# MACHAKOS UNIVERSITY

**University Examinations for 2019/2020 Academic Year**

**SCHOOL OF BUSINESS AND ECONOMICS**

**DEPARTMENT OF ECONOMICS**

**FOURTH YEAR SECOND SEMESTER EXAMINATION FOR**

**BACHELOR OF ECONOMICS**

**EES 401: FUNDAMENTALS OF ECONOMETRICS II**

**DATE: 23/10/2020** **TIME: 8:30 – 10:30 AM**

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**INSTRUCTIONS:**

Answer Question **ONE** and any other **TWO** questions

**QUESTION ONE (COMPULSORY) (30 MARKS)**

a) EES 401 modelers investigated the production characteristics of various Kenyan industries, including cotton and sugar. They specified Cobb–Douglas production function for output (Q) as a double-log function of labour (L) and capital (K):

$$lnQ_i = \beta_1 + \beta_2 lnL_i + \ln \beta_2 \, K_i + u_i$$

| Industry | $\hat{\beta}_0$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $R^2$ |
|---|---|---|---|---|
| Cotton | 0.97 | 0.92 | 0.12 | .98 |
| | | (0.03) | (0.04) | |
| Sugar | 2.70 | 0.59 | 0.33 | .80 |
| | | (0.14) | (0.17) | |

i. Interpret the coefficients of Labour and capital for each industry? (8 marks)

ii. What economic significance does the sum have? (3 marks)

b) You have a sample of 100 men and women. You construct two dummy variables: Mi = 1 if the ith person is male and 0 if female; Fi = 1 if the ith person is female and 0 if male. You also observe a variable yi which is the monthly salary of the ith person. You attempt to run the following regression:

$$Y_i = \beta_1 + \beta_2 M_i + \beta_3 F_i + u_i$$

where ui is a homoskedastic, zero-mean random disturbance term which is assumed independent of Mi and Fi. What do you think will go wrong with the attempt to run this regression?

(4 marks)

c) Explain in general terms the Chow test for structural stability. Be careful to specify the null and alternative hypotheses involved. (10 marks)

d) The following results are from a prospective study that considered predictors of mammography use in women. The investigators used logistic regression to analyze their data.

***Table*1: Results of a logistic regression predicting annual mammography use**

| Variable name | Parameter estimate (std error) | Significance value |
|---|---|---|
| Family history-associated risk group | 0.14 (0.09) | not sig. |
| Age | -0.04 (0.02) | <0.05 |
| Worry | -0.04 (0.01) | <0.05 |

i. What is the odds ratio for getting a mammogram for every 10-year increase in age? (2.5 marks)

ii. What is (are) the odds ratio(s) for every 1-unit increase in worry? (2.5 marks)

**QUESTION TWO (20 MARKS)**

A researcher estimated savings function for Kenya and obtained the following results

$$Y = 1.016 + 152.478D + 0.0803X - 0.0655D.X$$

t (0.0504) (4.609) (5.54) (-4.096)

Where $Y$ is savings in billions, X is income in billions, $D = 1$ for observations in 1982-1995 and $D = 0$ for observations in 1970-1981, D.X is interaction variable between D and X.

a) What is your priori expectation about the relationship between savings and income? Which economic theory is relevant here? (1 mark)

b) Holding income constant, what is the average savings in period 1982-1995? Is it statistically different from the period 1970-1981? How do you know? (5 marks)

c) Are the marginal propensity to save (MPS), statistically different? How do you know? (5 marks)

d) Suppose the researcher estimated savings model without the variable D.X, what is the implication for the magnitude of average savings and MPS in 1982-1995? (5 marks)

e) Assuming a researcher collected data and obtained the following equation $l_n y_i = 2.1763 - 0.2437 D_i$ where Y is hourly wage, Di = 1, If female 0 otherwise. Is female medium hourly wage lower than men worker hourly wage? Show your working. (4 marks)

**QUESTION THREE (20 MARKS)**

a) Consider the model:

$$Y_1 = \alpha Y_2 + \delta X + u_1$$
$$Y_2 = \beta Y_1 + \gamma X + u_2$$

Where X is exogenous and the error terms $u_1$ and $u_2$ have mean zero and are serially uncorrelated.

i. Write down the equations expressing the reduced form coefficients in terms of structural parameters. (5 marks)

ii. Show that if $\gamma = 0$, the $\beta$ can be identified. Are the parameters $\alpha$ and $\delta$ identified in this case? Why or why not (5 marks)

b) Regarding panel data;

(i) Describe a test that could be used to assess the appropriateness of fixed effects and random effects estimation. Clearly state the null hypothesis (5 marks)

(ii) Suppose the test (ii) above indicates that random effects is appropriate. Describe a test that we could use to decide whether to use random effects model or pooled OLS. Clearly state the null hypothesis. Why is this test important? (5 marks)

**QUESTION FOUR (20 MARKS)**

a) EES 401 modelers regressed per capita personal consumption expenditure (PPCE) on per capita disposable income (PPDI) and lagged PPCE gave the following results:

$\text{PPCE}_t = -1242.169 + 0.6033\text{PPDI}_t + 0.4106\text{PPCE}_{t-1}$

t = (−3.0855) (4.0155) (2.6561)

If we assume that this model resulted from a Koyck-type transformation, find:

i. The median lag (3 marks)

ii. The mean lag and interpret (5 marks)

b) Explain the limitations of linear probability model (LPM) (6 marks)

c) Explain the consequences one faces when he/she runs a regression using non-stationary variables? (6 marks)

**QUESTION FIVE (20 MARKS)**

a) One of the examples of simultaneous equations is the Keynesian consumption model given as:

$$C_t = \beta_0 + \beta_1 Y_t + u_t$$

Where $C_t$consumption at time t is, $Y_t$ is income at time t and is the usual error term at time t. Show that $Y_t$ and $u_t$ are correlated (5 marks)

b) Explain why one may choose logit model instead of probit model (3 marks)

c) What is the meaning of cointegration? (5 marks)

d) Consider the following Augmented Dickey Fuller results

$$\widehat{\Delta GDP_t} = 234.9729 + 1.8921t + 0.0786GDP_{t-1} + 0.3557\Delta GDP_{t-1}$$

$t\ (=\tau) =$ (2.3833) (2.1522) (-2.2152) (3.4647)

$R^2 = 0.1526$ $d = 2.0858$

Note: The 10 percent critical τ value is −3.1570

i. What is the role of the lagged dependent variable in the regression? (2 marks)

ii. On the basis of these results, is the GDP stationary or nonstationary? Alternatively, is there a unit root in this time series? How do you know? (5 marks)