SIMON FRASER UNIVERSITY
Department of Economics
ECONOMICS 435
Fall 1992
Final Examination
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STUDENT ID's ONLY PLEASE
Each question worth 20%. Exam 3 hours in duration.

1. Short Answer: Explain briefly each of the following, and give an example if appropriate.

a) degree-of-freedom adjustment
b) equality of t-test and F-test with 1 degree-of-freedom restriction
c) slope dummy variable
d) endogeneity
e) $R\beta = c$
f) MSE criterion
g) third order autoregressive model

2. a) Motivate intuitively the result that $\hat{\beta} = (X'X)^{-1} X'y$ is normally distributed if ε is normally distributed, where $y = X\beta + \varepsilon$. Is there another way to get normality of $\hat{\beta}$ without assuming ε is normally distributed? Why do we care what the distribution of $\hat{\beta}$ is?
b) Do we need normality of ε to show unbiasedness of $\hat{\beta}$? Show unbiasedness of $\hat{\beta}$, listing carefully the assumptions needed. List two misspecifications that can result in biasedness of $\hat{\beta}$, and show biasedness for one of these misspecifications.

3. Suppose I asked you to formulate and estimate a model of consumer spending of individual families on food, write a report on it, and interpret the results. Describe the data you would collect, the model you would form, the specification tests you would perform and the problems you would expect to encounter together with possible solutions you would implement.

$$\begin{aligned}
\gamma_{1,1}\ y_1 + \gamma_{1,2}\ y_2 &= \beta_{1,1}\, x_1 + \varepsilon_1 \\
\gamma_{2,1}\ y_1 + \gamma_{2,2}\ y_2 &= \beta_{2,2}\, x_2 + \beta_{2,3}\, x_3 + \varepsilon_2
\end{aligned}$$

where the Y's are endogenous variables and the X's are exogenous variables.

a) Are these structural or reduced form equations? Discuss *precisely* the identifiability of each equation above.

b) Write down a system of equations that has at least one equation unidentified, and one equation indentified, point out each, and explain the identification rule you use. Write out a system of equations with no equation identified.

c) Suggest 3 variables that would identify a supply equation for wonderbread (a white bread loaf with no nutritional value). Suggest 3 variables that would identify a demand equation for wonderbread.

5. Give a brief explanation for each of the following (answers may be based on arguements appealing to

intuition or more formally based, diagrams may also be of use).
a) Why R^2 cannot fall with the addition of an extra explanatory variable.
b) The impact on OLS estimates of omitting a relevant explanatory variable.
c) Why and how the R^2 statistic should be adjusted.
d) The distinction between structure form equations and reduced form equations, and what the value is of estimating each.

Formulae

Given the Guass-Markov assumptions and the PRF

$$y = X\beta + \varepsilon$$

we have the following from a least squares regression on n observations producing regression residuals e .

$$\hat{se}(e_{n+1}) = \; = \hat{\sigma}\left(X'_{n+1} \; (X'X)^{-1} \;\; X_{n+1} + 1 \right)^{½}$$

Given normality of the innovations ε it follows directly that

$$\frac{e_{n+1}}{\hat{se}(e_{n+1})} \approx t_{n-k}$$

$$b = (X'X)^{-1} X' y$$

$$t = \frac{b_i - \beta_{oi}}{\hat{se}(\, b_i)}$$

$$\hat{se}(\, b_i) = \; s_X^2 \; X_{ii}^{-1}$$

$$X_{ii}^{-1} \; : i^{th} \;\; diagonal \;\; element \;\; of \;\; (X'X)^{-1}$$

$$F = (R\; b - c)'(R\; \hat{var}(\, b)\; R')^{-1}(R\; b - c)/q$$

$$= \frac{(e'_* e_* - e'e)/q}{(e'e)/(n-q)}$$