Economics 125 Fall 2009
Linus Yamane Pitzer College

Problem Set #3

I. Trade

The trade deficit is a major economic issue in the U.S. Consider the following model of U.S. imports:

$$\ln imports_t = \beta_1 + \beta_2 \ln GDP_t + \beta_3 \ln CPI_t + \varepsilon_t$$

where IMPORTS are nominal imports of goods and services, GDP is nominal gross domestic product and CPI is the consumer price index. Quarterly data from 1947:1 to 2009:2 are found in "import.dta" in the course folder.

a. Estimate the parameters of this model using data from 1995:1 to 2009:2. Make sure you take logs, and note the specific time period here.

regress limp lgdp lcpi if tin(1995q1,2009q2)

Are β_2 and β_3 statistically significant?

b. Calculate the correlation matrix for IMPORTS, GDP and CPI using the command

correlate limp lgdp lcpi

What do you notice?

c. Run the following three regressions:

i) $\ln imports_t = A_1 + A_2 \ln GDP_t + \varepsilon_t$

ii) $\ln imports_t = B_1 + B_2 \ln CPI_t + \varepsilon_t$

iii) $\ln GDP_t = C_1 + C_2 \ln CPI_t + \varepsilon_t$

What can you say about the nature of multicollinearity in these data?

d. A common procedure for reducing collinearity with time series data is to first-difference the data and then to work with the first-differenced data. Logarithmic first-differencing is particularly attractive, since $\ln y_t - \ln y_{t-1}$ equals $\ln(y_t / y_{t-1})$, which for small changes can be interpreted as the percentage change in *y* from period *t*-1 to period *t*. Estimate the above model using the logarithmic first difference for the period 1995:1 to 2009:2,

$$\ln imports_t - \ln imports_{t-1} = \alpha_1 + \beta_2(\ln GDP_t - \ln GDP_{t-1}) + \beta_3(\ln CPI_t - \ln CPI_{t-1}) + \varepsilon_t$$

Compare the estimates β_2 and β_3 to those above. Are β_2 and β_3 statistically significant now?

e. Estimate the parameters of this model using all the data from 1947:1 to 2009:2. What do you notice? Can you explain what happened?

II. More Money

Using the famous square-root formula for money demand along with a partial adjustment model, we have the following money demand regression equation from our previous problem set:

$$\ln M_t = \alpha + \beta \ln M_{t-1} + \gamma \ln Y_t + \delta \ln i_t + \varepsilon_t$$

a. Estimate a money demand equation for M1 using U.S. data in "money.dta." After running the regression, issue the command **rvfplot** (residual-versus-fitted plot). Do you see any heteroskedasticity?

b. Plot your residuals over time. You can use **predict** to generate the fitted values of y and the residuals.

predict yhat

predict res, residuals

Use the command **graph twoway scatter x y** to generate a scatter plot of x and y.

c. Use the Goldfeld-Quandt test to see if the variance of the errors increased after 1980.
d. Use White's general test for heteroskedasticity. The version in Stata is the Breusch-Pagan/Cook-Weisberg test. Issue the following command after running the regression.
estat hettest
What do you conclude?
e. Reestimate the money demand equation using weighted least squares (WLS).
Take the fitted values for the residuals from your regression in part a. Generate a new variable called "wts" where wts = $1/\sqrt{resid^2}$. Estimate a weighted least squares regressions with the following command.
regress y x1 x2 [weight=wts]
Compare these regression estimates to your regression estimates from above.
f. An alternative remedy for heteroskedasticity is to estimate the regression with White heteroskedasticity consistent standard errors. You can do so in Stata by using the option
regress y x1 x2, vce(robust)
Compare this regression with the regression in part a. How does it differ?

III. Compensation in Manufacturing
Consider the following model for compensation in U.S. manufacturing:

$$COMP_t = \alpha + \beta PROD_t + \varepsilon_t$$

where:

COMP = real compensation per hour
PROD = multifactor productivity

a. Estimate this compensation-productivity relationship using OLS for the period 1987-2006 with the annual data provided in "prod.dta."
b. Whenever you estimate an equation, you should examine your residuals. Plot the residuals across time. Do you see any patterns?
c. Test for serial correlation using the Durbin – Watson statistic.
estat dwatson
d. Test for serial correlation using the Breusch-Godfrey test.
estat bgodfrey
e. What do these serial correlation tests tell you about the quality of the OLS regression results?
f. Re-estimate the compensation-productivity relationship assuming you have first order serial correlation.
prais y x
Compare your coefficient estimates.

Due Thursday 5 November