

**UNIVERSITY OF SWAZILAND
FACULTY OF SOCIAL SCIENCES
DEPARTMENT OF ECONOMICS
MAIN EXAMINATION 2017/2018**

**TITLE OF PAPER : INTRODUCTION TO ECONOMETRICS I
COURSE CODE : ECO 307
TIME ALLOWED : TWO (2) HOURS**

INSTRUCTIONS :

- 1. ANSWER QUESTION ONE (1) AND ANY OTHER TWO (2) IN THIS PAPER.**
- 2. ONLY SCIENTIFIC NON-PROGRAMMABLE CALCULATORS ARE ALLOWED.**
- 3. ROUND UP YOUR FINAL ANSWERS TO THREE (3) DECIMAL PLACES.**
- 4. IF IT IS NOT SPECIFIED, USE $\alpha = 0.05$ FOR STATISTICAL TESTS.**
- 5. THE REQUIRED PROBABILITY TABLES ARE ATTACHED AT THE BACK OF QUESTION PAPER.**

THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR

QUESTION 1 (Compulsory)**[40 MARKS]**

- a) Differentiate between cross sectional and panel data. [6 Marks]
- b) State the Gauss-Markov theorem. [6 Marks]
- c) The table below shows sample data of monthly wages (y) in Emalangeneni and the education level (x) in years completed:

Education	12	18	14	12	11	16	10	18	15	12
Wage	3845	4040	4125	3250	2810	7000	3000	5405	5770	5000

- i) Use the data to fit a regression line. (Show working for full marks) [16 Marks]
- ii) Interpret the slope coefficient of the regression. [6 Marks]
- iii) If the calculated coefficient of determination (R^2) for the above data is 0.3948, interpret what it means. [6 Marks]

ANSWER ANY TWO QUESTIONS FROM THE FOLLOWING QUESTIONS**QUESTION 2****[30 MARKS]**

Consider an estimated model that is used to study the effects of missing lectures on the Grade Point Average (GPA) of the student. $HsAgr$ is High school grade 12 average grade, and $Skip$ is the average number of lectures missed per week.

$$\widehat{GPA} = 1.39 + 0.412 HsAgr - 0.083 Skip$$

$$(0.33) \quad (0.094) \quad (0.026)$$

$$n = 141, \quad R^2 = 0.234$$

Note that the values in brackets are standard errors.

- a) Interpret the model. [6 Marks]
- b) Briefly explain whether the signs of the coefficients make sense. [5 Marks]
- c) Using the standard normal table approximation, find the 95% confidence interval for β_{HsAgr} . [8 Marks]
- d) Are you able to reject the null hypothesis $H_0 : \beta_{HsAgr} = 0.4$ at the 5% level of significance? [5 Marks]

- e) What is the p – value that can be attached on coefficient of the average number of lectures missed per week (β_{skip}). [6 Marks]

QUESTION 3

[30 MARKS]

The following partial output was obtained from running a model of the following form in Stata

$$y_i = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + u_i$$

Source	SS	df	MS	Number of Obs =	526
Model	1927.877	3	642.625576	F(3, 522) =	64.11
Residual	5232.538	522	10.0240183	Prob > F =	0.0000
Total	7160.414	525	13.6388844	R - Squared =	
				Root MSE =	3.1661

wage	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
Log(educ)	0.595343	0.053025		0.000	0.491174	0.6995118
exper	0.268287	0.036897		0.000	0.195802	0.3407717
expersq	-0.00461	0.000822		0.000	-0.00623	-0.002998
Constant	-3.96489	0.752153		0.000	-5.44251	-2.487272

Where : wage – hourly wage, educ – education level in years, exper – experience level, expersq – experience square

- a) Briefly explain why a quadratic term may be included in a regression model. [4 Marks]
- b) State the fitted regression line. [4 Marks]
- c) Interpret the coefficient $\beta_{Log(educ)}$ [6 Marks]
- d) Test the hypothesis that $\beta_{Constant} = 0$ against $\beta_{Constant} \neq 0$ at the 1% level of significance. [5 Marks]
- e) Does the data provide evidence that *expersq* contributes useful information in the prediction of wages? [6 Marks]
- f) Calculate the Goodness of Fit measure (R^2) and interpret it. [5 Marks]

QUESTION 4**[30 MARKS]**

- a) Briefly explain why in some models it is necessary to include an interaction of the independent variables. [6 Marks]
- b) Consider the following model whereby the returns to education depend upon the amount of work experience.

$$\log(\text{wage}) = \beta_0 + \beta_1 \text{educ} + \beta_2 \text{exper} + \beta_3 \text{educ} * \text{exper} + u$$

Where wage – monthly wage, educ – education in years, exper – years of work experience

- i. If experience is held constant, what is the effect of education? [6 Marks]
- ii. State the null hypothesis that the return to education does not depend on the level of experience. State and **justify** an appropriate alternative hypothesis. [6 Marks]
- c) If the model in (b) above is estimated as :

$$\begin{aligned} \log(\widehat{\text{wage}}) = & 5.9494 + 0.044 \text{educ} - 0.0215 \text{exper} + 0.0032 \text{educ} * \text{exper} \\ & (0.2408) \quad (0.0174) \quad (0.020) \quad (0.0015) \\ & n = 935, \quad R^2 = 0.1349 \end{aligned}$$

- d) Test the hypotheses you stated in (b) above. [7 Marks]
- e) Is it necessary to include the interaction term ($\text{educ} * \text{exper}$) in the model? [5 Marks]