EC402 - Econometrics I **Name:** _____
Fall 2013 **Student ID:** _____
Final Exam
12/06/2013
Time: 60 minutes **Professor:** Andrés Castaño Zuluaga *M.Sc. (c)*

This exam contains five pages and a total of 15 questions. Each question is worth 4 points for a total of 60 points. Enter the required information at the top of the sheet. In multiple-choice questions with a single answer, each mistake is penalized with 1 point. You can use a calculator and statistical tables.

1. (4 points) If it is suspected that at some point (in a time series) there is a structural change in the relationship between the outcome and the regressors, explain what is the procedure that you can follow to test the hypothesis of structural change in the time series and what would the statistical test look like?

2. (4 points) Which of the following is NOT a corrective measure for Multicollinearity:
   A. Using panel data
   B. Excluding variables from the regression
   C. Transforming the variables into first differences.
   D. Transformation of variables to ratios
   E. Applying a Principal Component Analysis
   F. None of the above.
   G. All of the above

3. (4 points) If in a model of the type $Y_i = \beta_1 + \beta 2 X_i + \mu_i$ all the classical assumptions of the general linear model are met, the OLS estimator of β_2 is:
   A. A (constant) number that matches the true value of β_2
   B. A (constant) number whose variance is minimal, according to the Gauss-Markov theorems
   C. A random variable whose variance is equal to zero
   D. A random variable whose probability distribution is not centered on the true value of β_2
   E. None of the above
   F. All of the above

4. (4 points) In the model $Y_i = \beta_1 + \beta_2 ln(X_i) + \mu_i$, where ln represents the natural logarithm, the parameter β_2 represents approximately:
   A. The expected percentage change in the dependent variable given a 1% change percentage in the explanatory variable.
   B. The expected proportional change in the dependent variable given a one-unit change in the explanatory variable.

C. The expected absolute change in the dependent variable given a one-unit change in the explanatory variable.

D. The expected absolute change in the dependent variable given a 1% change percentage in the explanatory variable.

E. None of the above

5. (4 points) The degrees of freedom are:

A. The total number of observations minus the dependent variables imposed in parameter estimation

B. The total number of observations minus any linear constraints imposed on estimating a parameter

C. They are the total number of observations that will be free to vary after estimating some unknown parameter

D. All of the above

E. None of the above

F. (A) and (B) only

G. (B) and (C) only

H. (A) and (C) only

6. (4 points) When is the minimization of OLS residuals met?

A. The sum of the residuals is the smallest possible

B. The observed data is closest to the sample regression function

C. The dispersion of the observed values with respect to the sample regression function is minimal

D. All of the above

E. None of the above

F. (A) and (B) only

G. (B) and (C) only

H. (A) and (C) only

7. (4 points) given OLS assumptions, the $Gauss - Markov$ theorem determines that the estimators obtained are:

A. Linear

B. Consistent

C. Efficient

D. All of the above

E. None of the above

F. (A) and (B) only

G. (B) and (C) only

H. (A) and (C) only

8. (4 points) Specification bias refers to::

A. Choosing the wrong functional form
B. Choose explanatory variables unrelated to the dependent variable
C. Choose a correct functional form
D. All of the above
E. None of the above
F. (A) and (B) only
G. (B) and (C) only
H. (A) and (C) only

9. (4 points) The precision of the linear regression parameters can be evaluated through the:
   A. The variance of the estimators
   B. The standard error of the estimators
   C. The stochastic disturbance
   D. All of the above
   E. None of the above
   F. (A) and (B) only

10. (4 points) To compare two models based on the R^2 one must take into account:
   A. Both models have the same dependent variable
   B. Explanatory variables take any form
   C. Both models do not have the same number of observations
   D. All of the above
   E. None of the above.
   F. (A) and (B) only
   G. (B) and (C) only
   H. (A) and (C) only

Questions 11 and 12 refer to the following. A market analyst is interested in studying the determinants of copper sales (vship, in millions of dollars) from 1970-2010. She uses as explanatory variables total employment (emp, in thousands), total wages paid to employees (pay, in millions of dollars), total capital expenditures (invest, in millions of dollars), cost of electricity (energy, in millions of dollars), and investment in equipment (equip, in millions of dollars).

Figure 1: **Summary of model estimation results**

Source	SS	df	MS		
Model	121121050	5	24224209.9	Number of obs =	40
Residual	15939755.7	34	468816.344	F(5, 34) =	51.67
				Prob > F =	0.0000
Total	137060805	39	3514379.62	R-squared =	_____
				Adj R-squared =	0.8666
				Root MSE =	684.7

vship	Coef.	Std. Err.	t	P>|t|	Beta
emp	-433.234	_____	-5.33	0.000	-1.208648
pay	_____	8.526888	7.22	0.000	2.167519
invest	-2.200353	_____	-1.73	0.093	-.1484527
energy	_____	7.454643	-4.67	0.000	-1.115403
equip	-1.772903	.6159922	___	0.007	-.54456
_cons	3539.101	936.0097	___	0.001	.

11. (4 points) Filling out the spaces on the regression table above for $ee(emp)$, $coef(pay)$, $ee(invest)$, $coef(energy)$, $t(equip)$, $t(const)$ y R^2 yields:

    A. 81.31, 61.59, 1.11, 34.8, -2.88, 3.78 y 0.86

    B. 81.31, 61.59, 1.11, -34.8, -2.88, 3.78 y 0.81

    C. 81.31, 61.59, 1.27, -34.8, -2.88, 3.78 y 0.83

    D. 81.31, 61.59, 1.27, -34.8, -2.88, 3.78 y 0.75

    E. 81.31, 61.59, 1.27, 34.8, -2.88, 3.78 y 0.88

    F. None of the above

12. (4 points) According to the results that you filled in and also taking into account the standardized results, it can be said:

    A. An increase in the cost of energy of one million dollars generates a decrease of 34 thousand pesos in copper sales

    B. All the coefficients are statistically significant except for the variable invest

    C. The variable that generates the greatest impact on copper sales is energy spending

    D. An increase in the payroll of $1,000 causes an increase in copper sales of $61,000

    E. Only A and B

    F. Only A and C

    G. B and C only

    H. C and D only

    I. None of the above

13. (4 points) In the general linear model $Y = X\beta + U$, if there is a perfect linear relationship between the regressors contained in the data matrix X, the OLS estimator of β:

    A. Is biased and inefficient

    B. Is biased and inefficient because the regressors are linearly dependent only when some relevant explanatory variable has been omitted from the model

    C. Is not unique because the determinant of array $X'X$ equals zero

D. Is unbiased and efficient because approximate multicollinearity does not affect the statistical properties of the OLS estimator of β

E. None of the above

F. Only (B) and (C)

14. (4 points) In the model $Y_i = \beta_1 + \beta 2X_i + \beta_3 Z_i + \mu_i$, the null hypothesis and the alternative hypothesis in the global significance test of the slopes are:

A. $H_0 : \beta_1 + \beta_2 + \beta_3 = 0$ and $H_1 : \beta_1 + \beta_2 + \beta_3 \neq 0$.

B. $H_0 : \beta_2 + \beta_3 = 0$ and $H_1 : \beta_2 + \beta_3 \neq 0$.

C. $H_0 : (\beta_2, \beta_3)' = (0, 0)'$ and $H_1 : (\beta_2, \beta_3)' \neq (0, 0)'$.

D. $H_0 : (\beta_1, \beta_2, \beta_3)' = (0, 0, 0)'$ and $H_1 : (\beta_1, \beta_2, \beta_3)' \neq (0, 0, 0)'$.

E. None of the above

15. (4 points) In the context of the General Linear Model $Y = X\beta + U$, indicate which of the following assumptions is NOT required for the efficiency of the OLS estimator of β (efficient in the sense of the Gauss-Markov theorem):

A. The variance of the error term is constant throughout the sample

B. Excluding variables from X

C. Normality in the distribution of U

D. Explanatory variables are deterministic

E. Covariance between any pair of errors is equal to zero.

F. None of the above.

G. All of the above