BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF COMMERCE

DEPARTMENT OF ECONOMICS

MSc ECONOMICS

JUN 2023

ADVANCED ECONOMETRICS (MEC 502)

EXAMINATION **DURATION: 3 HOURS**

INSTRUCTIONS TO CANDIDATES

1. Answer question 1 in Section A and any other three questions from Section B.
2. Question 1 carries 40 marks.
3. All the questions in Section B carry equal marks of 20 each.
4. Cell-phones are not allowed into the examination room.

SECTION A (COMPULSORY)

Question 1

a) A researcher is interested in how outside temperature influences electricity usage. The researcher thinks that at very low temperatures, people use a lot of electricity to run their electric space heaters. As outside temperature rises, people use their space heaters less frequently and electricity usage goes down. However, as temperatures get very hot, electricity usage begins to rise again as people use their air conditioners more and more. To estimate this relationship between outside temperature and electricity usage, the researcher decides to use the following model:

$$E = \beta_0 + \beta_1 T_C + \beta_2 T_F + \varepsilon$$

where E is total electricity usage over a one week period measured in kilowatt-hours, T_C is the average temperature over that week measured in degrees Celcius, and T_F is the average temperature over that week measured in degrees Fahrenheit. The data the researcher uses come from a cross-section of Zimbabwean households, each observation represents one household.

(i) Explain two ways in which the researcher has misspecified the model. Explain what changes you would make to the model to deal with with these problems. **(10 marks)**

(ii) Suppose that high income households use more electricity at any given temperature than low income households. Given also that the average difference in electricity usage between high and low income households is different at every temperature level. Considering this new information, specify the correct population model. **(5 marks)**

(iii) Based on the information given throughout the problem, what would you predict the signs to be for each parameter? Justify your answer. **(8 marks)**

b) Consider the following description of variables and regression output for a paper entitled *"Does aging increase an individual's susceptibility to suffer from high blood pressure? Evidence from Malawi"*. Blood pressure is measured as a contionuous variable and increases in value as blood pressure increases.

Figure 1. Description of variables

```
. des

Contains data from C:\Program Files (x86)\STATA V14\ado\base/b/bplong.dta
  obs:           240                          fictional blood-pressure data
 vars:             5                          1 May 2014 11:28
 size:         1,680
-------------------------------------------------------------------------------
              storage   display    value
variable name   type    format     label      variable label
-------------------------------------------------------------------------------
patient         int     %8.0g                 Patient ID
sex             byte    %9.0g      sex          Male=1
agegrp          byte    %9.0g      agegrp     Individual's age in years
when            byte    %8.0g      when       Status
bp              int     %9.0g                 Blood pressure
-------------------------------------------------------------------------------
Sorted by: patient
```

Figure 2. Regression output

```
. reg bp agegrp sex
```

Source	SS	df	MS	Number of obs	=	240
				F(2, 237)	=	35.58
Model	9447.0625	2	4723.53125	Prob > F	=	0.0000
Residual	31465.7333	237	132.766807	R-squared	=	0.2309
				Adj R-squared	=	0.2244
Total	40912.7958	239	171.183246	Root MSE	=	11.522

bp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
agegrp	6.3875	.9109295	7.01	0.000	4.592947	8.182053
sex	-6.975	1.487542	-4.69	0.000	-9.905493	-4.044507
_cons	144.6167	2.103702	68.74	0.000	140.4723	148.761

(i) On the basis of the regression output presented in Figure 2, comment on the impacts of age and gender on blood pressure. **(7 marks)**

(ii) Comment on the overall fitness of the model presented in Figure 2. **(3 marks)**

(iii) The paper also seeks to investigate whether there is any gender heterogeneity in the impact of age on blood pressure. Explain how the regression in Figure 2 could be amended to cater for that objective. **(5 marks)**

(iv) The estimates presented in figure 2 are potentially biased. Detail the potential sources of such bias. **(8 marks)**

[40 marks]

SECTION B (ANSWER ANY THREE QUESTIONS)

Question 2

Results of a binary choice model on the determinants of health insurance are reported in the table below.

Have health insurance	Regression coefficients /marginal effects	Logit coefficients	Logit average marginal effects	Probit coefficients	Probit average marginal effects
Retired	0.04**	0.19*	0.04*	0.11*	0.04*
Age	-0.002	-0.01	-0.003	-0.008	-0.003
Good health status	-0.06**	-0.31**	-0.06*	-0.19**	-0.06*
HH income	0.0004**	0.002*	0.0005*	0.001*	0.0004**
Education years	0.02**	0.11*	0.02**	0.07*	0.02*
Married	0.12*	0.57**	0.12*	0.36*	0.12**
Black/African	-0.12**	-0.81*	-0.16**	-0.46**	-0.15**
Constant	0.12	-1.71*		-1.06*	

(**), (*) Indicates significance at the 1% level and 5% level respectively.

(a) Why is a linear probability estimator not ideal for the above model? **(3 marks)**

(b) Comment on the impact of age on the individual's health insurance status. **(2 marks)**

(c) Interpret the OLS and Logit coefficients for the variables Education years and Married. **(4 marks)**

(d) Interpret the marginal effects results of the Probit model for the variables Good health: status, HH income and Black/African and provide recommendations. **(8 marks)**

(e) Explain a situation that would make the above model feasible to be estimated using Tobit. **(3 marks)**

[20 marks]

Question 3

In Pakistan the number of years of schooling for the rural population increased in the last 20 years, while the participation in the elections decreased in the same period. Therefore, this is clear evidence that a more educated population caused a reduction in the percentage of people voting in the elections. Comment on the assertion. **[20 marks]**

[Hint: Your arguments should include: sample selection bias, confounding and the counterfactual problem]

Question 4

The Government of Zimbabwe (GoZ) declared a state of disaster following the devastation caused by cyclone Idai. The international humanitarian partners responded swiftly in support of government efforts providing life-saving Search and Rescue interventions including assistance to survivors and directly affected internally displaced people (IDPs). Additionally, humanitarian partners have been supporting government efforts to mitigate the effects of the cyclone through conducting spontaneous early recovery for the survivors from potential risks such as disease outbreaks.

There have however been media reports that aid efforts are being given along political lines. As an econometrician you are tasked to test the validity of these assertions. Detail the following:

(a) The data you would collected or the data sources

(b) The empirical estimation model and assumptions you would apply

(c) The potential problems you might encounter in such a study

(d) The possible explanations for the aid differentials that have been observed

[20 marks]

Question 5

Consider the following paper:

Rawlings, L.B & Schady, N.R. (2002): "Impact Evaluation of Social Funds: An Introduction," *World Bank Economic Review*, 16(2), 213–217.

(a) Explain giving examples the meaning of social funds. Why is it important to evaluate them? **(5 marks)**

(b) The authors argue that one of the most difficult challenges facing impact evaluation practitioners is the construction of a counterfactual. Explain using examples the three methods suggested in this paper to solve this challenge. **(15 marks)**

[20 marks]

END OF PAPER