## FIRST SEMESTER, 2016/2017 ACADEMIC YEAR

## THIRD YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS

## ECO 412: ECONOMETRICS I

**EXAMINATION SESSION: DECEMBER 2016** **YEAR: 2016**

**INSTRUCTIONS**

**(i) Answer question ONE and any Other THREE questions**
**(ii) Do not write on the question paper**
**(iii)Show your working clearly**

**QUESTION ONE – 25 MARKS**

a) Explain the main branches of econometrics **(3 marks)**

b) Briefly outline the general assumption underlying the simple classical linear regression model. **( 5 marks)**

c) Explain the main steps that constitute an econometric research methodology **(5 marks)**

d) Two variables X and Y are connected by the equation $Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t$ with parameters $\beta_0$ and $\beta_1$ and estimators $\hat{\beta}_0$ and $\hat{\beta}_1$. The estimated relationship is $\hat{Y}_t = \hat{\beta}_0 + \hat{\beta}_1 X_t$. Derive the least square estimators $\hat{\beta}_0$ and $\hat{\beta}_1$. **(6 marks)**

e) Briefly explain and give the remedies to the three econometric problems **(3 marks)**

f) Briefly explain three reasons for time lags **(3 marks)**

**QUESTION TWO – (15 MARKS)**

a) The following data refers to the demand for Tomatoes Y, in Kg and the price of Tomatoes X, in Kshs. per Kg on 10 different market stalls.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Y | 99 | 91 | 70 | 79 | 60 | 55 | 70 | 101 | 81 | 67 |
| X | 22 | 24 | 23 | 26 | 27 | 24 | 25 | 23 | 22 | 26 |

i. Specify and estimate the parameters of the model **(6 marks)**

ii. Interpret your result in above **( 2 marks)**

iii. Calculate average price elasticity of demand when the price of tomatoes equal to 7.5 units

(2 marks)

b) The following results have been obtained from a sample of 31 observations on the value of sales, Y of a firm and the corresponding prices, X.

$\overline{X} = 216.24$, $\overline{Y} = 173.57$, $\sum X_t Y_t = 921{,}514$, $\sum X_t^2 = 713{,}644$, $\sum Y_t^2 = 342{,}316$.

i) Estimate the linear sales function for this commodity **(1 marks)**

ii) Calculate the price elasticity of demand **(1 marks)**

iii) Find the unexplained variations and interpret **(3 marks)**

**QUESTION THREE – (15 MARKS)**

a)Assuming that the model $Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t$ is correctly specified

i. Proof the OLS assumption of Homoscedasticity **(3 marks)**

ii. Proof the OLS assumption of no Autocorrelation **(4 marks)**

iii. Proof the OLS assumption that the error term $\varepsilon_t$ is independent of the explanatory variable **(4 marks)**

a) Given the function

$$\hat{Y} = 234.68 + 14.72X \quad \text{and } n=71$$
$$s.e \quad (33.67) \quad (3.41)$$

Construct the confidence interval for $\beta_0$ and $\beta_1$ at 99% confidence level. **(4 marks)**

**QUESTION FOUR – (15 MARKS)**

a) The admission officer of a college rated accepted applicants chances of success at the college as poor, good, or excellent. The college's cumulative grade index is a scale from 1 (lowest) to 12. Three random samples of students, one sample for each chance-of-success rating, were selected. The table below shows the cumulative grade indexes of the sample students. Perform an ANOVA test by mean of squares at the 5% level of significance to determine whether mean cumulative grade indexes for the chance-of-success ratings are equal.

| Chance of success rating | | |
|---|---|---|
| Poor | Good | Excellent |
| 6.8 | 7.3 | 6.3 |
| 5.4 | 5.9 | 10.3 |
| 4.2 | 6.4 | 8.9 |
| 6.5 | 8.2 | 11.1 |

| | | |
|---|---|---|
| 6.6 | 4.0 | 9.4 |
| 7.1 | 6.7 | 8.6 |
| 6.9 | 7.6 | 9.5 |
| 7.5 | 9.0 | 7.0 |
| 7.3 | 10.3 | 8.2 |

**(8 marks)**

b) Use Cramer's Rule to solve simultaneous equation

$6x - 22y + 19z = 41$

$-7z - 21y + 12x = -34$

$14y + 9x - 13z = -56$ **(7 marks)**

**QUESTION FIVE – (15 MARKS)**

a) Suppose you are given the function $\begin{array}{l} y = 83.61 \ + 1.47x_1 - 0.76x_2 \\ s.e \ \ (7.32) \ \ (0.84) \ \ \ (-0.24) \end{array}$

Also, $R^2 = 0.819, \quad n = 59 \quad \& \quad F_c = 84$

i) Test whether each of the estimators is significant **(4 marks)**

ii) Test whether all the estimators are jointly significant at 1% level **(2 marks)**

iii) Construct confidence interval for $\beta_2$ **(2 marks)**

b) Assume that demand for good(Q)depends on its ownprice (P), income(M)and the price of a substitute good (S) according to the demand function $Q_i = \beta_1 P_i + \beta_2 M_i + \beta_3 S_i + \varepsilon$

where β1, β2, and β3 are parameters whose values are not yet known and the subscript i denotes the observation number.

| n | Y | $X_1$ | $X_2$ | $X_3$ |
|---|---|---|---|---|
| 1 | 240 | 10 | 12 | 20 |
| 2 | 150 | 5 | 8 | 15 |
| 3 | 300 | 12 | 18 | 20 |

Find the values of $\beta_1$, $\beta_2$, and $\beta_3$ by setting up the relevant system of simultaneous equations in matrix format and solving using the inverse matrix. Use the vector of parameters β that you have found to predict the value of Q. **(7 marks)**

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