University of Iceland — May 14th, 2005
Faculty of Economics and Business Administration, (B. Eklund) — 13:30-16:30
Written Exam for course 04.06.23-050

Econometrics MS (Hagrannsóknir í meistaranámi)

Instructions:
Write the solutions in English and in a readable style. Please start each new problem on a blank sheet of paper.

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1. Explain the concept of multicollinearity. What does it mean, what symptoms would indicate multicollinearity in your model, and how can you solve the problem? (6 points)

2. Describe a method how to compare two competing linear models, that is, how to perform a test of

$$\begin{aligned} H_0 &: y = X\beta + \varepsilon_0 \\ H_1 &: y = Z\gamma + \varepsilon_1. \end{aligned}$$

(6 points)

3. Let $x_1, x_2, \ldots, x_n$ be iid lognormally distributed with parameters μ and σ^2. The density function is then given by

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \frac{1}{x} \exp\left(-\frac{(\ln x - \mu)^2}{2\sigma^2} \right),$$

where $x > 0$, and $\exp(a) = e^a$ as usual.

   (a) Obtain the log-likelihood function of the random sample. (2 points)

   (b) Find the maximum likelihood estimators of μ and σ^2. (6 points)

   (c) Obtain the joint asymptotic distribution of the estimators. (6 points)

4. In a multiple regression model of y on a constant, x_1, and x_2 the following results are obtained: $e'e = 33$, $n = 25$,

$$\widehat{y}_t = 0.73 - 0.32x_1 + 0.68x_2,$$

$$(X'X)^{-1} = \begin{bmatrix} 0.062 & -0.028 & 0.026 \\ -0.028 & 0.041 & -0.024 \\ 0.026 & -0.024 & 0.044 \end{bmatrix}.$$

   (a) Which assumptions are needed to be able to perform hypothesis testing on the model parameters? (2 points)

   (b) Test the joint hypothesis that the constant is equal to 0.5 and that the two slopes sum to zero. (Use the critical value 3.10, but make sure you state the test statistic and its distribution.) (6 points)

Hint: The inverse of a 2 by 2 matrix $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is $A^{-1} = \frac{1}{ad-bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$.