Washington University
Department of Economics

Spring 2010
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Economics 5161

Homework #2
Due on Thursday 4/1
(20% penalty per day late)

1. Unit Root Tests and Spurious Regressions (10 points)

Find two very persistent series that you know, a priori, should have no causal relationship (e.g., the classic example is the stock market and a Super Bowl indicator that is equal to one when the NFC wins and zero when the AFC wins, but do not use this example). Make an argument as to why the two series that you pick really have no relationship.

Conduct unit root tests for the two series. See the discussion of ADF tests in Stock and Watson (pp. 462-466). Use AIC for lag selection. Report the test statistic and critical values. Also, explain your assumptions for deterministic regressors for the series that you chose.

Make sure that you cannot reject the unit root null for each of the two series. If you can, find other series to consider. The point here is to demonstrate the spurious regression phenomenon, and this is easiest (or most pronounced) if there are unit roots.

Now, regress one of the series on the other using OLS (in EViews). Report the estimates, standard errors, R-squared, and Durbin-Watson (DW) statistic (present results concisely). What is the t-stat for the coefficient that captures the relationship between the two variables? Do you have a spurious regression problem?

It is possible that your coefficient is simply picking up deterministic trends. Include a time dummy (in EViews you can create a time dummy by typing "genr t=@trend") in the regression. Report results as before. Is your X variable still significant? What is the DW statistic?

(2-3 pages)

2. Structural Break in Volatility (10 points)

Take your Quarterly Real GDP growth series (constructed by 100 time changes in natural logs of the raw data), subtract the sample mean, and square the demeaned returns. The resulting series should be a noisy measure of volatility. You might notice that the general level of this volatility is lower since the 1980s. Consider the regression,

$(\Delta y_t - \hat{\mu})^2 = c + \varepsilon_t$.

The constant term from the regression provides an estimate of the variance of Δy_t.

Now consider a model that allows a structural break in the variance:

$(\Delta y_t - \hat{\mu})^2 = c + \gamma D_t(\tau) + \varepsilon_t$,

where

$$D_t(\tau) = \begin{cases} 0 & if \quad t \le \tau \\ 1 & if \quad t > \tau \end{cases}$$

See the discussion in Stock and Watson (pp. 468-473) for more details on this approach to testing for a structural break.

Write simple code to estimate this regression model for different possible break dates for structural change in variance. Follow Stock and Watson by considering only break dates in the middle 70% of the sample period (see top of p. 470 in SW). For each possible break date, calculate an F-statistic for the null hypothesis that $\gamma = 0$. Submit code and plot the F-statistic against possible break dates (much like SW do in Figure 12.5), including the 10%, 5%, and 1% critical values based on Table 12.5 in SW (which is really based on Andrews, 1993).

What is the QLR statistic (see p. 474 in SW) and for what date?

(1-2 pages)

3. Hoover and Sims Readings (Bonus Question: 10 bonus points)

Summarize the Hoover and Sims readings on methodology in macroeconomics.

(3 pages)