model using the least squares approach.
6. Estimate an ARCH(8) model using the maximum likelihood approach. Compare the results with those obtained in part (5). What is the drawback of the least squares approach in estimating an ARCH model?
7. Save the conditional variance obtained in part (6) and plot it against time. Do the periods of high and low conditional variance coincide with the periods of big and small changes in returns?
8. Estimate a GARCH(1,1) model and discuss the results.
9. Estimate a GARCH-in-mean model and discuss the results. What is the contribution of volatility to the exchange rate returns?
10. Is the GARCH-in-mean model better than the GARCH model in an econometric sense (look at the statistical tests of significance)? Is the GARCH-in-mean model better than the GARCH model in a financial economic sense (look at the implications of the results).