

Elements of Econometrics. 2022-2023.

Class 16. Time Series Models

Problem 1.

Show that including a single lagged dependent variable in the equation is equivalent to including an infinite number of lagged independent variables with a geometric lag structure.

Problem 3. (Practice exercise). Using data file `expend.wfl` investigate the structure of coefficients in the model describing dependence of expenditures on housing HOUS of the current disposable personal income DPI and lagged dependent variable HOUS(-1). Repeat estimation with the data on expenditures on cosmetics COSM. Compare.

LS HOUS C DPI HOUS(-1)

Dependent Variable: HOUS

Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.634296	1.471592	-1.790099	0.0879
DPI	0.029204	0.007269	4.017536	0.0006
HOUS(-1)	0.854534	0.040887	20.90004	0.0000
R-squared	0.999385	Mean dependent var	113.9792	
Adjusted R-squared	0.999326	S.D. dependent var	34.93566	
S.E. of regression	0.906965	Akaike info criterion	2.759042	
Sum squared resid	17.27428	Schwarz criterion	2.906299	
Log likelihood	-30.10850	F-statistic	17052.48	
Durbin-Watson stat	1.207057	Prob(F-statistic)	0.000000	

Problem 4 (Mixed theoretical and practical exercise). What is the difference between short run and long run dynamics in the models with lagged dependent variable? Calculate for the example above.

Problem 5 (Theoretical exercise). What is $ADL(p,q)$ model. Explain its meaning and structure.

Problem 6. (Mixed theoretical and practical exercise). Investigate how to estimate the models with geometrical distribution of coefficients (Koyck distribution)

- NLS

- grid-search (min RSS)

Problem 7. (Mixed theoretical and practical exercise). Investigate how to estimate the models with a polynomial distribution of coefficients (Almon)



Problem 8. (UoL and ICEF Exam problem).

An econometrician having **quarterly data** for 12 years (plus current values - 49 observations total) believes that current total consumption expenditure C_t is dependent not only on current value of disposable personal income Y_t and current price index P_t , but also on the last **two** years values of disposable personal income Y_{t-k} . She estimates using OLS the equation:

$$\hat{C}_t = 99 + 0.9Y_t - 0.2Y_{t-1} - 0.4Y_{t-2} - 0.2Y_{t-3} - 0.1Y_{t-4} + 0.04Y_{t-5} + 0.1Y_{t-6} + 0.4Y_{t-7} - 0.02Y_{t-8} + 0.4P_t \quad R^2 = 0.99$$

(91) (0.32) (0.28) (0.29) (0.29) (0.28) (0.30) (0.33) (0.33) (0.30) (0.31)

- (a) What econometric phenomena can be observed in the equation above? What econometric problems (if any) are likely connected with these phenomena?
- (b) Explain how you would test the hypothesis that consumption is dependent on disposable income for the last year only against the alternative hypothesis that consumption is dependent on the last two years. Give details of the information you need for this test.
- (c) A colleague suggests that you should use an infinite lag model instead of the model above in (a). How would you estimate this model on the basis of Koyck distribution;
- (d) How would you estimate the same model on the basis of Koyck transformation?