



# MANICALAND STATE UNIVERSITY OF APPLIED SCIENCES

**FACULTY OF AGRIBUSINESS AND COMMERCE**

**Agricultural Economics and Development**

**ECONOMETRICS II**

**CODE: HACE417**

**SESSIONAL EXAMINATIONS**

**JULY 2022**

**DURATION: 3 HOURS**

**EXAMINER: MR N. CHIPUNZA**

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## ***INSTRUCTIONS***

- 1. Answer any 5 questions*
- 2. Start a new question on a fresh page*
- 3. Total marks 120*

*Additional material(s): Calculator*

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### Question 1

- i. State the two qualities that a valid instrument must have in instrumental variable (IV) estimations. [6]
- ii. Interpret the difference between the IV and OLS estimates of the coefficient on X in the model below. [8]

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

$$\text{Cov}(X_i, \varepsilon_i) \neq 0$$

- iii. How do the IV and OLS estimates compare if the instrument is weak and the sample is small? [6]

### Question 2

A. Suppose a series.  $Y_t$ , is modelled by the following three equations:

$$y_t = \phi + e_t \quad (1)$$

$$e_t | I_{t-1} \sim N(0, h_t) \quad (2)$$

$$h_t = \alpha_0 + \alpha_1 e_{t-1}^2, \alpha_0 > 0, 0 \leq \alpha_1 < 1 \quad (3)$$

- i. How would you describe this model and why? [6]
  - ii. Describe the distribution of the error term in equation (2) [6]
- B. In a GARCH( $p, q$ ) model, what do the  $p$  and  $q$  indicate? [8]

### Question 3

- i. What are the dummy variables? [5]
- ii. Discuss briefly the features of the dummy variable regression model [7]
- iii. Discuss the uses of dummy variables. [8]

### Question 4

If your model has heteroskedastic error terms, what would you do?

- i. If you do not know the functional form of the error variance. [6]

- ii. If you suspect that the error variance is homoscedastic within a group but not across groups. [7]
- iii. If you know that the error variance is a function of one continuous variable i.e, if  $var(e_i) = \sigma_i^2 = \sigma^2 w_i$ , where  $w_i$  is a continuous variable. [7]

**Question 5**

- a. *The values of each  $X_{ik}$  are not random and are not exact linear functions of the other explanatory variables.*
- b.  $var(e_i) = \sigma^2$
- c. *The least squares estimators are BLUE.*
- d.  $cov(y_i, y_j) = cov(e_i, e_j) = 0; \quad (i = j)$

- i. Which of the assumptions below are necessary for the multiple regression model. [4]
- ii. State what the assumptions are and why they are necessary. [4]
- iii. Explain briefly why the remaining option is not a necessary assumption. [4]
- iv. A model estimated using a dataset with 125 observations generates the following results.

	<b>SS</b>	<b>df</b>	<b>MS</b>
Regression	919587.543	4	229896.9
Error	2590390.62	121	534.2113

<b>Variable</b>	<b><math>\beta</math></b>	<b>Std. Error</b>	<b>t</b>	<b><math>P &gt;  t </math></b>
$x_1$	-0.012655	0.005519	-2.28937	0.022
$x_2$	0.5957923	0.014482	41.13934	0.000
$x_3$	1.124589	0.877192	1.282032	0.200
$x_4$	0.3237421	0.060709	5.332661	0.000
Constant	8.86016	1.766116	5.016749	0.000

- i. What is the  $R^2$  for this sample? [4]
- ii. What information does the  $R^2$  provide? [4]

**Question 6**

- i. Explain the problem of multicollinearity and its types. [5]
- ii. Explain the methods for detection of multicollinearity. [5]
- iii. Describe the consequences of multicollinearity. [5]
- iv. How would you proceed for estimation of parameters in the presence of perfect multicollinearity? [5]

**Question 7**

Explain when variable  $y_t$  is said to Granger-cause  $x_t$ , and outline the steps involved in conducting a Granger causality test. [20]

**END OF EXAMINATION**