UNIVERSITY OF ESWATINI

FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF ECONOMICS

MAIN EXAMINATION

JUNE 2019

TITLE OF PAPER:	**ECONOMETRICS METHODS II**
COURSE CODE:	**ECO420**
TIME ALLOWED:	**2 HOURS**
INSTRUCTIONS:	**ANSWER ANY THREE QUESTIONS**
	EACH QUESTION CARRIES 20 MARKS

REQUIREMENTS

1. SCIENTIFIC CALCULATOR

DO NOT OPEN THIS PAPER UNTIL YOU HAVE BEEN INSTRUCTED TO DO SO

QUESTION 1

Based on the Michigan Income Dynamics Study, Hausman attempted to estimate a wage, or earnings, model using a sample of 629 high school graduates, who were followed for a period of 6 years, thus giving in all 3774 observations. The dependent variable in this study was logarithm of wage, and the explanatory variables were age (divided into several age groups), unemployment in the previous year, poor health in the previous year, self-employment, region of residence (South = 1; 0 otherwise), area of residence (rural = 1; 0 otherwise). Hausman used both FEM and ECM.

The results are given in Table 1 below (standard errors in parentheses):

a. Do the results make economic sense? [5]

b. Is there a vast difference in the results produced by the two models? If so, what might account for these differences? [5]

[10]

WAGE EQUATIONS (DEPENDENT VARIABLE: LOG WAGE*)

Variable	Fixed effects		Random effects	
1. Age 1 (20–35)	0.0557	(0.0042)	0.0393	(0.0033)
2. Age 2 (35–45)	0.0351	(0.0051)	0.0092	(0.0036)
3. Age 3 (45–55)	0.0209	(0.0055)	−0.0007	(0.0042)
4. Age 4 (55–65)	0.0209	(0.0078)	−0.0097	(0.0060)
5. Age 5 (65–)	−0.0171	(0.0155)	−0.0423	(0.0121)
6. Unemployed previous year	−0.0042	(0.0153)	−0.0277	(0.0151)
7. Poor health previous year	−0.0204	(0.0221)	−0.0250	(0.0215)
8. Self-employment	−0.2190	(0.0297)	−0.2670	(0.0263)
9. South	−0.1569	(0.0656)	−0.0324	(0.0333)
10. Rural	−0.0101	(0.0317)	−0.1215	(0.0237)
11. Constant	—	—	0.8499	(0.0433)
s^2	0.0567		0.0694	
Degrees of freedom	3,135		3,763	

*3774 observations; standard errors are in parentheses.

Reproduced from Cheng Hsiao, *Analysis of Panel Data*, Cambridge University Press, 1986, p. 42. *Original source:* J. A. Hausman, "Specification Tests in Econometrics," *Econometrica*, vol. 46, 1978, pp. 1251–1271.

QUESTION 2

a) What is meant by intrinsically linear and intrinsically nonlinear regression models? Give some examples. [3]

b) Since the error term in the Cobb–Douglas production function can be entered multiplicatively or additively, how would you decide between the two? [5]

c) What is the difference between OLS and nonlinear least-squares (NLLS) estimation? [2]

d) The relationship between pressure and temperature in saturated steam can be expressed as:

$$Y = \beta_1 (10)^{\frac{\beta_2 t}{(\gamma + t)}} + u_t$$

where Y = pressure and t = temperature. Using the method of nonlinear least squares (NLLS), obtain the normal equations for this model. [10]

QUESTION 3

(a) Suppose you want to choose between the two models specified in the below excerpts

Model 1 (Long Model)

Dependent Variable: HWAGE
Sample: 1 528

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.182714	1.275908	-3.278227	0.001
EDUCATION	0.937130	0.082625	11.34194	0.000
GENDER	-2.140661	0.391546	-5.467200	0.000
HISPANIC	-0.512385	0.911056	-0.562408	0.574
LFEXP	0.098486	0.017494	5.629597	0.000
MSTATUS	0.485134	0.418081	1.158167	0.247
RACE	-0.942389	0.583578	-1.614849	0.107
REGION	-0.771424	0.430173	-1.793287	0.073
UNION	1.468088	0.512735	2.863248	0.004

R-squared	0.282693	Mean dependent var	9.047509
Adjusted R-squared	0.271636	S.D. dependent var	5.144077
S.E. of regression	4.390177	Akaike info criterion	5.813517
Sum squared resid	10003.03	Schwarz criterion	5.886293
Log likelihood	-1525.768	F-statistic	25.56715
Durbin-Watson stat	1.857457	Prob(F-statistic)	0.000000

Model 2 The Short Model

Dependent Variable: HWAGE
Sample: 1 528

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.289796	1.258229	-3.409392	0.[illegible]
EDUCATION	0.953006	0.082184	11.59596	0.[illegible]
GENDER	-2.134171	0.391749	-5.447929	0.[illegible]
LFEXP	0.104037	0.016888	6.160545	0.[illegible]
REGION	-0.840832	0.427621	-1.966303	0.[illegible]
UNION	1.427421	0.509978	2.798988	0.[illegible]

R-squared	0.276707	Mean dependent var	9.04753[illegible]
Adjusted R-squared	0.269779	S.D. dependent var	5.14409[illegible]
S.E. of regression	4.395772	Akaike info criterion	5.8104[illegible]
Sum squared resid	10086.51	Schwarz criterion	5.8589[illegible]
Log likelihood	-1527.962	F-statistic	39.93[illegible]
Durbin-Watson stat	1.858629	Prob(F-statistic)	0.000[illegible]

i. $R_1^2 = 0.283$ *and* $R_2^2 = 0.277$ based on the R_i^2 which model would you choose? Critically justify your choice. [2]

ii. Based on the AIC and the Shwarz Criterion, which model would you choose between the long and short model. Clearly your choice. [3]

iii. What are the fundamental differences between adjusted R^2, the AIC and the Shwart criterion. Analytically (Stating the formulae) and intuitively compare the three model selection criteria. [15]

QUESTION 4

i. Assuming that as an analysist you suspect that a model has a structural break and we cannot determine when the structure of the data changes, how would you go about solving this problem? Critically explain using a relevant example [10]

ii. Using a theoretical example, explain how the chow test for model stability can also be modified to show the model's predictive prowess. [10]