UGANDAMARTYRS UNIVERSITY
NKOZI

UNIVERSITY EXAMINATIONS
May 2023
FACULTY OF SCIENCE
DEPARTMENT OF MATHEMATICS & STATISTICS

STA 3101: REGRESSION MODELS

BSc. Econ & Stat. III

DATE: **19/05/2023**

TIME: **2:00 pm - 5:00 pm**

DURATION: **3 HRS**

Instructions:

1. *Carefully read through ALL the questions before attempting*
2. **ANSWER Four (4) Questions**. *(Each question carries equal marks)*
3. *No **names** should be written anywhere on the examination book.*
4. *Ensure that your **ID number** is indicated on all pages of the examination answer booklet.*
5. *Ensure your work is **clear** and **readable**. Untidy work shall be penalized*
6. *Any type of examination Malpractice will lead to automatic disqualification*
7. *Do not write anything on the questions paper.*

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QUESTION 1

(a) Explain the following terms as applied to regression models
   (i)   Endogenous variable
   (ii)   Explanatory variable
   (iii)   Stochastic model
   (iv)   Disturbance/noise term [1 marks @]

   (b) The following data shows consumption expenditure (C) and income (Y) for a sample of 10 people in a certain town

C	70	65	90	95	110	115	120	140	150	155
Y	80	100	120	140	160	180	200	220	240	260

   (i)   Estimate the consumption expenditure, $C_i = \beta_0 + \beta_1 Y_i$, give its interpretation [15 marks]

   (ii)   Estimates the income, if the consumption expenditure (C) is 200 .[6 marks]

QUESTION 2

(a) What is the importance of the following in econometric modelling?
   (i) Coefficient of determination   (ii) t-test   [2 marks @]
(b) Give and explain example of a stochastic model [6 marks]
(b) List the importance (s) of error term (noise) in any given model [3 marks]
© Consider the table below

X_i	10	11	12	13	14
Y_i	40	46	44	55	45

Use matrix method and,

   (i)   estimate regression function $Y_i = \beta_0 + \beta_1 X_i$ [10 marks]
   (ii)   give the econometric meaning of the estimated function [2 marks]

QUESTION 3

   (a) State any five (5) assumptions of linear regression models [5 marks]
   (b) Given a regression function, Financial Status (y) = α + 0.23(Age) +0.36(Education level) - 0.51 (H/Hold size) -0.94 (m/status) + €,
      (i)   Interpret the model coefficients [5 marks]
      (ii)   State the importance of the error term in a given regression function. [5 marks]

© The table below shows data that was collected when a procurement manager wanted to find out whether there was a relationship with the age of vehicles and cost of maintenance.

Age of a vehicle (x) in years	5	10	15	20	25
Cost of maintenance (y) in thousands	190	230	220	300	350

(i)   Fit a regression model y on x and interpret the parameter estimates. **[5 marks]**

(ii)   Determine the age (years) of a car which needs the cost of 285(thousands) for maintenance. **[5 marks]**

QUESTION 4

Given a stochastic demand function $Qt = \alpha + \beta P_t + e_i$, where Qt is the quantity demanded of a good, P_t is the price and ei is the error term. The sales department of ABC supermarket provided the data below. Use the information to answer the questions (a) to (d).

Derivations are not required but write the exact formulae without changing variable names where necessary and use them accordingly.

Month	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct.
Pt	220	210	130	90	75	70	62	54	36	22
Qt	1	3	5	7	9	10	11	12	13	15

(a) Find and interpret the Odds Least Squares (OLS) estimates of α and β. **[15 marks]**

(b) Write the estimated demand function (regression model). **[5 marks]**

(c) Estimate price of a good, when quantity demanded is 20 units. **[5 marks]**

QUESTION 5

(a) Write short notes about Poisson regression, Cox regression, logistic regression and Tobit regression. **[15 marks]**

(b) State the key areas for each of the above cases where they are suitable for application and give examples of each.**[10 marks]**

QUESTION 6

(a) Regression models help in determining the degree of relationship between two or more variables but do not tell us anything about cause and effect relationship. Discuss. **[5 marks]**

(b) The manager of a firm thinks that there is a relationship in a form of a linear regression between advertising expenditures and sales. That other things

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remaining constant, the more one invests in advertising the more the sales. He studied the relationship between these variables and below is his findings.

Advertising costs($) X	40	20	25	20	30	50	40	20	50	40	25	50
Sales ($) Y	385	400	395	365	475	440	490	420	560	525	480	510

REQUIRED

(i) Fit a regression line using least squares method and interpret the parameter estimates. **[10 marks]**

(ii) Using the fitted line, what would be the sales with an advertising budget of $ 45? **[5 marks]**

(iii) What would be the advertising budget be if we want sales of $500? **[5 marks]**

END