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Department of Economics
Econ 467D2: Econometrics
Final exam (deferred)

No documentation allowed
Hand calculator allowed
Time allowed: 3 hours

35 points 1. Answer by TRUE, FALSE or UNCERTAIN to each one of the following statements, and justify briefly your answers (maximum: 1 page per statement).

(a) By standardizing least squares residuals, outliers are created.

(b) The Durbin-Watson test is a test meant to detect outliers.

(c) For an AR(1) process, the first autocorrelation and the first partial autocorrelation are identical.

(d) The Box-Pierce statistic is always larger than the Ljung-Box statistic.

(e) When an autoregressive model satisfies the unit root hypothesis, the associated polynomial has at most one root.

(f) The Dickey-Fuller procedure allows one to test whether au autoregressive model is non-stationary.

(g) The generalized least squares method is a special case of the instrumental variables method.

20 points 2. Consider the following models:

$$X_t = 0.5\, X_{t-1} + u_t - 0.5\, u_{t-1}$$

where $\{u_t : t \in \mathbb{Z}\}$ is an $i.i.d.$ $N(0, 1)$ sequence. For each one of these models, answer the following questions.

(a) Is this model stationary? Why?

(b) Is this model invertible? Why?

(c) Compute:

i. $E(X_t)$;

ii. $\gamma(k)$, $k = 1, \ldots , 8$;

iii. $\rho(k)$, $k = 1, 2, \ldots, 8$.

(d) Graph $\rho(k)$, $k = 1, 2, \ldots, 8$.

(e) Find the coefficients of u_t, u_{t-1}, u_{t-2}, u_{t-3} and u_{t-4} in the moving average representation of X_t.

15 points 3. Consider the model

$$y_t = x_t'\beta + u_t \ , \quad t = 1, \ldots, T \tag{1}$$

where

$$u_t = \rho u_{t-1} + \varepsilon_t \ , \quad t = \ \ldots, 0, 1, 2, \ldots \tag{2}$$

$$|\rho| < 1 \ , \tag{3}$$

$$\{\varepsilon_t\}_{t=1}^{T} \text{ is a sequence of i.i.d. disturbances,} \tag{4}$$

$$\mathsf{E}\,(\varepsilon_t) = 0 \ , \quad \mathsf{V}\,(\varepsilon_t) = \sigma^2 \ , \forall t \ . \tag{5}$$

(a) Explain how the above linear regression could be transformed to make the disturbances i.i.d. (when ρ is unknown).

(b) Discuss how ρ could be estimated in the above model.

(c) Discuss how β cold be estimated in the above model.

10 points 4. Describe the method of seemingly unrelated regressions and explain why it may lead to efficiency improvements.

20 points 5. Consider the following demand and supply model:

$$q_t = a_1 + b_1 p_t + c_1 Y_t + d_1 R_t + u_{t1} \ , \quad \text{(demand function)} \tag{6}$$

$$q_t = a_2 + b_2 p_t + u_{t2} \ , \quad \text{(supply function)} \tag{7}$$

where

$q_t =$ quantity (at time t), $p_t =$ price, $Y_t =$ income, $R_t =$ rain volume,

u_{t1} and u_{t2} are random disturbances.

(a) Derive the reduced form of this model.

(b) Explain why applying least squares to the equations (6)-(7) may not be an appropriate method to estimate the parameters of these two equations.

(c) Are the parameters of equations (6)-(7) identified? Explain your answer.

(d) Propose an estimation method for the parameters of equations (7) and discuss its properties.