Jean-Marie Dufour
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McGill University
ECN 706
Special topics in econometrics
Mid-term exam

No documentation allowed
Time allowed: 1.5 hour

30 points

1. Provide brief answers to the following questions (maximum of 1 page per question).

   (a) Explain the difference between the "level" of a test and its "size".

   (b) Explain the difference between the "level" of a confidence set and its "size".

   (c) Discuss the link between tests and confidence sets: how confidence sets can be derived from tests, and vice-versa.

40 points

2. Consider the following simplified equilibrium model:

$$
\begin{aligned}
D_t &= \alpha + 2p_t + u_{1t}\,,\\
S_t &= c + u_{2t}\,,\\
Q_t &= D_t = S_t \qquad , \; t = 1, \ldots, T
\end{aligned}
$$

   where D_t is the demand for a product, S_t the supply for the same product, and Q_t the quantity produced and sold. We suppose that the vectors $(u_{1t},\, u_{2t})'$, $t = 1, \ldots, T$, are independent and $N[0,\, I_2]$.

   (a) Find the reduced form of this model.

   (b) For which parameters is the vector $Q = (Q_1, \ldots, Q_T)'$ exogenous? Justify your answer.

   (c) For which parameters is the vector $p = (p_1, \ldots, p_T)'$ exogenous? Justify your answer.

   (d) Are the variables Q_t and p_t simultaneous?

30 points 3. Consider the linear regression model

$$y = X\beta + u \tag{0.1}$$

where y is a $T \times 1$ vector of observations on a dependent variable, X is a $T \times k$ fixed matrix of explanatory variables (observed), $\beta = (\beta_1, \ldots, \beta_k)'$, and $u = (u_1, \ldots, u_T)'$ is a $T \times 1$ vector of unobserved error terms. Suppose the elements of u are independent and identically distributed according to a $\sigma t(1)$ distribution, where $t(1)$ represents a Student t distribution with 1 degree of freedom and σ is an unknown constant.

(a) Propose a method for testing the hypothesis $H_0 : \beta_1 = 1$ at level $\alpha = 0.05$ in the context of this model such the size of the test is exactly equal to $\alpha = 0.05$.

(b) Propose a test for detecting serial dependence between the errors $u_1, \ldots, u_T$ such the size of the test is exactly equal to $\alpha = 0.05$.