

Due Thursday, December 10

This assignment covers time series econometric methods. The necessary data are contained in the Excel file `dat501.xls` and the STATA file `dat501.dta` available at <http://u.arizona.edu/~rlo>. Be sure to attach the supporting computer print out to the completed assignment and make clear where your answers are shown.

The data for this exercise are quarterly time series data from the National Income and Product Accounts and from the Federal Reserve and span the period 1960q1-2000q4. $pgdp$ is the implicit price deflator for nominal gross domestic product (gdp), $m1$ is a measure of the money supply, and div is nominal dividend income.

1. A time-series model of the implicit price deflator for gross domestic product is given by

$$\Delta \ln(pgdp)_t = \beta_0 + \beta_1 [\Delta \ln(m1)_t - \Delta \ln(gdp)_t] + \beta_2 \Delta \ln(pgdp)_{t-1} + \varepsilon_t$$

$$\varepsilon_t = u_t \sqrt{\alpha_0 + \alpha_1 \varepsilon_{t-1}^2},$$

where $u_t \sim N(0, 1)$ and satisfies all of the classical assumptions, $\alpha_0 > 0$,

$0 < \alpha_1 < 1$, $\Delta \ln(pgdp)_t = \ln(pgdp)_t - \ln(pgdp)_{t-1}$, $\Delta \ln(m1)_t = \ln(m1)_t - \ln(m1)_{t-1}$, and $\Delta \ln(gdp)_t = \ln(gdp)_t - \ln(gdp)_{t-1}$.

- a. Use an LM test to test H_0 : ARCH(0), H_1 : ARCH(1) at the 5% level of significance.
 - b. Estimate the parameters of the above model by MLE.
2. Test for unit roots in the log of real money supply, $\ln(m1/pgdp)$, and in the log of real dividend income, $\ln(div/pgdp)$, using the augmented Dickey-Fuller test of the form

$$\Delta Z_t = \beta_0 + \alpha Z_{t-1} + \beta_1 \Delta Z_{t-1} + u_t.$$

Conduct your test of H_0 : $\alpha = 0$, H_1 : $\alpha < 0$ at the 5% level of significance. You may use Table 22.2 (p.746) of Greene's *Econometric Analysis*, 6th ed to obtain your critical value.

3. Test for cointegration between $\ln(m1/pgdp)_t$ and $\ln(div/pgdp)_t$ in the model $\ln(div/pgdp)_t = \alpha + \beta \ln(m1/pgdp)_t + u_t$. Conduct your test at the 5% level of significance for a one-tailed test. You may use the large sample test statistics for Case 2, Table B.9 (p. 766) of Hamilton's *Time Series Analysis*.