

 **MURANG’A UNIVERSITY OF TECHNOLOGY**

**BACHELOR OF BUSINESS ADMINSTRATION WITH IT**

**ACADEMIC YEAR 2016/2017**

**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: $Y=β\_{0}+β\_{1}X\_{1}+β\_{2}X\_{2}+ε$ , 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: $y=β\_{0}+β\_{1}x\_{1}+β\_{2}x\_{2}+…β\_{n}x\_{n}+ ε$; determine:

1. $E(y)$ and $VAR(y)$
2. The distribution of $y$ (3marks)

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

 (ii) $y\_{i}=βx\_{i}+ε\_{i}$ , $i=1,2,…,n$ ; $ε\_{i}\~iiN(0, σ^{2})$ is a multivariate form of a regression model. Find $X^{'}X$and $e^{'}e$(5 marks)

1. Define the term Heteroscedasity (2 marks)
2. List two consequences of heteroskedasity on least squares estimators (2mks)

**QUESTION TWO**

 Given the following data, you are required to find:

 (a)$X^{'}X$ and $X^{'}Y$

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

$$y\_{i}=α+βx\_{i}+ε\_{i}$$

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| $$x\_{t}$$ | 64 | 81 | 100 | 121 | 144 | 169 | 196 | 225 |
| $$y\_{t}$$ | 54 | 67 | 53 | 99 | 118 | 138 | 159 | 183 |

 (10 marks)

**QUESTION THREE**

Consider the following equation with the estimated standard errors in parentheses

$$\hat{W\_{t}}=8.562+0.364P\_{t}+0.004P\_{t-1}-2.560U\_{t}$$

 (0.080) (0.072) (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: $Y\_{i}=βX\_{i}+ε\_{i}$ , where $VAR\left(ε\_{i}\right)=σ\_{i}^{2}$. Show that:

 (i) $E\left(\hat{β}\right)=β$ (3 marks)

 (ii) $VAR\left(\hat{β}\right)=\frac{\sum\_{}^{}X\_{i}^{2}σ\_{i}^{2}}{\left(\sum\_{}^{}X\_{i}^{2}\right)^{2}}$ (5 marks)

 (c)Supposing $σ\_{i}^{2}=σ^{2}Z\_{I}^{2}$ where $Z\_{i}$’s are known, show that if $β^{\*}$ is the weighted least squares (WLS) estimator of $β,$and $\hat{β}$ is the ordinary least squares(OLS) estimator of $β$ ,then

$$\frac{Var(β^{\*})}{Var(\hat{β})}=\frac{\left(\sum\_{}^{}x\_{i}^{2}\right)^{2}}{\sum\_{}^{}\left(^{x\_{i}^{2}}/\_{z\_{i}^{2}}\right)\sum\_{}^{}x\_{i}^{2}z\_{i}^{2}}$$

**QUESTION FIVE**

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

 b) Given an econometric model,$Y\_{t}=α+D\left(L\right)X\_{t}+U\_{t}$ where D(L) is a polynomial of degree s in its lag operator ,i.e.

$D\left(L\right)=δ\_{0}+δ\_{1}L+…+δ\_{s}L^{s}$, show that the mean lag is given by;

 $\frac{\sum\_{i=0}^{s}iδ\_{i}}{\sum\_{i=0}^{s}δ\_{i}}$ (3marks)

 (c) When there is a distributed lag on both $Y\_{t}$ and $X\_{t}$, we can have the following relationship

 $A\left(L\right)\left(Y\_{t}-α\right)=αB\left(L\right)X\_{t}+V\_{t}$ where $A\left(L\right)=1-α\_{1}L-α\_{2}L^{2}-….-α\_{p}L^{p}$ and $B\left(L\right)=β\_{0}+β\_{1}L+β\_{2}L^{2}+…+β\_{q}L^{q}$ and $p+q<s$ . Prove that:

1. $D\left(L\right)=\frac{B(L)}{A(L)}=β\_{0}+\left(α\_{1}β\_{0}+β\_{1}\right)L+α\_{1}\left(α\_{1}β\_{0}+β\_{1}\right)L^{2}+α\_{1}^{2}\left(α\_{1}β\_{0}+β\_{1}\right)L^{2}+…$ (5mks)

1. $D\left(1\right)=\frac{β\_{0}+β\_{1}}{1-α\_{1}}$ (2mks)
2. The mean lag $=\frac{α\_{1}β\_{0}+β\_{1}}{\left(1-α\_{1}\right)\left(β\_{0}+β\_{1}\right)}$ ( 3 mks)