YEAR THREE SEMESTER I

SAS 313: PRINCIPLES OF ECONOMETRICS

INSTRUCTION: Answer Question **One** and any other **Two** questions.

QUESTION ONE

(a) Describe sources of an econometric data (5 marks).

(b) (i) Outline the procedure of a two-sided t-test for testing the coefficients of an econometric model. Assume that you have a model of the form: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$, where β_0, β_1 and β_2 are constants, Y is a dependent variable and X_i's are independent variables (4 marks).

(ii) List three limitations of a t-test (3 marks).

(c) Given a generalized linear econometric model of the form: $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots \beta_n x_n + \varepsilon$; determine:

(a) $E(y)$ and $VAR(y)$

(b) The distribution of y (3marks)

(i) Describe any three methods used in modern econometrics (6 marks).

(ii) $y_i = \beta x_i + \varepsilon_i$, $i = 1,2,\ldots,n$; $\varepsilon_i \sim iiN(0, \sigma^2)$ is a multivariate form of a regression model. Find $\boldsymbol{X'X}$ and $\boldsymbol{e'e}$ (5 marks)

(iv) Define the term Heteroscedasity (2 marks)

(v) List two consequences of heteroskedasity on least squares estimators (2mks)

QUESTION TWO

Given the following data, you are required to find:

(a) $\boldsymbol{X'X}$ and $\boldsymbol{X'Y}$

(b) α and β,the $y - intercept$ and the slope of the linear econometric model of the form:

$$y_i = \alpha + \beta x_i + \varepsilon_i$$

[illegible]	64	81	100	121	144	169	196	225
[illegible]	54	67	53	99	118	138	159	183

(10 marks)

QUESTION THREE

Consider the following equation with the estimated standard errors in parentheses

$$\widehat{W_t} = 8.562 + 0.364P_t + 0.004P_{t-1} - 2.560U_t$$

$$(0.080) \qquad (0.072) \qquad (0.658)$$

Where W_t = wages and salaries per employee in year t

P_t =the price level at year t

U_t = the unemployment rate in year t

(a) Develop a one –sided t-test to test your own hypotheses for the estimated coefficients of P_{t-1} and U_t

(b) Discuss the theoretical validity of P_{t-1} and how your opinion of that validity to this equation might be changed by your answer in (a) above. With a reason explain whether P_{t-1} should be dropped from the equation.

QUESTION FOUR

(a) What do we mean by first-order autoregressive model?(2mks)

(b) Given a simple econometric model of the form: $Y_i = \beta X_i + \varepsilon_i$, where $VAR(\varepsilon_i) = \sigma_i^2$. Show that:

(i) $E(\hat{\beta}) = \beta$ (3 marks)

(ii) $VAR(\hat{\beta}) = \frac{\sum X_i^2 \sigma_i^2}{(\sum X_i^2)^2}$ (5 marks)

(c)Supposing $\sigma_i^2 = \sigma^2 Z_I^2$ where Z_i's are known, show that if β^* is the weighted least squares (WLS) estimator of β,and $\hat{\beta}$ is the ordinary least squares(OLS) estimator of β ,then

$$\frac{Var(\beta^*)}{Var(\hat{\beta})} = \frac{\left(\sum x_i^2\right)^2}{\sum\left(x_i^2 / z_i^2\right)\sum x_i^2 z_i^2}$$

QUESTION FIVE

(a) Describe three economic situations where lag operators can be applied (6mks)

b) Given an econometric model,$Y_t = \alpha + D(L)X_t + U_t$ where D(L) is a polynomial of degree s in its lag operator ,i.e.

$D(L) = \delta_0 + \delta_1 L + \cdots + \delta_s L^s$, show that the mean lag is given by;

$$\frac{\sum_{i=0}^{s} i\delta_i}{\sum_{i=0}^{s} \delta_i}$$ (3marks)

(c) When there is a distributed lag on both Y_t and X_t, we can have the following relationship

$A(L)(Y_t - \alpha) = \alpha B(L)X_t + V_t$ where $A(L) = 1 - \alpha_1 L - \alpha_2 L^2 - \cdots . -\alpha_p L^p$ and $B(L) = \beta_0 + \beta_1 L + \beta_2 L^2 + \cdots + \beta_q L^q$ and $p + q < s$. Prove that:

(i) $D(L) = \frac{B(L)}{A(L)} = \beta_0 + (\alpha_1\beta_0 + \beta_1)L + \alpha_1(\alpha_1\beta_0 + \beta_1)L^2 + \alpha_1^2(\alpha_1\beta_0 + \beta_1)L^2 + \cdots$ (5mks)

(ii) $D(1) = \frac{\beta_0 + \beta_1}{1 - \alpha_1}$ (2mks)

(iii) The mean lag = $\frac{\alpha_1\beta_0 + \beta_1}{(1-\alpha_1)(\beta_0+\beta_1)}$ (3 mks)