Economics 232B. Time Series Econometrics — Spring 2006
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Homework #2

Due Monday, May 15

1. The file SP500.txt contains S&P500 daily index prices from 1/1/1990 to 16/2/2005. Compute the corresponding return series as $r_t = \log(P_t) - \log(P_{t-1})$, where P_t is the index price. Do the following:

   (a) Plot the autocorrelograms of r_t and r_t^2.

   (b) Consider the model $r_t = c + \varepsilon_t$ and test for the presence of ARCH in the residuals ε_t.

   (c) Using maximum likelihood, estimate for ε_t : (1) a GARCH(1,1) with normal disturbances; (2) a GARCH(1,1) with Student's t disturbances and report the results. Which model has the highest log-likelihood? Test for the presence of ARCH in the standardized residuals (that is, the residuals divided by the estimate of the conditional standard deviation) from this "best" model.

   (d) To see if there is evidence of parameter variation, consider the best model from point c) and estimate it over a rolling window of size 1250 (roughly 5 years of data). This means estimating the model using observations 1 to 1250, then re-estimating it using observations 2 to 1251 and so forth (if you have convergence problems, try using the previous parameter estimates as starting values). Plot the parameter estimates from each rolling window.

2. Use FRED II to get quarterly data on real GDP from 1964:1 onwards. Form a quarterly series for Average Weekly Hours: Total Private Industries by taking the average of the monthly observations (within each quarter). Then compute the logarithmic growth rate of hours and of productivity (measured as the GDP/Hours ratio). Estimate a bivariate VAR model for the productivity growth and the hours growth. Select the number of lags by using appropriate statistical criteria. Assume that we have two shocks, technological and non-technological shocks, and that only technology shocks have a long-run effect on the level of productivity (see Gali, 1999, "Technology, Employment, and the Business Cycle: Do Technology Shocks Explain Aggregate Fluctuations?," AER).

   (a) Compute impulse-response functions (IRF) up to 30 steps ahead and comment on the results.

   (b) Compute 90% confidence intervals around IRF by an appropriate method. Comment on the results.

   (c) Assess the overall reasonableness of the identifying procedure and of the results.