Economics 312 | Spring 2014
Project #5 Assignment | Due: Midnight, Monday, March 31

Partner assignments

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This assignment is based on the textbook's Exercise 10.3 and uses the HGL dataset brumm.dta, containing macroeconomic data on 76 countries averaged over the period 1980–93. Although the textbook gives you a reference to the paper from which the dataset is taken, I encourage you *not* to read the paper, at least until you have performed the analysis and written a draft of the report.

The quantity theory of money is a classical macroeconomic model of inflation. It starts from the "equation of exchange" $MV = PY$, which says that total nominal spending in an economy can be viewed equivalently as the money supply (M) times the income "velocity" of money (V, the number of times the average dollar is spent in a year) or as the price level (P) times the amount of goods produced and bought in a year (Y). Expressing the equation of exchange in terms of logs and solving for price yields

$$\ln(P) = \ln(M) + \ln(V) - \ln(Y)$$

and taking the first difference to put the model in terms of changes gives us

$$\Delta \ln P = \Delta \ln M + \Delta \ln V - \Delta \ln Y. \quad (1)$$

In equation (1), $\Delta \ln P$ is the average annual inflation rate, $\Delta \ln M$ is the growth rate of the money supply, $\Delta \ln V$ is the growth rate of velocity, and $\Delta \ln Y$ is the growth rate of real output, all at average annual rates.

What makes the quantity theory a theory is the assumption that changes in money growth and output do not cause changes in velocity. In other words, $\Delta \ln (V)$ can be treated as an exogenous random variable uncorrelated to the other variables in the right-hand side.

Suppose that the growth rate of velocity is modeled as $\Delta \ln V = \beta_1 + e,$ where e is an error term and β_1 is the mean value of the growth of velocity. We can then write equation (1) as

$$\Delta \ln P = \beta_1 + \beta_2 \Delta \ln M + \beta_3 \Delta \ln Y + e, \tag{2}$$

with $\beta_2 = 1$ and $\beta_3 = -1$. This is sometimes called the "weak" form of the hypothesis; the "strong" form of the quantity theory also asserts that the mean change in velocity should be zero, so $\beta_1 = 0$ in addition to the other conditions.

One can test the strong and weak forms of the quantity theory by testing the appropriate restrictions in equation (2) using the variables *inflat*, *money*, and *output*, with all variables expressed as average annual rates of change. But what estimator should be used?

As HGL detail in Exercise 10.3, there are (at least) two potential concerns with OLS: (a) countries with high levels of money growth are likely to have greater conditional variance of inflation and (b) it is possible that inflation might affect output growth.

Conduct an initial analysis of the hypotheses using OLS, then test for heteroskedasticity and amend your analysis appropriately (if necessary) based on the results.

Following that, explore the possible endogeneity of output growth and its implications for the model. Potential instruments in the data set are the initial level of real GDP (*initial*), a measure of population educational attainment (*school*), the average investment share of GDP (*inv*), and average population growth (*pop*). Explain why each of these is, theoretically, a plausible instrument for output growth in the equation. Use appropriate IV estimators to repeat the tests of the hypotheses and assess the quality of the IV estimators by examining the endogeneity of output growth, assessing the strength of your instruments, and examining overidentifying restrictions if you have them.

Finally, organize your report in the form of a short paper, describing the theoretical model, the estimation strategies, and the results, with an appropriate conclusion at the end to sum up what you find and to assess the potential strengths and weaknesses of your analysis.