UGANDA MARTYRS UNIVERSITY

NKOZI

UNIVERSITY EXAMINATIONS

END OF SEMESTER TWO FINAL ASESSMENT 2021/2022

BSC III GEN & BSC III ECON & STAT

ECONOMETRICS II

DATE: Wednesday 20 July 2022

TIME: 09:30am – 12:30pm

Instructions:

1. *Attempt any **FOUR (04)** questions*
2. *All questions carry equal marks*
3. *Do not write anything on the questions paper.*
4. *Carefully read through ALL the questions before attempting.*
5. *No **names** should be written anywhere on the examination booklet.*
6. *Ensure your work is **clear** and **readable**. Untidy work shall be penalized.*
7. *Any type of examination Malpractice will lead to automatic disqualification.*
8. *Ensure that your **ID number** is indicated on all pages of the examination answer booklet.*

Question ONE

Household savings in Mpigi District depend on accumulated wealth (W) and income level (Y). Suppose you are given the following summarized data for a sample of 280 households.

$\bar{S} = 50$, $\bar{W} = 10$, $\bar{Y} = 15$, $\sum s^2 = 1000$, $\sum w^2 = 100$ $\sum y^2 = 200$, $\sum sw = 100$, $\sum sy = 400$, $\sum wy = 0$. The lower cases denote deviations from the sample mean values.

(a) Fit the savings model $S = \beta_0 + \beta_1 W + \beta_2 Y$ (9*marks*)

(b) Interpret the coefficients in the savings model (3*marks*)

(c) Compute the standard error of the estimate of β_1. (5*marks*)

(d) Compute and interpret the value of $\mathbf{R^2}$. (4*marks*)

(e) Estimate the 95 % confidence interval for β_1 (Use Z-critical=1.96) (4*marks*)

Question TWO

(a) Write down the simple functional form of the stochastic log-linear model and show the derivations required to interpret the slope parameter as elasticity. (5*marks*)

(b) Survey data was collected from a sample of smallholder farmers to investigate the impact of the extension program on household per capita income, controlling for other household characteristics. An appropriate model was used at multivariate level and the model results are summarized in the table below:

reg *PCPITA EXT HHSIZE CULT_LAND*

Source	*df*	*SS*	*MSS*	*F-Ratio*	*Prob. value*
Model	3	52393	17464	11.79	0.000
Residual	568	630770	1110.5		
Total	572	683163	1194.3		

Regression Dep. Var, Y: Household per capita income

Ind. variables	*Coef.*	*Std. Error*	*t-statistic*	*Prob. Value*
EXT	195422	92182.91	2.12	0.034
HHSIZE	-95453.61	14813.52	-6.44	0.000
CULT_LAND	60496.45	25971.94	2.33	0.220
_Const	1225566	123450.9	9.93	0.000

0.05 level of significance

The model variables are explained as shown below

PCPITA = Household per capita income (in shillings)

EXT = 1 if the household participated in the extension program, 0 if otherwise

HHSIZE = Total household size

CULT _ LAND = Total amount of land cultivated by the household (in hectares)

Required:

(i) Identify the type of model used for multivariate analysis and why? (2*marks*)

(ii) Interpret the partial slope coefficients in the model and comment on their statistical significance levels (6*marks*)

(iii) How many smallholders were sampled? (1*mark*)

(iv) Compute the value of adjusted R^2 and give its interpretation (4*marks*)

(v) Comment on the overall significance of the model (2*marks*)

(vi) Estimate the per capita income of the household that participated in the extension program with seven members and cultivating two hectares of land (3*marks*)

(vii) As an economist, what would be your policy recommendations in relation to the findings of the study (2*marks*)

Question THREE

(a) Distinguish between the following terms, giving examples where possible

(i) ANOVA models and ANCOVA models (4*marks*)

(ii) Dummy variable and base category (4*marks*)

(iii) Ordinal variables and nominal variables (4*marks*)

(b) HB Ltd is a company specializing in real estate business. Given its long standing experience in such business, the managing director of HB Ltd believes that the price of the house (in dollars) depends on the number of rooms (RMS), amount of pollution (NOX) and its location (LOC), a dummy variable defined as LOC = 1 if the house is located in the urban area; 0 otherwise. To verify whether this relationship holds, data was collected for 100 houses which resulted in the following ordinary least squares model:

$$PRICE = \underset{(115.5)}{5200} - \underset{(0.09)}{0.25}\,NOX + \underset{(7.1)}{23.6}\,RMS + \underset{(16.8)}{85.3}\,LOC$$. Standard errors in parenthesis

Required.

(i) Identify the type of model used in the study above (2*marks*)

(ii) Interpret the parameter estimates of the explanatory variables in the model (3*marks*)

(iii) What is the price of a house with 5 rooms located in an urban environment with 2000 cubic concentration level of carbon dioxide? (4*marks*)

(iv) Test at 5% level of significance whether there is a significant difference in price of the houses based on its location (Use Z-critical=1.96) (4*marks*)

Question FOUR

(a) What are limited dependent variable models? (2*marks*)

(b) The simple binary logit model below was estimated to study conservation technology adoption decisions for a sample of 50 households in a certain village who were exposed to a certain conservation programme by a certain non- governmental organization.

$$\hat{Y} = 0.38 + 0.21X \qquad R^2 = 0.96$$
$$(0.12)\ (0.05)$$

Where $\hat{Y} = 1$ If the household adopted the conservation technology; **0** if otherwise
X = Farming experience (in years)

(i) Interpret the logits in the model (4*marks*)

(ii) For each logit, calculate the odds ratios and give their interpretations (6*marks*)

(iii) Compute and interpret the probability of conservation technology adoption for a household with farming experience of 5 years (5*marks*)

(iv) Compute and interpret the marginal effect of conservation technology adoption for a household whose farming experience is 5 years. (4*marks*)

(c) What are the shortcomings of Linear Probability Models that have given rise to logit and probit models? (4*marks*)

Question FIVE

(a) Autocorrelation is a serious problem especially in time series regression models. As a statistician;

(i) What do you understand by the term autocorrelation? (2*marks*)

(ii) Give any four sources of autocorrelation in regression models (4*marks*)

(iii) Give any four consequences of using OLS in the presence of autocorrelation in regression models (4*marks*)

(iv) Explain the procedure you would take to detect autocorrelation in a regression model using the Durbin-Watson test (6*marks*)

(v) Give any four limitations you are likely to encounter when using the Durbin-Watson test to test for autocorrelation in a regression models. (4*marks*)

of the houses (4marks)

(b) A researcher obtained the following results for a study of personal consumption expenditure for 60 consumers. (figures in the parentheses are the standard errors).

$$Y_t = -5.74 + 0.129X_t + 0.13Y_{t-1}$$
$$(1.39)\quad (0.29)\quad (0.112)$$
$$R^2 = 0.942 \qquad DW=2.18$$

Where Y_t = personal consumption expenditure

X_t = Personal disposable income

Y_{t-1} = Lagged personal consumption expenditure

Test for the presence of autocorrelation in the regression model. (*5marks*)

Question SIX

(a) What is meant by the term multicollinearity and how does it arise? (*5marks*)

(b) Given a multiple linear regression model $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + u_i$. Show that in the presence of perfect multicollinearity, the parameter estimates of the independent variables become indeterminate. (*8marks*)

(c) What do you understand by the term heteroscedasticity and when does it arise? (*5marks*)

(d) Outline any three (3) consequences of heteroscedasticity in economic modelling. (*3marks*)

(e) Given the following data

RSS_1 based on the first 30 observations = 55, df = 25

RSS_2 based on the second 30 observations = 140, df = 25

Carry out the Goldfeld-Quandt test of heteroscedasticity at 5% level of significance. (Use the critical value = 1.94) (*4marks*)

END (GOOD LUCK)