

## Exercise 7

To examine the quantity theory of money, Brumm (2005) [“Money Growth, Output Growth, and Inflation: A Reexamination of the Modern Quantity Theory’s Linchpin Prediction,” *Southern Economic Journal*, 71(3), 661–667] specifies the equation:

$$\text{Inflation} = \beta_0 + \beta_1 * \text{Money} + \beta_2 * \text{Output} + u$$

where *INFLAT* is the growth rate of the general price level, *MONEY* is the growth rate of the money supply, and *OUTPUT* is the growth rate of national output. According to theory we should observe that  $\beta_0 = 0$ ,  $\beta_1 = 1$ , and  $\beta_2 = -1$ . The data used in this paper is contained in the file *brumm.gdt*. It consists of 1995 year data on 76 countries.

- a) Estimate the model by OLS and interpret all the parameters.
- b) Test the joint hypothesis that  $\beta_0 = 0$ ,  $\beta_1 = 1$  and  $\beta_2 = -1$ . What do you conclude?
- c) Examine the least squares residuals for the presence of heteroskedasticity related to the variable *Money*.
- d) Obtain robust standard errors for the model and compare them to the OLS standard errors. Does your conclusion change in part (b) after using robust standard errors?
- e) It is argued that *Output* may be endogenous. Four instrumental variables are proposed, *INITIAL* = initial level of real GDP, *SCHOOL* = a measure of the population’s educational attainment, *INVEST* = average investment as a share of GDP, and *POPRATE* = average population growth rate. Using these instruments, obtain instrumental variables (2SLS) estimates of the inflation equation (do the two stage procedure).
- f) Are the instruments strong?