Applied Econometric Time Series – Problem Set 4

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1 Error correction

Preliminaries

Consider the bivariate error correction system

$$\Delta r_{St} = \alpha_S(r_{Lt-1} - \beta r_{St-1} - \mu) + a_{1,11}\Delta r_{St-1} + a_{1,12}\Delta r_{Lt-1} + \epsilon_{St} \tag{1.1}$$

$$\Delta r_{Lt} = \alpha_L(r_{Lt-1} - \beta r_{St-1} - \mu) + a_{1,21}\Delta r_{St-1} + a_{1,22}\Delta r_{Lt-1} + \epsilon_{Lt} \tag{1.2}$$

where $r_{St} \sim I(1)$ and $r_{Lt} \sim I(1)$, and ϵ_{St} and ϵ_{Lt} are white noise processes.

Question (1a) Argue why r_{St} and r_{Lt} must be co-integrated. What is the co-integrating vector? What is the long-run equilibrium? Why is an intercept μ included in the co-integrating relationship? In which case should the restrictions $\alpha_S\mu? = 0$ and $\alpha_L\mu? = 0$ be imposed?

Question (1b) Formulate the null hypothesis that r_{Lt} does not Granger cause r_{St}.

Question (1c) Describe the adjustment mechanisms towards the long-run equilibrium. Also, describe the adjustment mechanisms toward the long-run equilibrium assuming that r_{Lt} is weakly exogenous. What is the role of Δr_{St-1} and Δr_{Lt-1} terms?

Question (1d) Assume that $r_{St} \sim I(1)$ and $r_{Lt} \sim I(1)$ (as before) but not cointegrated. Why is it a problem to run the regression $r_{St} = \mu + \beta_1 r_{Lt} + \varepsilon_t$? Are there any cures for spurious regressions?

2 Empirical exercise

Do Exercise 4 (but not 4f) in the textbook (page 402).