



UNIVERSITY OF THE PUNJAB

Sixth Semester - 2017
Examination: B.S. 4 Years Programme

Roll No.

PAPER: Econometrics II
Course Code: ECON-307

TIME ALLOWED: 2 hrs. & 30 mins.
MAX. MARKS: 50

Attempt this Paper on Separate Answer Sheet provided.

Subjective Part		
Note: Attempt all questions.		
Q2.	Explain the following briefly. (i) Autoregressive process (ii) Properties of ML estimators (iii) ARCH models (iv) Instrumental variable (v) Durbin Watson Statistics	4 x 5 =20
Q3.	Outline the major steps involved in the application of the Box–Jenkins approach to forecasting.	10
Q4.	The following equation was estimated, where standard errors are in parenthesis: $\text{SAT}_{\text{that}} = 1,028.1 + 19.30 \text{ hsize} - 45.09 \text{ female} - 169.81 \text{ black} + 62.31 \text{ female*black}$ (6.29) (3.83) (4.29) (12.71) (18.15) Where hsize is the number of students in the school, female and black are dummy variables indicating that the student is female or black, respectively, and female*black is an interaction of the two. a) What is the estimated difference in SAT score between black males and non-black males? b) What is the estimated difference in SAT score between black females and non-black females? What would you need to do to test whether the difference is statistically significant? c) State the null hypothesis that the effect of being female does not vary by race. d) What is the marginal effect of being female on SAT _{that} ? Briefly interpret this result.	10
Q5.	What is autocorrelation? Briefly discuss the methods available to detect and remove it.	10



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Roll No.

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TIME ALLOWED: 30 mins.
MAX. MARKS: 10

Attempt this Paper on this Question Sheet only.

Q.1	<u>Objective Part:</u> Encircle the correct answer.	Max Marks= 10
	<p>1. The confidence interval for a single coefficient in a multiple regression</p> <ul style="list-style-type: none">a) makes little sense because the population parameter is unknown.b) should not be computed because there are other coefficients present in the model.c) contains information from a large number of hypothesis tests.d) should only be calculated if the regression R^2 is identical to the adjusted R^2. <p>2. When there are omitted variables in the regression, which are determinants of the dependent variable, then</p> <ul style="list-style-type: none">a) you cannot measure the effect of the omitted variable, but the estimator of your included variable(s) is (are) unaffected.b) this has no effect on the estimator of your included variable because the other variable is not included.c) this will always bias the OLS estimator of the included variable.d) the OLS estimator is biased if the omitted variable is correlated with the included variable. <p>3. When you have an omitted variable problem, the assumption that $E(u_i X_i) = 0$ is violated. This implies that</p> <ul style="list-style-type: none">a) the sum of the residuals is no longer zero.b) there is another estimator called weighted least squares, which is BLUE.c) the sum of the residuals times any of the explanatory variables is no longer zero.d) the OLS estimator is no longer consistent. <p>4. In a two regressor regression model, if you exclude one of the relevant variables then</p> <ul style="list-style-type: none">a) it is no longer reasonable to assume that the errors are homoskedastic.b) OLS is no longer unbiased, but still consistent.c) you are no longer controlling for the influence of the other variable.d) the OLS estimator no longer exists.	

(P.T.O.)

5. For a stationary autoregressive process, shocks will
- Eventually die away
 - Persist indefinitely
 - Grow exponentially
 - Never occur
6. The purpose of "augmenting" the Dickey-Fuller test regression is to
- Ensure that there is no heteroscedasticity in the test regression residuals.
 - Ensure that the test regression residuals are normally distributed
 - Ensure that there is no autocorrelation in the test regression residuals
 - Ensure that all of the non-stationarity is taken into account.
7. If the Engle-Granger test is applied to the residuals of a potentially cointegrating regression, what would be the interpretation of the null hypothesis?
- The variables are cointegrated
 - The variables are not cointegrated
 - Both variables are stationary
 - Both variables are non-stationary
8. Which of the following could be used as a test for autocorrelation up to third order?
- The Durbin Watson test
 - White's test
 - The RESET test
 - The Breusch-Godfrey test
9. Which one of the following is examined by looking at a goodness of fit statistic?
- How well the population regression function fits the data
 - How well the sample regression function fits the population regression function
 - How well the sample regression function fits the data
 - How well the population regression function fits the sample regression function.
10. Stationarity means that the
- error terms are not correlated.
 - forecasts remain within 1.96 standard deviation outside the sample period.
 - probability distribution of the time series variable does not change over time.
 - time series has a unit root



UNIVERSITY OF THE PUNJAB

Sixth Semester - 2018
Examination: B.S. 4 Years

Roll No.

PAPER: Econometrics II
Course Code: ECON-307 Part – II

TIME ALLOWED: 2 Hrs. & 45 Min.
MAX. MARKS: 50

Attempt this Paper on Separate Answer Sheet provided.

- Q.2. Explain the following briefly. (5 x 4 = 20 Marks)
- Moving Average process
 - Specification Bias
 - ARCH models
 - Unit Root test
 - Restricted Least Square
- Q3. (i) Describe the least square estimation procedure in matrix notation. (5 Marks)
(ii) Explain the purpose and procedure of Chow test. (5 Marks)
- Q4. (i) You are given the following data:
RSS1 based on the first 30 observations = 55, df = 25
RSS2 based on the last 30 observations = 140, df = 25
Carry out the Goldfeld–Quandt test of heteroscedasticity at the 5 percent level of significance. (4 Marks)
- (ii) Consider the following model
$$Y_i = \alpha_1 + \alpha_2 D_i + \beta X_i + u_i$$
where Y = annual salary of a college professor, X = years of teaching experience
D = dummy for gender
Consider three ways of defining the dummy variable.
a) D = 1 for male, 0 for female. b) D = 1 for female, 2 for male.
c) D = 1 for female, -1 for male.
Interpret the preceding regression model for each dummy assignment. Is one method preferable to another? Justify your answer. (6 Marks)
- Q.5. Develop a suitable ARIMA model to forecast the labor force participation rate for females and males separately. What considerations would you take into account in developing such a model? Show the necessary calculations and explain the various diagnostic tests you use in your analysis. (10 Marks)



UNIVERSITY OF THE PUNJAB

Sixth Semester - 2018

Examination: B.S. 4 Years

Roll No.

PAPER: Econometrics II

TIME ALLOWED: 15 Min.

Course Code: ECON-307 Part – I (Compulsory)

MAX. MARKS: 10

Attempt this Paper on this Question Sheet only.

This Paper will be collected back after expiry of time limit mentioned above.

Q.1 Encircle the correct answer.

(10 Marks)

- (i) In multiple regression, the R^2 increases whenever an explanatory variable is
- added unless the coefficient on the added variable is exactly zero.
 - added unless the adjusted R^2 falls.
 - added unless there is heteroskedasticity.
 - added unless the added variable is not statistically significant at the 5%-level.
- (ii) Which of the following is an equivalent expression for saying that the explanatory variable is "non-stochastic"?
- The explanatory variable is partly random
 - The explanatory variable is fixed in repeated samples
 - The explanatory variable is correlated with the errors
 - The explanatory variable always has a value of one
- (iii) The sample average of the OLS residuals is
- some positive number since OLS uses squares.
 - zero.
 - unobservable since the population regression function is unknown.
 - dependent on whether the explanatory variable is mostly positive or negative.
- (iv) In the regression model $Y_i = \beta_0 + \beta_1 C_i + \beta_2 F_i + \beta_3 (C_i \times F_i) + u_i$, where Y denotes earnings, C a dummy variable for having a college degree and F a gender dummy variable, β_2
- is the gender difference in earnings for someone with a college degree.
 - is the gender difference in earnings for someone without a college degree.
 - is the difference in earnings between those with and without a college degree when $F_i = 0$.
 - cannot be estimated since F_i and $(C_i \times F_i)$ are perfectly collinear when $F_i = 0$.
- (v) The random walk model is an example of a
- stationary model.
 - stochastic trend model.
 - binomial model.
 - deterministic trend model
- (vi) The order of integration
- depends on the number of lags in the VAR specification.
 - is the number of times that the series needs to be differenced for it to be stationary.
 - cannot be calculated in time series.
 - can never be zero.

(P.T.O.)

(vii) Which one of the following would NOT be a consequence of using non-stationary data in levels form?

- a) The regression R^2 may be spuriously high
- b) Test statistics may not follow standard distributions
- c) Statistical inferences may be invalid
- d) Parameter estimates may be biased

(viii) Negative residual autocorrelation is indicated by which one of the following?

- a) A cyclical pattern in the residuals
- b) An alternating pattern in the residuals
- c) A complete randomness in the residuals
- d) Residuals that are all close to zero

(ix) What is the meaning of the term "heteroscedasticity"?

- a) The variance of the errors is not constant
- b) The variance of the dependent variable is not constant
- c) The errors are not linearly independent of one another
- d) The errors have non-zero mean

(x) For a stationary autoregressive process, shocks will

- a) Eventually die away
- b) Persist indefinitely
- c) Grow exponentially
- d) Never occur



UNIVERSITY OF THE PUNJAB
B.S. 4 Years Program / Sixth Semester – 2019

Paper: Econometrics II

Course Code: ECON-307 Part – I (Compulsory)

Time: 15 Min. Marks: 10

Roll No. in Fig.

Roll No. in Words.

Signature of Supdt.:

ATTEMPT THIS PAPER ON THIS QUESTION SHEET ONLY.

Division of marks is given in front of each question.

This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the correct choice.

(1x10=10)

1. Even though the disturbance term in the CLRM is not normally distributed, the OLS estimators are
 - a) Still unbiased
 - b) Biased but inefficient
 - c) Both unbiased and efficient
 - d) Both biased and efficient
2. In a regression model that contains the intercept, the sum of the residuals is always
 - a) Zero
 - b) One
 - c) Infinity
 - d) Can't be estimated
3. The conditional and unconditional means of a random variable are the same things.
 - a) Same thing
 - b) Different thing
 - c) Not comparable
 - d) Comparable
4. Dummy variable trap is associated by
 - a) Multicollinearity
 - b) Heteroscedasticity
 - c) Autocorrelation
 - d) None of the above
5. In the regression of Y on X_2 and X_3 , suppose there is little variability in the values of X_3 . This would increase
 - a) $\text{var}(\hat{\beta}_1)$
 - b) $\text{var}(\hat{\beta}_2)$
 - c) $\text{var}(\hat{\beta}_3)$
 - d) None of the above
6. If heteroscedasticity is present, the conventional t and F tests are
 - a) Valid
 - b) Invalid
 - c) Not possible to estimate
 - d) All of the above

P.T.O.

7. The R^2 values of two models, one involving regression in the first difference form and another in the level form, are
 - a) Not directly comparable
 - b) Directly comparable
 - c) Not measurable
 - d) Measurable and directly comparable
8. When autocorrelation is present, OLS estimators are
 - a) Unbiased
 - b) Efficient
 - c) Consistent
 - d) None of the above
9. Autocorrelation is a problem associated with
 - a) Time series data only
 - b) Cross section data only
 - c) Panel data only
 - d) Both time series and panel data
10. WHITE test is used to detect
 - a) Multicollinearity
 - b) Heteroscedasticity
 - c) Autocorrelation
 - d) Misspecification



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B.S. 4 Years Program / Sixth Semester – 2019

Roll No.

Paper: Econometrics II
Course Code: ECON-307 Part – II

Time: 2 Hrs. 45 Min. Marks: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

		<u>Subjective Part</u>																																		
Q 2.	Explain the following terms. i) Multiple regression K-variable model ii) Consequences of Autocorrelation iii) ARDL Model iv) Moving Average (2) process v) Unit Root Problem		4x5 = 20																																	
Q 3.	Write in detail about ARCH models. Also discuss ARCH (1) and ARCH (2) processes.		10																																	
Q 4.	On the basis on following data, a researcher estimated the regression line as: $\hat{Y} = -25.08 - 0.66X_2 + 6.21X_3$ <table border="1" style="margin: 10px auto;"><tr><td>Y</td><td>11</td><td>16</td><td>11</td><td>14</td><td>13</td><td>17</td><td>14</td><td>15</td><td>12</td><td>18</td></tr><tr><td>X₂</td><td>20</td><td>18</td><td>22</td><td>21</td><td>27</td><td>26</td><td>25</td><td>27</td><td>30</td><td>28</td></tr><tr><td>X₃</td><td>8.1</td><td>8.4</td><td>8.5</td><td>8.5</td><td>8.8</td><td>9.0</td><td>8.9</td><td>9.4</td><td>9.5</td><td>9.5</td></tr></table> Find the Durbin Watson "d" Statistics and confirm either there is autocorrelation in the model or not. <i>Note:</i> The critical values of Durbin Watson statistics at 5% level of significance are dL = 0.697 dU = 1.641	Y	11	16	11	14	13	17	14	15	12	18	X ₂	20	18	22	21	27	26	25	27	30	28	X ₃	8.1	8.4	8.5	8.5	8.8	9.0	8.9	9.4	9.5	9.5		10
Y	11	16	11	14	13	17	14	15	12	18																										
X ₂	20	18	22	21	27	26	25	27	30	28																										
X ₃	8.1	8.4	8.5	8.5	8.8	9.0	8.9	9.4	9.5	9.5																										
Q 5.	Differentiate between short run and long run model for integration.		10																																	



UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Sixth Semester – Spring 2022

Paper: Econometrics II

Course Code: ECON-307

Roll No.

Time: 3 Hrs. Marks: 60

THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

Q.1. Answer the following short questions. (6x5=30)

1. If you have monthly data over a number of years, how many dummy variables will you introduce to test the following hypotheses:
 - a) All the 12 months of the year exhibit seasonal patterns.
 - b) Only February, April, June, August, October, and December exhibit seasonal patterns.
2. Discuss properties of ML (Maximum Likelihood) estimators.
3. Discuss usage of ARCH (Auto-regressive Conditional Hetro-skedasticity) model.
4. Discuss usage of Durbin Watson Statistic.
5. Define instrumental variable and its properties.
6. What do you mean by specification bias and errors in variables?

Q.2. Answer the following questions. (3x10=30)

i.

The estimated long run function is reported below.

$$\begin{array}{ccccccc} \text{PCY}_t & = & 59.25 & + & 0.24 \text{ Openness}_t & - & 14.85 \text{ Gini}_t & + & 0.97 \text{ Edu}_t & + & 28.15 \text{ Health}_t \\ \text{St. Errors} & & & & (0.145) & & (1.66) & & (0.103) & & (2.84) \\ n=34 & & R^2 = 0.60 & & \text{D.W} = 1.96 & & & & \text{F-stat (p-value)} = 0.07 & & \end{array}$$

Where, PCY – per capita income used for economic growth, Openness – trade volume as % of GDP, Gini – used for income inequality, Edu – Education expenditures in millions, Health – Life expectancy (in years) used as proxy for health indicator. All variables are taken in log form. The standard errors are given in parenthesis.

- a) Discuss individual statistical significance of the variables.
- b) Interpret Gini and Openness estimated coefficient.
- c) Comment on Overall significance of the model.
- d) What is usage of Durbin Watson stat?
- e) Is it necessary that all variables must be integrated of order one to have a long run relationship?

ii.

"A test of co-integration can be thought as a pre-test to avoid spurious regression situation". Discuss with your valuable comments.

iii.

- a) What do you mean by hetro-skedasticity and auto-correlation problem?
- b) Discuss relevance of GLS (Generalized least square) method with respect to hetro-skedasticity and auto-correlation issue.



UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Seventh Semester – Spring 2022

Paper: Econometrics – II

Course Code: ECON-405A

Roll No.

Time: 3 Hrs. Marks: 60

THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

Q.1. Answer the following short questions: (6x5=30)

1. Discuss simultaneity bias: Inconsistency to OLS estimators
2. What is stochastic process? What are the methods to detect white noise process?
3. Discuss usage of Hausman Specification test.
4. Define coefficient of determination and discuss its properties.
5. Discuss usage of Logit/Probit model in empirical analysis.
6. What do you mean by BLUE?

Q.2. Answer the following questions. (3x10=30)

1. Explain the least square estimation process in Matrix notation.
2. Consider the following Model with a dummy variable as explanatory variable

$$Y = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \mu$$

Where Y=Earnings of College Teacher,

X_2 = Teaching experience in number of years

$$X_3 = \begin{pmatrix} 1 & \text{If Male} \\ 0 & \text{Otherwise.} \end{pmatrix}$$

Y	40	35	55	45	60	70	35	32	41	50
X_2	10	8	9	8	11	12	7	6	8	9
X_3	F	F	M	M	M	M	F	F	M	M

Estimate the Model and Test the Hypothesis that there is no difference in earning of college teachers due to gender effect.

3. Discuss Co-integration and Error Correction mechanism in detail.