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ECONOMETRICS 1
EXERCISES 4

Linear regression
Empirical application
Canadian money demand

1. Consider the data on money demand variables supplied on the web site of the textbook by Davidson and MacKinnon (2004).
   See the file money.data at: http://econ.queensu.ca/ETM/data/;
   All data are taken from the CANSIM Database of Statistics Canada. These data are quarterly and cover the period 1967-1 to 1998-4. The variables are defined as follows:

   M_t is the log of the real money supply for Canada [the log of series B1629 (M1B), converted to quarterly, minus P];

   Y_t is the log of Canadian GDP, in 1992 dollars, seasonally adjusted [the log of series D14872];

   P_t is the log of the price level for Canada [the log of series D14840 divided by series D14872];

   R_t is the 3-month Treasury Bill rate for Canada [series B14007, converted to quarterly].

2. Graph each of the series against time. Discuss the patterns of the graphs (presence of trends, outlying observations, potential presence of structural breaks).

3. Consider the following "money demand equation":

$$M_t = \beta_0 + Y_t\beta_1 + R_t\beta_2 + u_t\,, \quad t = 1, , \ldots, T \tag{1}$$

   where $t = 1$ corresponds to the first quarter of 1967 (1967-1).

4. Discuss how the coefficients β_0, β_1, β_2 can the interpreted (*e.g.*, as elasticities or semi-elasticities).

5. Estimate the above equation by ordinary least squares over the following two periods:

   - 1967-1 to 1995-4;
   - 1967-1 to 1998-4.

6. On assuming that equation (1) satisfies the assumptions of the Gaussian classical linear model, and for each subperiod,
   (a) test whether each one of the coefficients β_0, β_1, β_2 is equal to zero at level .05;
   (b) test whether $(\beta_1, \beta_2) = (0, 0)$;
   (c) build a confidence interval with level 0.05 for each coefficient β_0, β_1, β_2;
   (d) discuss the results and compare the two subperiods.
7. Using the data from 1967-1 to 1995-4, test the following hypotheses:
   (a) the income elasticity of money demand is equal to one.
   (b) real money demand is homogeneous of degree 0 with respect to the price level. [This can be done by adding P_t to the equation.]
8. Graph the residuals of the estimation based on the shorter period 1967-1 to 1995-4.
9. Analyze whether the residuals
   (a) contain outliers,
   (b) exhibit heteroskedasticity,
   (c) exhibit serial dependence.
10. By employing the method described in Dufour (1980), compute predictions and prediction errors for the observations 1996-1 to 1998-4, based on the parameter estimates obtained from the sample 1967-1 to 1995-4.
11. Test whether model coefficients appear to be constant after 1995-4.

References

DAVIDSON, R., AND J. G. MACKINNON (2004): *Econometric Theory and Methods*. Oxford University Press, New York.

DUFOUR, J.-M. (1980): "Dummy Variables and Predictive Tests for Structural Change," *Economics Letters*, 6, 241–247.