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Question:	1	2	3	4	5	Total
Points:	4	4	4	4	34	50

**Justify** all your answers. You are required to show your work on each problem on this problem set. **Organize your work.** Work scattered all over the page will receive very little credit. A correct answer in a multiple choice question is worth 4 points; an incorrect one is worth  $-1$  point.

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- (4) 1. Consider the model  $y_t = \beta_0 + \beta_1 z_t + \beta_2 z_{t-1} + u_t$ , with  $z_t = 1 + t$  and  $t$  a time trend. Additionally, suppose that  $E(u_t) = 0$ . It is true that,
- The assumption TS.3, strict exogeneity, is not verified.
  - The assumption TS.1 is not verified because the model is not linear in the parameters.
  - The assumption TS.2 is not verified because there is perfect collinearity.
  - None of the previous statements is correct.

- (4) 2. Consider the following FDL model  $y_t = \alpha + \delta_0 x_t + \delta_1 x_{t-1} + \delta_2 x_{t-2} + u_t$ . It is known that
- The estimated impact multiplier is  $-0.82$  and the estimated long run multiplier is  $0.93$
  - The estimated change in  $y$  two periods after a temporary change of one unit in  $x$  is  $0.05$

Then, one can conclude that,

- $\hat{\delta}_0 = 0.93$ ,  $\hat{\delta}_1 = 0.05$  and  $\hat{\delta}_2 = -0.82$
  - $\hat{\delta}_0 = -0.82$ ,  $\hat{\delta}_1 = 0.05$  and  $\hat{\delta}_2 = 0.93$
  - $\hat{\delta}_0 = -0.82$ ,  $\hat{\delta}_1 = 1.70$  and  $\hat{\delta}_2 = 0.05$
  - There is not enough information to obtain the estimated coefficients
- (4) 3. Consider the model  $y_t = \beta_0 + \beta_1 x_t + \beta_2 x_{t-1} + u_t$ . Then,
- The condition for contemporaneous exogeneity is  $E(u_t | x_t) = 0$ .
  - The condition for strict exogeneity is  $E(u_t | x_t) = 0$ .
  - Assuming contemporaneous exogeneity it is possible that  $\text{corr}(x_t, u_{t-2}) \neq 0$ .
  - Contemporaneous exogeneity implies strict exogeneity.

- (4) 4. Consider the model  $\widehat{\log(y_t)} = -2.12 + 0.02 \log(x_t) - 0.01 \log(x_{t-1}) + 0.01 \log(x_{t-2})$ . Then,
- The estimated long-run elasticity is 2% and the estimated impact elasticity is 2%.
  - The estimated long-run elasticity is  $\exp(0.02)$  and the estimated impact elasticity is  $\exp(0.02)$ .
  - The estimated long-run elasticity is  $(\exp(0.01) - 1) \times 100\%$  and the estimated impact elasticity is  $(\exp(0.02) - 1) \times 100\%$ .
  - The estimated long-run elasticity is 0.02% and the estimated impact elasticity is 0.02%.

5. In order to explain the quarterly money supply of a given country,  $m$ , the following equation was specified:

$$\log(m_t) = \alpha_0 + \alpha_1 t + \delta_1 Q1_t + \delta_2 Q2_t + \delta_3 Q3_t + \beta_1 p_t + \beta_2 r_t + \beta_3 \log(y_t) + \beta_4 \log(y_{t-1}) + u_t$$

where  $p$  is the inflation rate,  $r$  the interest rate,  $y$  the GNP,  $t$  is a time trend and  $Q1$ ,  $Q2$  and  $Q3$  are seasonal dummies.

Use the data set Money.WF1 to estimate this model and to answer the following questions.

- (7.5) (a) Determine the impact multiplier and the long-run multiplier of GNP and interpret their respective values.
- (4) (b) Test the significance of the long-run multiplier of GNP.
- (7.5) (c) Interpret the estimated coefficient of the time trend. Explain why the time trend was introduced in this model.
- (7.5) (d) Define the variables  $Q1$ ,  $Q2$ , and  $Q3$  and interpret the estimated coefficient of  $Q2$ .
- (7.5) (e) Is there evidence of seasonality on the quarterly money supply?