AFRICA UNIVERSITY
A United Methodist-Related Institution

"Investing in Africa's Future"

COLLEGE OF HEALTH, AGRICULTURE & NATURAL SCIENCES

NAEC 503: APPLIED ECONOMETRICS

END OF FIRST SEMESTER FINAL EXAMINATIONS

NOVEMBER/DECEMBER 2022

LECTURER: PROF L. DUBE

DURATION: 3 HOURS

INSTRUCTIONS

1. Do not write your name on the answer sheet
2. Use Answer Sheets Provided
3. Begin your answer for Each Question on a New Page
4. Credit is Given for Neat Presentation

INSTRUCTIONS TO CANDIDATES

Answer Question 1 and any other three questions from the remaining questions. Question 1 carries 40 marks while the other questions carry 20 marks each. (Show all workings, steps and formulas to obtain full scores)

Question 1

The following table shows data relating aggregate consumption expenditure in the US (US billions US$) to aggregate disposable income X (US billions US$) for 12 years.

Years	**Aggregate Consumption Expenditure (US$ billions) - Yi**	**Aggregate Disposable Income (US$ billions) - Xi**
1971	102	114
1972	106	118
1973	108	126
9174	110	130
1975	122	136
1976	124	140
1977	128	148
1978	130	156
1979	142	160
1980	148	164
1981	150	170
1982	154	178

NOTE:

$\Sigma Y_i = 1524$ $\Sigma X_i = 1740$ $\Sigma X_i Y_i = 225124$ $\Sigma Y_i^2 = 197232$ $\Sigma X_i^2 = 257112$

$\Sigma U_i^2 = 115.28$

a) State the relationship between the two variables in (i) exact form (ii) stochastic form. (5%)
b) Find the value of the Marginal Propensity to Consume (MPC) and the Marginal Propensity to Save (MPS) for the consumption schedule. (10%)
c) Find the value of autonomous consumption. (5%)
d) Calculate the standard errors of the MPC and autonomous consumption. (5%)
e) Assess the goodness of fit of the estimated regression line by calculating R^2 and explain briefly what it means. (5%)
f) Conduct hypothesis testing to inquire whether aggregate disposable income is a significant regressor for aggregate consumption expenditure. (5%)
g) Construct the ANOVA table. (5%)

Question 2

Suppose you used the dummy variable to run the saving-income regression for the years from 1980 to 1995 and obtained the estimated results as

$\widehat{\textbf{Saving}}_t$	= 1.0161	+152.478 $\mathbf{D}_t$	+0.0803 $\textbf{Income}_t$	-0.0051($\mathbf{D}_t \bullet \textbf{Income}_t$)
se	= (0.0503)	(160.6090)	(0.0401)	(0.0021)

N=30 R^2=0.936 $\overline{R}^2$=0.9258 SEE=0.1217 DW=0.9549

Where D_t = 1 for 1982-1995
= 0 for 1970-1981

i) Write the estimated saving-income relationships for the two different periods? (6%)
ii) Test whether there is any structural change in the regression? (7%)
iii) If your professor said that you should use the "Chow" test to carry out the test of stability among the data, clearly state are the procedures of "Chow" test and the F-statistic? (7%)

Question 3

A researcher used OLS to estimate the following demand for money function for Mutare town over the 39-year period 1969 to 2007.

$$\log (M/P) = b_0 + b_1 \log (i) + b_2 \log (Y/P) + b_3 \log (L/P) + u$$

$$\log (M/P) = 2.310 - 0.761 \log(i) + 0.008 \log(Y/P) + 0.012 \log(L/P)$$
s.e. (0.11) (0.44) (0.001) (0.006)

where: M = quantity of nominal money demanded,
i = interest rate,
L = nominal amount of liquid assets, and
P =price index (to deflate nominal values, to eliminate changes in purchasing power).

The residuals (e_t) showed that $\Sigma e_t^2 = 1.0567$ and $\Sigma (e_t - e_{t-1})^2 = 0.2240$.

Based on this information, the researcher decided to re-estimate the demand for money function, using the first differences of the original variables.

i) Calculate the Durbin-Watson $\underline{d}$ statistic. (10%)
ii) Does the value of $\underline{d}$ justify the 'first differences' solution, adopted by the researcher? (10%)

Question 4

a) Explain the justification for the inclusion of a disturbance term in a regression analysis. (3%)

b) Economic theory postulates exact relationships between economic variables. Consider the following economic relationships.

Supply function $S_x = \beta_0 + \beta_1 P_x + \beta_2 P_f$

where S_x = quantity supplied; Px = price; P_f = price of factor inputs

Cost function $C = \beta_0 + \beta_1 X$

where C = total cost; X = total output

Liquidity preference $L = \beta_0 + \beta_1 r + \beta_2 Y$

where L = demand for money; r = interest rate; Y = gross income

i) What is the meaning of exact relationships? (3%)

ii) Fully explain the economic meaning of each of the coefficients (β_0; β_1; β_2) in each of the above relationships? (10%)

iii) What would you expect the sign of the coefficients to be in each of the above cases? (4%)

Question 5

Suppose you regress Y on X_2, X_3 X_4, and X_5 as following:

$$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + u_1$$

Y = the number of wildcats drilled (Thousands)
X_2 = price at the wellhead in the previous period (in constant dollars, 1972=100)
X_3 = domestic output ($millions of barrels per day)
X_4 = GNP constant dollars ($billions)
X_5 = trend variable
The regression result is obtained from EVIEWS as follow:

Equation: EQ01 Workfile: TABLE7-7

View | Procs | Objects | Print | Name | Freeze | Estimate | Forecast | Stats | Resids

Dependent Variable: Y
Method: Least Squares
Date: 02/25/03 Time: 10:18
Sample: 1 31
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.854596	8.895196	-1.107856	0.2781
X2	2.701012	0.695769		0.0006
X3		0.937314	3.264226	0.0031
X4	-0.016060	0.008179		0.0604
X5	-0.022701	0.272306	-0.083368	0.9342

R-squared	0.580377	Mean dependent var	10.64613
Adjusted R-squared	0.515819	S.D. dependent var	2.351515
S.E. of regression	1.[illegible]57	Akaike info criterion	3.969390
Sum squared resid	69.61077	Schwarz criterion	4.200678
Log likelihood	-56.52554	F-statistic	
Durbin-Watson stat	0.933888	Prob(F-statistic)	0.000107

i) Fill in the missing numbers due to the malfunction of printer. (5%)

ii) How would you interpret this result is good or not? How would you interpret the coefficients $\hat{\beta}_2$ and $\hat{\beta}_3$? (7%)

iii) Would you reject the hypothesis that the domestic output (X_3) has the effect of 3.00 on wildcat drilled (Y)? (5%)

iv) Why are you using the t-test in (iii) above but not using the normal distribution test? (3%)

END OF EXAMINATION PAPER