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McGill University
ECN 706
Special topics in econometrics
Final exam

No documentation allowed
Time allowed: 3 hours

30 points 1. Consider the model

$$Y_t = \beta_0 + \sum_{k=1}^{p} \lambda_k Y_{t-k} + \gamma X_t + u_t \ , \ t = 1 \, , \ \ldots \ , \ n \tag{1}$$

and the problem of testing the hypothesis

$$H_0 : \sum_{k=1}^{p} \lambda_k = 1 \tag{2}$$

in the context of model (1). We assume that the vector $(X_1, X_2, \ldots , X_n)$ is fixed.

(a) If $u_t \overset{i.i.d.}{\sim} N[0 \, , \ \sigma^2]$ and p is known, propose an exact method for testing H_0.

(b) If $u_t \overset{i.i.d.}{\sim} \sigma t(1)$ and p is known, propose an exact method for testing H_0.
[$t(1)$ represents a Student t variable with 1 degree of freedom.]

(c) Discuss the problem of testing H_0 when p is unknown.

20 points 2. Discuss the relationships between the following concepts:

(a) Granger causality and prediction;

(b) Granger causality and causality at several horizons;

(c) Granger causality and impulse response coefficients;

(d) causality at several horizons and impulse response coefficients.

20 points 3. Consider the following equilibrium model:

$$\begin{aligned} Q_t &= a + bp_t + u_{1t} \,, \\ p_t &= c + dp_{t-1} + u_{2t} \qquad , \; t = 1, \ldots, T \\ p_0 &\text{ is fixed} \end{aligned}$$

where the disturbances $(u_{1t},\ u_{2t})'$, $t = 1, \ldots, T$ are independent $N[0,\ I_2]$, Q_t represents the quantity sold, and p_t the price. For which parameters is the vector $p = (p_1, \ldots, p_T)'$

(a) sequentially exogenous?

(b) exogenous?

(c) strongly exogenous?

(d) Further, does Q_t cause p_t in the sense of Granger?

Justify your answers.

15 points 4. Describe the main statistical problems as decision problems.

(a) Explain the difference between a *nonrandomized* decision rule and a *randomized* decision rule.

(b) Define the risk function for each one of these two types of rule.

(c) When is a decision rule *admissible*?

15 points 5. Discuss the relationship between hypothesis tests and confidence sets. In particular, the following points should be covered:

(a) How can a confidence set be derived from a family of tests ?

(b) How can a test be derived from a confidence set ?

(c) If a confidence set for a parameter θ is derived from a family of tests with level α, what is the level of this confidence set ? Justify your answer.