MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS

2022/2023 ACADEMIC YEAR

FOURTH AND THIRD YEAR FIRST SEMESTER

SCHOOL OF BUSINESS AND ECONOMICS

BSC. ECONOMICS, FINANCIAL ECONOMICS, ECONOMICS & STATISTICS& PROJECT PLANNING

COURSE CODE: ECO 4103/ECS 3103

COURSE TITLE: ECONOMETRICS I

DATE: 6TH DECEMBER, 2022 **TIME: 1430-1630**

INSTRUCTIONS TO CANDIDATES

1. Answer Question **One** and any other **three** questions.

Question One

The yield of wheat is influenced by the amount of rainfall and average temperature at a given cropping season. Estimates of the relationships between yield and the conditioning factors over the last 8 years in Kenya revealed the following:

Y – yield, X_1 – rainfall and X_2 – temperature.

$\overline{Y} = 65$ $\quad \sum y^2 = 700$ $\quad \sum yx_1 = 20$

$\overline{X_1} = 19$ $\quad \sum x_1^2 = 18$ $\quad \sum yx_2 = 225$

$\overline{X_2} = 52$ $\quad \sum x_2^2 = 180$ $\quad \sum x_1x_2 = -33$

a) Fit an OLS equation for the relationship between Yield and conditioning factors (5 marks).
b) Interpret the relevance of the estimated results in (i) above considering the a priori expectations based on economic theory (5 marks).
c) Compute the multiple correlation coefficient and interpret your results (2 marks).
d) Compute the adjusted R^2 (5 marks).
e) Construct the ANOVA table for this data (5 marks).
f) Test for the joint significance of the partial coefficient assuming a 5% level of significance. (3 marks)

Question Two

a) Define Gauss Markov theorem (3 marks)
b) Using appropriate examples explain the main assumptions of the Classical Linear Regression Model (CLRM). (12 marks)

Question Three

The following table contains test scores (TS) and the corresponding mean grade (MG) for 8 Maasai Mara University students. Mean grade (MG) is placed on a 4-point scale and has been rounded to one digit after the decimal. It is hypothesized that the MG (Y) is based on the TS (X).

Students S/No	1	2	3	4	5	6	7	8
TS (X)	21	24	26	27	29	25	25	30
MG (Y)	2.8	3.4	3.0	3.5	3.6	3.0	2.7	3.7

a) Estimate the relationship between mean grade (MG) and total score (TS) using the Classical Linear Regression Model (6 marks).
b) Interpret your results and comment on the direction of the relationship. Does the intercept have a useful interpretation here? Why? (4 marks).
c) On average how elastic is mean grade (MG) with respect to total score (TS) (2 marks).
d) Compute the fitted values and residuals for each observation/student and verify that the residuals approximately sum to zero. (3 marks)

Question Four

Define and explain the following terms as used in econometrics.

a) Autocorrelation (5 marks)
b) Heteroscedasticity (5 marks)
c) Multicollinearity (5 marks)

Question Five

Table IV shows results from a regression of log wages on a dummy for whether a job has pay linked to performance (e.g. salespeople paid on commission) and other variables. The data are panel data on workers. In addition to the reported coefficients, the regressions include industry, occupation, and year dummies; county unemployment; and maritalstatus, race dummies, and union status. Standard errors are in parentheses.
The model also includes quadratic functions of experience (number of years in the workforce) and tenure (number of years at this specific job). The row labeled "Experience x performancepay" is the effect of experience at 20 years interacted with performance pay. Similarly, the row labeled "Tenure x performance pay" is the effect of tenure (evaluated at ten years) interacted with performance pay.

a) Based on column (3), is the return to education higher at performance pay jobs or nonperformance pay jobs? What is the difference and is it statistically significant? (5 marks)
b) Again using column (3), what is the return to having a performance pay job for somebody with acollege degree (16 years of education), 20 years of experience, and 10 years of tenure? (5 marks)
c) Regression (4) includes worker-level fixed effects. The coefficient on years of education fallsfrom 0.0637 in (3) to 0.0167 in (4). Is this a large change in economic terms? Explain. (5 marks)

TABLE IV

SKILLS-RELATED WAGE DIFFERENTIALS AND PERFORMANCE-PAY (PP) JOBS

	Sample					
			All jobs			
Estimation method	PP jobs OLS (1)	Non-PP jobs OLS (2)	OLS (3)	FE (4)	OLS (5)	FE (6)
Performance-pay job dummy	—	—	−0.4526	−0.2061	−0.2406	0.1414
			(0.1019)	(0.0723)	(0.1251)	(0.0998)
Years of education	0.0929	0.0665	0.0637	0.0167	0.0584	0.0040
	(0.0071)	(0.0039)	(0.0040)	(0.0091)	(0.0047)	(0.0096)
Education × performance-pay job	—	—	0.0365	0.0169	0.0217	−0.0079
			(0.0071)	(0.0048)	(0.0092)	(0.0071)
Education × 1990–1993	—	—	—	—	0.0161	0.0222
					(0.0085)	(0.0056)
Education × performance-pay job × 1990–1993	—	—	—	—	0.0190	0.0280
					(0.0137)	(0.0089)
Potential experience (effect at 20 years)	0.4259	0.2882	0.3010	0.4545	0.3002	0.4231
	(0.0535)	(0.0288)	(0.0294)	(0.1258)	(0.0294)	(0.1256)
Experience × performance-pay job	—	—	0.1162	0.0149	0.1018	−0.0278
			(0.0584)	(0.0501)	(0.0581)	(0.0509)
Tenure (effect at ten years)	0.1670	0.2197	0.2262	0.1158	0.2271	0.1191
	(0.0268)	(0.0154)	(0.0154)	(0.0129)	(0.0154)	(0.0129)
Tenure × performance-pay job	—	—	−0.0666	0.0278	−0.0677	0.0196
			(0.0301)	(0.0237)	(0.0303)	(0.0239)
Number of observations	9,680	16,466	26,146	26,146	26,146	26,146

Assorted Formulas:

$$\beta_1 = \frac{\sum x_2^2 \sum yx_1 - \sum x_1x_2 \sum yx_2}{\sum x_1^2 \sum x_2^2 - (\sum x_1x_2)^2} \qquad \beta_2 = \frac{\sum x_1^2 \sum yx_2 - \sum x_1x_2 \sum yx_1}{\sum x_1^2 \sum x_2^2 - (\sum x_1x_2)^2}$$

$$\alpha = \bar{Y} - \beta_1\bar{X}_1 - \beta_2\bar{X}_2$$

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