



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF BUSINESS ADMINISTRATION

SECOND YEAR FIRST SEMESTER EXAMINATION FOR

DOCTOR OF PHILOSOPHY IN BUSINESS.

BMS 919: ADVANCED STATISTICAL METHODS

DATE: 18/8/2021

TIME: 9:00 – 12:00 PM

INSTRUCTIONS:

ANSWER QUESTION ONE AND ANY OTHER THREE QUESTIONS

QUESTION ONE (COMPULSORY 30 MARKS)

- a) Briefly explain four factors that determine the choice of regression analysis technique for data analysis. Give appropriate examples in each case. (8 marks)
- b) The Ministry of Health has directed its research department to conduct a household survey to determine the factors influencing the uptake of COVID-19 vaccine among the people. The ministry seeks to build an appropriate econometric model for policy purposes.
- i) Explain the steps that the department should follow to develop this econometric model. (7 marks)
- ii) Explain five criteria that the department should use for judging the validity of the model (3 marks)
- c) A researcher wanted to confirm whether dairy farmers in different regions produced any statistically different outputs of milk. He sampled ten farmers from four regions and observed their monthly mean milk outputs. He then conducted nova test and generated the following results on SPSS.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	79.821	4	19.955	0.002	.0008
Within Groups	4287.619	95	45.133		
Total	4367.440	99			

Interpret the above Anova results

(4 marks)

- d) Kenya Bankers Association conducted a market survey to develop an econometric model for the relationship between the demand for loans and the interest rates in the banking sector. The Association sampled eight commercial banks and recorded their monthly loans portfolio in millions of Kenya Shillings at different interest rates as follows.

Bank	A	B	C	D	E	F	G	H
Interest rate	2	8	7	5	3	9	6	4
Loan portfolio	12	3	6	7	10	2	5	8

Assuming the relationship $Y = b_0 + b_1x + e$

- Estimate the demand function for the loans and interpret your results. (2 marks)
- Evaluate the estimated demand function on the basis of the relevant economic theory and coefficient of determination (2 marks)
- Conduct standard error tests to assess the significance of the parameter estimates (4 marks)

SECTION TWO: ANSWER ANY THREE QUESTIONS (30 MARKS)

QUESTION TWO (10 MARKS)

A researcher sought to determine the relationship between demand for mangoes(Q) and its own price (P_m) as well as the price of oranges(P_o). He sampled ten markets selling the two fruits at different prices and recorded the quantities of the mangoes bought at different prices of mangoes and oranges (P_m and P_o) for a given month. He analyzed the data and obtained the following summary statistics.

$$\begin{aligned} \bar{Q} &= 160 & \bar{P}_m &= 6 & \bar{P}_o &= 8 \\ \sum qp_m &= -600 & \sum qp_o &= 1300 & \sum p_m^2 &= 30 & \sum p_o^2 &= 158 \\ \sum p_m p_{ro} &= -59 & \sum q^2 &= 13800 & & & & \end{aligned}$$

- Estimate the demand function (2 marks)
- Test the overall goodness of fit (R^2) (2 marks)
- Test the statistical reliability of the estimates \hat{b}_0 , \hat{b}_1 and \hat{b}_2 (6 marks)

QUESTION THREE (10 MARKS)

Discuss the following econometric problems that arise in regression analysis giving their possible causes, effects and possible solutions

- Multicollinearity (5 marks)
- Unit root (5 marks)

QUESTION FOUR (10 MARKS)

Differentiate the following models used in data analysis. Use suitable symbolic illustrations

- a) Autoregressive (AR) models and Moving Average (MA) models (5 marks)
- b) Fixed effects and random effects models. (5 marks)

QUESTION FIVE (10 MARKS)

An institute of economic analysis conducted a study to determine the influence of six variables on foreign direct investment inflows (fdi) of different countries. The variables were expressed as follows: degree of openness (open), gross domestic product (gdp), external debt (exd), inflation (inf), lending interest rate (lir) and internet use (internet use) dummy variables (d) for the countries were generated. A regression analysis was conducted using STATA and the following results were generated.

```
. reg fdi open gdp exd inf lir internetusersper100people d1 d2 d3 d4 d5 d6 d7
```

Source	SS	df	MS			
Model	1235.82438	13	95.0634139	Number of obs =	120	
Residual	373.6126	106	3.52464717	F(13, 106) =	26.97	
Total	1609.43698	119	13.5246805	Prob > F =	0.0000	
				R-squared =	0.7679	
				Adj R-squared =	0.7394	
				Root MSE =	1.8774	

fdi	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
open	.0379068	.0186085	2.04	0.044	.0010137	.0747999
gdp	.0336	.0495217	0.68	0.499	-.0645817	.1317816
exd	-.0112656	.0053895	-2.09	0.039	-.0219507	-.0005805
inf	-.0494743	.0279642	-1.77	0.080	-.1049161	.0059674
lir	.2281789	.0391883	5.82	0.000	.1504842	.3058736
internetus~e	.1684454	.0384648	4.38	0.000	.0921852	.2447057
d1	2.096697	.8511876	2.46	0.015	.4091354	3.78426
d2	-3.540151	.7682881	-4.61	0.000	-5.063357	-2.016946
d3	-2.25814	.9166219	-2.46	0.015	-4.075432	-.4408485
d4	-6.388576	1.515923	-4.21	0.000	-9.394041	-3.38311
d5	-1.72165	.7115396	-2.42	0.017	-3.132347	-.3109537
d6	-.5714361	2.441445	0.23	0.815	-4.268966	5.411838
d7	-.2913584	.7060969	-0.41	0.681	-1.691264	1.108547
_cons	-2.363246	1.124113	-2.10	0.038	-4.591908	-.1345828

- a) Discuss the statistical significance of the estimated coefficients of the model (5 marks)
- b) Discuss the impact of the dummy variables (5 marks)