Annaba university
First year master in international economics
Date: 5/26/25

time: 1 h 15 min

The final exam in advanced econometrics

Question1:
Mention three types of nonlinear regression, choose one type and explain how to estimate the mathematical model using the ordinary least squares method.

Question2:
Mention the steps to estimate an econometric model.

Question3: Observe the following table of Linear Regression Analysis and answer the questions:

Table 01: the regression model

Dependent Variable: Y
Included observations: 47

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0,219	0.05	.....	0.0001
X1	.....	0.02	-1.97	0.0247
X2	.....	0.60	-0.14	0.0156
X3	0.0063	0.015	.....	0.3720

F-statistic	520.4	R-squared	0.75
Prob(F-statistic)	0.04	Durbin-Watson stat	1.22

The questions:

1. **Complete the table.**
2. **Write the regression equation.**
3. **Interpret the coefficient of determination, and the significance of the model.**
4. **Does the model contain econometrics problems? Justify your answer and what solutions do you suggest?**

Question4: make a statistical analysis for each index:

R-squared: 0,80

R = - 0,75

$Y = K^{0,25} H^{0,3}$

2 pts - answering in English.

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The final exam Solution in advanced econometrics.

Question 1 : 3,5pts

* Three types of non linear regression:
  - polynomial Regression (1)
  - Exponential Regression (1)
  - Logarithmic Regression (1)
  - Power Regression
* choosing one type and showing how to estimate using "ols": (0,5)

every type has a spetial way to treat, the important matter is to change the non linear form using spisifit tools and make it a linear form which allow to practise the "ols" method.

Question 2 : 4pts

Steps to estimate an econometric model :

(0,5) - understanding Economic Theory.
(0,5) - Econometric, Mathematical model of theory.
(0,5) - collect data
(0,5) - Estimation of econometric model
(0,5) - testing the model validity
(0,5) - Hypothesis testing.
(0,5) - Forecasting ~~using the model for~~
(0,5) - using the model for control or policy purposes.

Question 3:

1. completing the table : 2 pts

$$t_{\hat{B}} = \frac{\hat{B}}{SE_{\hat{B}}}$$

$$t_{\hat{C}} = \frac{\hat{C}}{SE_{\hat{C}}} = \frac{0,219}{0,05} = 4.38$$ 0,5

$$\hat{B}_{x_1} = t_{\hat{B}_1} \cdot SE_{x_1} = 0,02 \times (-1,97) = -0,0394$$ 0,5

$$\hat{B}_{x_2} = t_{x_2} \cdot SE_{x_2} = 0,6 \times (-0,14) = -0,084$$ 0,5

$$t_{x_3} = \frac{\hat{B}}{SE_{x_3}} = \frac{0,0063}{0,015} = 0,42$$ 0,5

2. The regression equation : 1 pts

$$y = 0,219 + (-0,0394)\, x_1 + (-0,084)\, x_2 + (0,0063)\, x_3$$

$$y = 0,219 - 0,0394\, x_1 - 0,084\, x_2 + 0,0063\, x_3$$ 1

3. Interpreting the R^2 : 0,5 pts

$R^2 = 0.75$ it means : 75% of changing in the "y" trend due to the independants variables (x_1, x_2, x_3) and 25% due to extern variable. 0,5

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* Interpeting the significance of the model :

1) Total Sig : [2pts]

0,5 Sig (F) = 0,04 < 5%. that means the model is Sig

2) partial Sig :

0,5 Sig (t_{x_1}) = 0,0247 < 5%. that means x_1 is Sig.

0,5 Sig (t_{x_2}) = 0,0156 < 5%. // x_2 //

0,5 Sig (t_{x_3}) = 0,3720 > 5%. // x_2 is not sig

4. cheking econometric problems : [2pts]

- the model contain the auto-correlation (0,5) cause D.W stat is 1.22 far from "2".
- the model also contain the Heteroskedasticity (0,5) cause F-stat (520,4) is a large number.

we suggest to solve those prob :

- adding data.
- adding or deleting variables.
- using algorithms ....

Question 4: stat analysis : 3pts

1) $R^2 = 0.8$: it means 80% of changing in the dependent variable dues to the independant trend and 20% dues to exterm variables.

2) $R = -0,75$: there is a negative strange corelation between the dependant and independant variable.

3) $Y = K^{0.25} H^{0.93}$

we have :

Y : Gross poduct

K : capital

H : human capital.

the equation is expo and its the production functions.

2pts English.