



STRATHMORE INSTITUTE OF MATHEMATICAL SCIENCES

BBS ACTUARIAL SCIENCE; BBS FINANCIAL ECONOMICS; BBS FINANCE

EXAMINATION

COURSE: INTERMEDIATE ECONOMETRICS

COURSE CODE: BSE 2205

Date: 7th December 2017

Time: 2 hours

Instructions:

The EXAM set has FIVE QUESTIONS.

Answer Question 1 (COMPULSORY) and any other TWO (2) Questions

Question 1 (30 marks)

a) Provide a brief discussion of the following concepts in econometrics (2 marks each):

- (i) Gauss Markov Theorem
- (ii) The Breusch Godfrey test for Autocorrelation
- (iii) Using OLS to analyse Linear Probability Model
- (iv) Generalised Method of Moments Estimation
- (v) Simultaneity bias

b) Consider a financial time series model $Y = X\beta + \mu$ where Y is a $(T \times 1)$ column vector of dependent variable observed through T observations, X is a $(T \times K)$ matrix of K independent variables, β is a matrix of coefficients that describe the relationship between Y and X ; and μ is the vector of random disturbances. Assuming a normal distribution, derive the maximum likelihood estimate for the variance of random disturbances and show that the estimate is lower than the unbiased estimated generated by Ordinary Least Squares procedure (Note: *You need not derive the least squares unbiased estimate for the variance of random disturbances*) (10 marks)

c) Under the classical linear regression analysis, discuss the importance of errors in the regressions being non-serially correlated and non-correlated with the independent variables (10 marks)

Question 2 (20 marks)

- a) Assume that you have conducted regression analysis and discovered that errors are perfectly auto-correlated of order 1 with an autocorrelation coefficient of 1. Describe a solution to consider in addressing this problem using a simple linear regression specification. **(10 marks)**
- b) Prove that among linear and unbiased estimators, OLS estimates would always depict minimum variance. **(10 marks)**

Question 3 (20 marks)

- a) Assume that from a simple regression analysis, an analyst discovered that errors have a variance described by the expression $\sigma^2 X_i^{-4}$. Describe a solution to this problem based on Generalised Least Squares Estimation procedure. Be careful to show that the approach you use generates errors that are homoscedastic **(10 marks)**
- b) Describe an instrumental variable modelling technique and derive the formula for its coefficient / parameter estimates **(10 marks)**

Question 4 (20 marks)

- a) Describe the procedure adopted in the Method of moments estimation technique **(7 marks)**
- b) Probit and Logit Models are improvements of the linear probability model. Discuss **(7 marks)**
- c) Consider the function: $f(X) = \alpha X^{\alpha+4}$ describing the distribution of variable X where α is the parameter of interest to you as an analyst. Derive the Maximum likelihood estimate for $\hat{\alpha}$. **(6 marks)**

Question 5 (20 marks)

- a) Describe the concept of unbiasedness in econometrics and its implication for modelling **(5 marks)**
- b) Describe Goldfeld– Quandt test for Heteroscedasticity and its limitation **(8 marks)**
- c) ‘Multicollinearity is a concept of degree not existence’. Discuss this statement showing the implications of multicollinearity on parameter estimates **(7 marks)**

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