



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF COMMERCE, HUMAN SCIENCES AND EDUCATION**

**DEPARTMENT OF ECONOMICS, ACCOUNTING AND FINANCE**

<b>QUALIFICATION:</b>	<b>BACHELOR OF ECONOMICS HONOURS DEGREE</b>		
<b>QUALIFICATION CODE:</b>	08HECO	<b>LEVEL:</b>	8
<b>COURSE CODE:</b>	AEM810S	<b>COURSE NAME:</b>	APPLIED ECONOMETRICS
<b>SESSION:</b>	JUNE 2023		
<b>DURATION:</b>	3 HOURS	<b>MARKS:</b>	100

<b>FIRST OPPORTUNITY QUESTION PAPER</b>	
<b>EXAMINER(S)</b>	Prof. Tafirenyika Sunde
<b>MODERATOR:</b>	Dr. Reinhold Kamati

<b>INSTRUCTIONS</b>
1. Answer ALL the questions. 2. Write clearly and neatly. 3. Number the answers clearly.

**PERMISSIBLE MATERIALS**

1. Ruler
2. Calculator

**THIS QUESTION PAPER CONSISTS OF 4 PAGES**

**QUESTION 1 [20 MARKS]**

- a) What is the difference between time-series and cross-sectional data?[5]
- b) Explain the purpose of the following diagnostic tests and state their hypotheses and decision rules.
- i. Normality [2]
  - ii. Autocorrelation [2]
  - iii. Heteroscedasticity [2]
  - iv. Ramsey RESET [2]
  - v. CUSUM [2]

- c) Given the following unrestricted OLS regression equation

$$Y_t = B_0 + B_1X_{1t} + B_2X_{2t} + B_3X_{3t} + B_4X_{4t} + B_5X_{5t} + e_t$$

- i. State the hypothesis and decision rule used to test whether  $X_2$ ,  $X_3$  and  $X_4$  are redundant variables. [4]
- ii. If the explanatory variables in question c) i. are redundant, how would the adjusted coefficient of determination be affected? [1]

**QUESTION 2 [20 MARKS]**

- a) What properties of time series data would make Ordinary Least Squares (OLS) results spurious? [4]
- b) State the characteristics of the spurious OLS regression equation. [4]
- c) Why should one conduct the unit-roots tests? [4]
- d) State the Augmented Dickey-Fuller (ADF) equations used to test for unit roots. [4]
- e) Compare and contrast the Dickey-Fuller and the Augmented Dickey-Fuller tests for unit roots [4]

**QUESTION 3 [20 MARKS]**

- a) Under what circumstances do you use the ARDL econometrics method?
- b) Given Gross Domestic Product (Y), Capital (K) and Labour (L) variables, where Y is the dependent variable, and K and L are independent variables, answer the following questions:
- i. Write the ARDL equation for the three variables. [4]

- ii. How do you test for cointegration using the above equation in b) i.? State the hypothesis and decision rule. [4]
- iii. If cointegration is confirmed, state the ARDL-ECM for these three variables. [4]
- iv. Write down the short-run and long-run parameters in the ARDL-ECM equation. [4]
- v. Explain the importance of the coefficient of the error correction term in the ARDL-ECM model. [4]

**QUESTION 4 [20 marks]**

The results below relate to the model, which has GDP per capita (GDPC) as the dependent variable and capital (CAPITAL), Government Consumption Expenditure (GCE), exports (EXPORT) and imports (IMPORT) as the independent variables. Use the information to:

- a) Interpret the bounds test results in Table 1. [4]
- b) Interpret the significance of the short-run coefficients. [4]
- c) Interpret the meaning of the long-run coefficient results. [4]
- d) Interpret the diagnostic tests shown (note that the probability values are in brackets). [4]
- e) Given the results in (d) above, what is your overall conclusion about the robustness of the estimated model? [4]

**Table 1: Bounds Test**

		<b>Model 1</b>	
F-statistic		8.6670	
Asymptotic	10 bound	11 bound	
10%	2.260	3.350	
5%	2.620	3.790	
1%	3.410	4.680	

**Source:** Authors' compilation



**Table 2: Model 1 ARDL Error Correction Results**

Dependent Variable: $\Delta$ GDPC)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\Delta$ GDPPC <sub>t-1</sub>	0.718561	0.109843	6.541717	0.0000
$\Delta$ CAPITAL	0.023534	0.007184	3.275855	0.0021
$\Delta$ CAPITAL <sub>t-1</sub>	0.023481	0.007666	3.063024	0.0038
$\Delta$ GCE	0.098649	0.040458	2.438287	0.0190
$\Delta$ GCE <sub>t-1</sub>	0.064403	0.041016	1.570206	0.1237
$\Delta$ EXPORT	0.193348	0.052318	3.695652	0.0006
$\Delta$ EXPORT <sub>t-1</sub>	0.170057	0.049054	3.466700	0.0012
$\Delta$ IMPORT	-0.107918	0.039872	-2.706626	0.0097
$\Delta$ IMPORT <sub>t-1</sub>	-0.089017	0.041593	-2.140167	0.0381
ECT <sub>t-1</sub>	-0.092793	0.018807	-4.933906	0.0000
R-squared	0.779004			
Adjusted R-squared	0.707051			
$\chi^2$ Serial	0.345567 (0.7686)			
$\chi^2$ ARCH	0.359706 (0.5526)			
$\chi^2$ Normal	0.364725 (0.8333)			
$\chi^2$ RESET	0.609020 (0.4443)			

**Source:** Authors' compilation

**QUESTION 5 [20 marks]**

- What is the difference between a static and a dynamic model? [2]
- State an AR(2) model using the variable GDP. [2]
- State a distributed lag model (DLM) using variable GDP as the dependent variable and PCE as the independent variable. [2]
- State the Auto Regressive Distributed Lag Model (ARDL) using the variable GDP and gross fixed capital formation (GFCF), where GDP is the dependent variable. [4]
- Given the following estimated ARDL equation where GDP is gross domestic product, PCE is personal consumption expenditure, and PDI is personal disposable income.

$$GDP_t = 50 + 0.5GDP_{t-1} + 0.4PCE_t + 0.2PCE_{t-1} + 0.2PDI_t + 0.1PDI_t$$

- What are the instantaneous impact multipliers associated with PCE and PDI? [2]
- What are the cumulative short-run multipliers of PCE and PDI after one period? [2]
- Determine the long-run multipliers with respect to PCE and PDI. [6]