FACULTY	AGRICULTURE, ENGINEERING AND NATURAL SCIENCES		
SCHOOL	AGRICULTURE AND FISHERIES SCIENCES		
DEPARTMENT	ANIMAL PRODUCTION, AGRIBUSINESS & ECONOMICS		
SUBJECT	ECONOMETRICS FOR AGRICULTURAL ECONOMISTS		
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DATE	JUNE 2023		
DURATION	**3 HOURS**	**MARKS**	**100**

SECOND OPPORTUNITY EXAMINATION QUESTION PAPER

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Internal Moderator: Prof HJ Sartorius von Bach

This question paper consists of SEVEN (7) pages including this front page

Instructions

- Answer all questions in section A and B
- Please write legibly and number your questions clearly
- Show your calculations to two decimal places

UNIVERSITY OF NAMIBIA EXAMINATIONS

SECTION A

[50 MARKS]

QUESTION 1 **[25 MARKS]**

a) Why is the OLS estimator so widely used and is it superior to all other estimators?(6)

b) What is meant by the *mean-square error*? (3)

c) What is meant by consistency? (4)

d) What is meant forecasting and prediction? (4)

e) Differentiate between heteroscedasticity and multicollinearity among variables. (3)

f) What are dummy variables and when are they introduced into a regression analysis.(5)

QUESTION 2 **[25 MARKS]**

a) How is the form of the functional relationship decided? (9)

b) What are some of the most useful transformations into linear functions? (9)

c) Prove that in the double-log demand function of the form: $Q = \beta_0 P^{\beta_1} Y^{\beta_2} e^{u}$; where Q is quantity demanded, P is the price, and Y is the income, β_1 is the price elasticity of demand. (7)

SECTION B

APPLICATION QUESTION

[50 MARKS]

Namibia Statistical Agency (NSA) has provided the following information on aggregate consumption (Y_i) and disposable income (X_i) of beef and partially analysed it for you. You are required to use the information in exhibit 1to answer the questions below:

i) State the general relationship between consumption and disposable income in

(a) exact linear form, and (4)

(b) stochastic form (4)

(c) why would you expect most observed values of Y not to fall exactly on straight line (see Exhibit 2 on page 4? (5)

ii) In the context of the output printout in Exhibit 1,

a) What is the meaning of estimator $\widehat{\beta}_0$? (3)

b) What is the meaning of estimator $\hat{\beta}_1$? (3)

c) Find the elasticity of consumption. (5)

iii) State the null and alternative hypotheses to test the statistical significance of the parameters of the regression equation estimated in Exhibit 1. (5)

iv) What is the form of sampling distribution of $\hat{\beta}_0$and $\hat{\beta}_1$? (3)

v) What distribution must be used to test the statistical significance of $\hat{\beta}_0$and $\hat{\beta}_1$? (5)

vi) What are the degrees of freedom? (4)

vii) Test at the 5% level of significance for $\hat{\beta}_0$and $\hat{\beta}_1$? (9)

Exhibit 1: Model output from Stata

Source	SS	df	MS	Number of obs	=	32
				F(1, 30)	=	831.65
Model	1.63973436	1	1.63973436	Prob > F	=	0.0000
Residual	.059149625	30	.001971654	R-squared	=	0.9652
				Adj R-squared	=	0.9640
Total	1.69888399	31	.054802709	Root MSE	=	.0444

LBECP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LRINC	.2831243	.0098176	28.84	0.000	.263074	.3031745
_cons	1.087143	.0933416	11.65	0.000	.8965145	1.277772

Exhibit 2: Scatter diagram depicting the model.

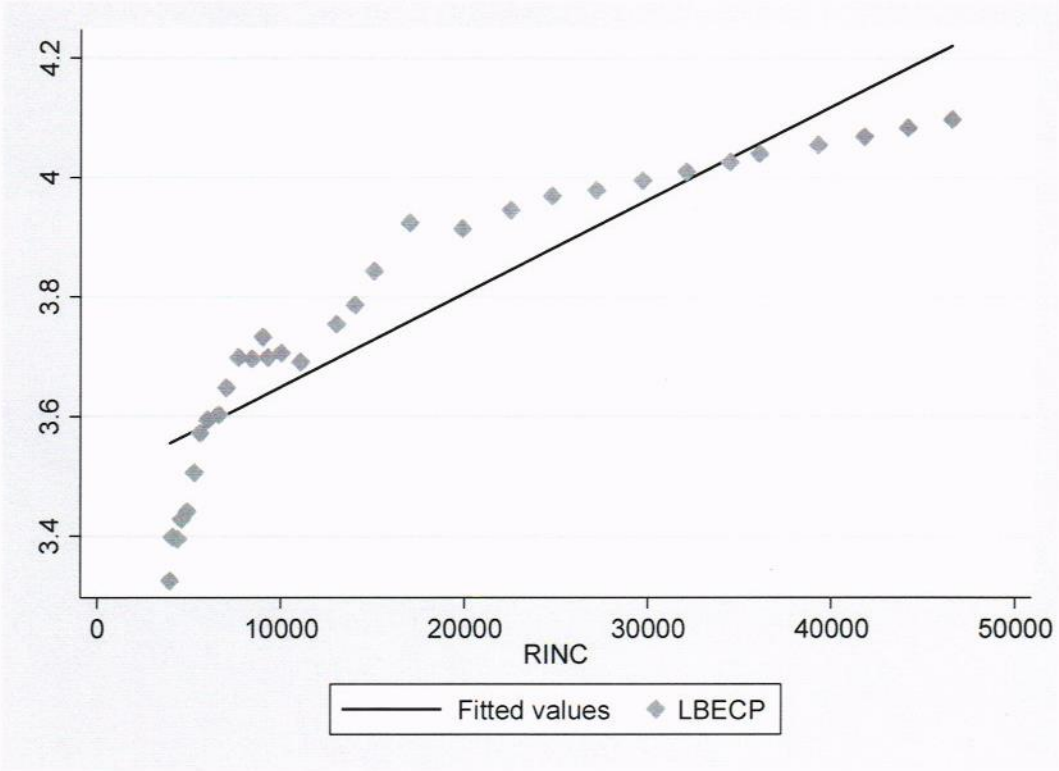

EXHIBIT 1: EQUATION 1: OUTPUT

```
. regress BCCP RDIPC RRPB
```

Source	SS	df	MS		
Model	1089.27697	2	544.638485	Number of obs	= 23
Residual	106.651726	20	5.33258629	F(2, 20)	= 102.13
				Prob > F	= 0.0000
				R-squared	= 0.9108
				Adj R-squared	= 0.9019
Total	1195.9287	22	54.3603953	Root MSE	= 2.3092

BCCP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
RDIPC	.0148836	.0021935	6.79	0.000	.010308	.0194591
RRPB	-.2135922	.1219054	-1.75	0.095	-.4678824	.0406979
_cons	34.51561	3.855779	8.95	0.000	26.47259	42.55862

EXHIBIT 2: EQUATION 2 OUTPUT

```
. regress BCCP RDIPC RRPB RRPP
```

Source	SS	df	MS		
Model	1120.17015	3	373.39005	Number of obs	= 23
Residual	75.7585456	19	3.98729188	F(3, 19)	= 93.65
				Prob > F	= 0.0000
				R-squared	= 0.9367
				Adj R-squared	= 0.9267
Total	1195.9287	22	54.3603953	Root MSE	= 1.9968

BCCP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
RDIPC	.0108762	.0023812	4.57	0.000	.0058922	.0158602
RRPB	-.5410844	.1579697	-3.43	0.003	-.8717187	-.21045
RRPP	.1740545	.0625307	2.78	0.012	.0431763	.3049327
_cons	38.6472	3.649601	10.59	0.000	31.00849	46.2859

EXHIBIT 3: EQUATION 3 OUTPUT

```
. regress BCCP RDIPC RRPB RRPC
```

Source	SS	df	MS
Model	1090.27144	3	363.423815
Residual	105.657251	19	5.56090797
Total	1195.9287	22	54.3603953

Number of obs	= 23
F(3, 19)	= 65.35
Prob > F	= 0.0000
R-squared	= 0.9117
Adj R-squared	= 0.8977
Root MSE	= 2.3582

BCCP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
RDIPC	.0129764	.0050355	2.58	0.018	.0024369	.0235159
RRPB	-.2223159	.1261854	-1.76	0.094	-.486425	.0417932
RRPC	.024988	.0590891	0.42	0.677	-.0986869	.1486628
_cons	33.79909	4.286535	7.88	0.000	24.82727	42.77091

EXHIBIT 4: EQUATION 4 OUTPUT

```
. regress BCCP RDIPC RRPB RRPP RRPC
```

Source	SS	df	MS
Model	1127.25901	4	281.814752
Residual	68.6696892	18	3.81498274
Total	1195.9287	22	54.3603953

Number of obs	= 23
F(4, 18)	= 73.87
Prob > F	= 0.0000
R-squared	= 0.9426
Adj R-squared	= 0.9298
Root MSE	= 1.9532

BCCP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
RDIPC	.0050107	.0048929	1.02	0.319	-.0052688	.0152902
RRPB	-.6111737	.1628489	-3.75	0.001	-.9533065	-.2690408
RRPP	.1984094	.0637207	3.11	0.006	.0645371	.3322816
RRPC	.0695029	.0509872	1.36	0.190	-.0376172	.1766229
_cons	37.23236	3.717695	10.01	0.000	29.42178	45.04295

EXHIBIT 5: EQUATION 5 OUTPUT

```
. regress BCCP RDIPC RRPB RRPP CRPCS
```

Source	SS	df	MS		
Model	1120.76091	4	280.190228	Number of obs	= 23
Residual	75.1677831	18	4.17598795	F(4, 18)	= 67.10
				Prob > F	= 0.0000
				R-squared	= 0.9371
				Adj R-squared	= 0.9232
Total	1195.9287	22	54.3603953	Root MSE	= 2.0435

BCCP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
RDIPC	.0097694	.0038207	2.56	0.020	.0017423	.0177964
RRPB	-.5388818	.1617704	-3.33	0.004	-.8787488	-.1990148
RRPP	.1612317	.072508	2.22	0.039	.0088982	.3135653
CRPCS	.0279421	.0742904	0.38	0.711	-.1281362	.1840205
_cons	37.83253	4.317561	8.76	0.000	28.76167	46.90339