# UNIVERSITY OF THE PUNJAB

**Fifth Semester    2018**
**Examination; B.S. 4 Years Programme**

**PAPER: Econometrics-I**
**Course Code: ECON-302**

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

*Attempt this Paper on Separate Answer Sheet provided.*

| | Subjective Paper:<br>**Note:** Attempt all Questions | |
|---|---|---|
| Q 2. | Explain the following briefly.<br>  i.    $R^2$ and Adjusted $R^2$<br>  ii.   Instrumental Variables<br>  iii.  OLS and GLS<br>  iv.  Use of Z - stat and F - stat<br>  v.   ILS and 2SLS | 4 * 5<br>= 20 |
| Q 3. | Income and Consumption expenditure (X and Y respectively) are given for 20 families. Given the data, estimate consumption function, indicate value of MPC (marginal propensity to consume), indicate consumption level at zero income and give economic interpretations of your regression results.<br>$\sum x = 191,200 \quad \sum y = 175,300 \quad \sum x^2 = 2,165,180,000$<br>$\sum y^2 = 1,813,469,000 \quad \sum xy = 1,973,670,000 \quad n = 20$ | 10 |
| Q 4. | Distinguish between simple correlation and auto-correlation. How to find the presence of auto-correlation? What are the consequences of auto-correlation and its remedies? | 10 |
| Q 5. | Consider the following OLS regression model:<br>$\ln y_t = \alpha + \beta \ln x_t + \varepsilon_t$<br>Where $y_t \rightarrow$ Real food expenditure,<br>    $x_t \rightarrow$ Real food advertising expenditure<br>The model was estimated using quarterly data and sample size = 40. Seasonal dummies (Seas) were introduced and the following results were obtained.<br>$\ln y_t = 8.236 - 0.076 Seas_1 - 0.012 Seas_2 - 0.004 Seas_3 + 0.0175 \ln x_t$<br>$R^2 = 0.75$<br>  i.   Interpret estimated regression coefficients.<br>  ii.  Explain why there are only three seasonal dummies in a regression.<br>  iii. Comment on value of coefficient of determination. | 10 |

**BON COURAGE**

# UNIVERSITY OF THE PUNJAB

Roll No. ................

**Fifth Semester    2018**
**Examination: B.S. 4 Years Programme**

PAPER: Econometrics-I
Course Code: ECON-302

**TIME ALLOWED: 30 mins.**
**MAX. MARKS: 10**

*Attempt this Paper on this Question Sheet only.*

| | Objective Part:<br>Encircle the Correct Answer. | Max Marks<br>(10) |
|---|---|---|
| 1. | The first order auto-regressive relationship of residual term is:<br>a) $\varepsilon_t = \rho\varepsilon_{t-1} + \mu_t$<br>b) $\varepsilon_t = \rho\varepsilon_{t-1} - \mu_t$<br>c) $\varepsilon_t = \rho\varepsilon_{t-2} + \mu_t$<br>d) $\varepsilon_t = \rho\varepsilon_{t+1} + \mu_t$ | |
| 2. | The variance of the random error term may be seriously underestimated if the errors are:<br>a) Not correlated<br>b) Auto-correlated<br>c) Both (a) & (b)<br>d) None of these | |
| 3. | The reduced form method is a:<br>a) Single equation method<br>b) Multi equation method<br>c) Double equation method<br>d) None of these | |
| 4. | Hetro-skedasticity can also arise as a result of the:<br>a) Presence of outlier<br>b) Absence of outlier<br>c) Both (a) & (b)<br>d) None of these | |

**P.T.O.**

| 5. | The Method of OLS assumes that independent variables must be:<br>a) Endogenous<br>b) Exogenous<br>c) Partially endogenous<br>d) None of these | |
|---|---|---|
| 6. | T-stat is used to check:<br>a) Overall significance of the model<br>b) Individual significance of the variables<br>c) Both (a) & (b)<br>d) None of these | |
| 7. | An equation can be:<br>a) Exactly identified<br>b) Over identified<br>c) Under identified<br>d) All of these | |
| 8. | If qualitative data has three attributes and we introduce three dummy variables, it refers to:<br>a) Qualitative classification<br>b) Categorical classification<br>c) Dummy variable trap<br>d) Absence of multi-collinearity | |
| 9. | In Correlation analysis, there is:<br>a) Cause and effect relationship between variables<br>b) No cause and effect relationship between variables<br>c) Both (a) & (b)<br>d) None of the above | |
| 10. | The correlation coefficient ranges from:<br>a) 0 to 1<br>b) -1 to +1<br>c) -1 to $+\infty$<br>d) $-\infty$ to $+\infty$ | |

# UNIVERSITY OF THE PUNJAB

**Fifth Semester    2017**

Roll No. .....................

**PAPER: Econometrics-I**                    TIME ALLOWED: 2 hrs. & 30 mins.
**Course Code: ECON-302**                    MAX. MARKS: 50

*Attempt this Paper on Separate Answer Sheet provided.*

| | **Subjective Part** <br> Note: Attempt all questions. | |
|---|---|---|
| Q2. | Explain the following briefly. <br>   (i)   BLUE properties <br>   (ii)  ANOVA technique <br>   (iii) AR(1) process <br>   (iv) Order and Rank conditions <br>   (v)  Two Stage Least Square | 4 x 5 <br> =20 |
| Q3. | In a regression of average wages ($W$, \$) on the number of employees ($N$) for a random sample of 30 firms, the following regression results were obtained : <br><br> $$\widehat{W} = 7.5 + \ 0.009N \qquad (1)$$ <br> $$t = \text{n.a.} \quad (16.10) \qquad R^2 = 0.90$$ <br><br> $$\widehat{W}/N = \ 0.008 + \ 7.8(1/N) \qquad (2)$$ <br> $$t = (14.43) \quad (76.58) \qquad R^2 = 0.99$$ <br><br> **a.** How do you interpret the two regressions? <br> **b.** What is the author assuming in going from Eq. (1) to (2)? Was he worried about heteroscedasticity? How do you know? <br> **c.** Can you relate the slopes and intercepts of the two models? <br> **d.** Can you compare the $R^2$ values of the two models? Why or why not? | 10 |
| Q4. | Consider the following modified Keynesian model of income determination: <br><br> $$C_t = \beta_{10} + \beta_{11} Y_t + u_{1t}$$ <br> $$I_t = \beta_{20} + \beta_{21} Y_t + \beta_{22} Y_{t-1} + u_{2t}$$ <br> $$Y_t = C_t + I_t + G_t$$ <br><br> where      $C$ = consumption expenditure <br>              $I$ = investment expenditure <br>              $Y$ = income <br>              $G$ = government expenditure <br>      $G_t$ and $Y_{t-1}$ are assumed predetermined <br><br> **a.** Obtain the reduced-form equations and determine which of the preceding equations are identified (either just or over). <br> **b.** Which method will you use to estimate the parameters of the over-identified equation and of the exactly identified equation? Justify your answer. | 10 |
| Q5. | Discuss how dummy variables can be used to test (i) change in intercept (ii) change in slope and (iii) changes in both intercept and slope | 10 |

UNIVERSITY OF THE PUNJAB

Roll No. .................

Fifth Semester 2017
Examination: B.S. 4 Years Programme

PAPER: Econometrics-I
Course Code: ECON-302

TIME ALLOWED: 30 mins.
MAX. MARKS: 10

*Attempt this Paper on this Question Sheet only.*

| | **Objective Part:**<br>Encircle the correct answer. | Max Marks = 10 |
|---|---|---|
| 1. | Which of the following is an equivalent expression for saying that the explanatory variable is "non-stochastic"?<br><br>a) The explanatory variable is partly random<br><br>b) The explanatory variable is fixed in repeated samples<br><br>c) The explanatory variable is correlated with the errors<br><br>d) The explanatory variable always has a value of one | |
| 2. | If an estimator is said to have minimum variance, which of the following statements is NOT implied?<br><br>a) The probability that the estimate is a long way away from its true value is minimised<br><br>b) The estimator is efficient<br><br>c) Such an estimator would be termed "best"<br><br>d) Such an estimator will always be unbiased | |
| 3. | Which one of the following is the most appropriate definition of a 99% confidence interval?<br><br>a) 99% of the time in repeated samples, the interval would contain the true value of the parameter<br><br>b) 99% of the time in repeated samples, the interval would contain the estimated value of the parameter<br><br>c) 99% of the time in repeated samples, the null hypothesis will be rejected<br><br>d) 99% of the time in repeated samples, the null hypothesis will not be rejected when it was false | |

**P.T.O.**

| 4. | Suppose that a test that the true value of the intercept coefficient is zero results in non-rejection. What would be the appropriate conclusion? | |
|---|---|---|
| | a) Drop the intercept and re-run the regression | |
| | b) Retain the intercept | |
| | c) Re-compute the test statistic | |
| | d) The regression line is running exactly through the origin | |
| 5. | Which one of the following is examined by looking at a goodness of fit statistic? | |
| | a) How well the population regression function fits the data | |
| | b) How well the sample regression function fits the population regression function | |
| | c) How well the sample regression function fits the data | |
| | d) How well the population regression function fits the sample regression function. | |
| 6. | What would be then consequences for the OLS estimator if heteroscedasticity is present in a regression model but ignored? | |
| | a) It will be biased | |
| | b) It will be inconsistent | |
| | c) It will be inefficient | |
| | d) All of (a), (b) and (c) will be true. | |
| 7. | 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 | |
| 8. | If a Durbin Watson statistic takes a value close to zero, what will be the value of the first order autocorrelation coefficient? | |
| | a) Close to zero | |
| | b) Close to plus one | |
| | c) Close to minus one | |
| | d) Close to either minus one or plus one | |
| 9. | What is the meaning of the term "heteroskedasticity"? 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 | |
| 10. | The dummy variable trap is an example of a) imperfect multicollinearity b) Something that is of theoretical interest only c) perfect multicollinearity d) something that does not happen to university or college students | |

**Attempt this Paper on this Question Sheet only.**
**Please encircle the correct option. 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 right answer, cutting and overwriting is not allowed.        (1x10=10)**

| | |
|---|---|
| 1. | Suppose that a test that the true value of the intercept coefficient is zero results in non-rejection. What would be the appropriate conclusion? |
| | a) Drop the intercept and re-run the regression |
| | b) Retain the intercept |
| | c) Re-compute the test statistic |
| | d) The regression line is running exactly through the origin |
| 2. | If an estimator is said to have minimum variance, which of the following statements is NOT implied? |
| | a) The probability that the estimate is a long way away from its true value is minimised |
| | b) The estimator is efficient |
| | c) Such an estimator would be termed "best" |
| | d) Such an estimator will always be unbiased |
| 3. | In the context of simultaneous equations modelling, which of the following statements is true concerning an endogenous variable? |
| | a) The values of endogenous variables are determined outside the system |
| | b) There can be fewer equations in the system than there are endogenous variables |
| | c) Reduced form equations will not contain any endogenous variables on the RHS |
| | d) Reduced form equations will contain only endogenous variables on the RHS |
| 4. | Near multicollinearity occurs when |
| | a) Two or more explanatory variables are perfectly correlated with one another |
| | b) The explanatory variables are highly correlated with the error term |
| | c) The explanatory variables are highly correlated with the dependent variable |
| | d) Two or more explanatory variables are highly correlated with one another |
| 5. | Which one of the following is examined by looking at a goodness of fit statistic? |
| | a) How well the population regression function fits the data |
| | b) How well the sample regression function fits the population regression function |
| | c) How well the sample regression function fits the data |
| | d) How well the population regression function fits the sample regression function. |

**P.T.O.**

| | |
|---|---|
| 6. | What would be then consequences for the OLS estimator if heteroscedasticity is present in a regression model but ignored?<br><br>a) It will be biased<br><br>b) It will be inconsistent<br><br>c) It will be inefficient<br><br>d) All of (a), (b) and (c) will be true. |
| 7. | Which of the following could be used as a test for autocorrelation up to third order?<br><br>a) The Durbin Watson test<br><br>b) White's test<br><br>c) The RESET test<br><br>d) The Breusch-Godfrey test |
| 8. | If OLS is applied separately to each equation that is part of a simultaneous system, the resulting estimates will be<br><br>a) Unbiased and consistent<br><br>b) Biased but consistent<br><br>c) Biased and inconsistent<br><br>d) It is impossible to apply OLS to equations that are part of a simultaneous system |
| 9. | The order condition is<br><br>a) A necessary and sufficient condition for identification<br><br>b) A necessary but not sufficient condition for identification<br><br>c) A sufficient but not necessary condition for identification<br><br>d) A condition that is neither necessary nor sufficient for identification |
| 10. | Negative residual autocorrelation is indicated by which one of the following?<br><br>a) A cyclical pattern in the residuals<br><br>b) An alternating pattern in the residuals<br><br>c) A complete randomness in the residuals<br><br>d) Residuals that are all close to zero |

# UNIVERSITY OF THE PUNJAB

**Fifth Semester – 2019**

**Examination: B.S. 4 Years Program**

**PAPER: Econometrics-I**

**Course Code: ECON-302    Part – II**

**MAX. TIME: 2 Hrs. 45 Min.**
**MAX. MARKS: 50**

## ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

**Q2.** Explain the following briefly.
  (i) Coefficient of Determination
  (ii) Perfect and partial multicollinearity
  (iii) Indirect Least Squares
  (iv) Order and Rank conditions
  (v) Generalized Least Square

$4 \times 5$
$=20$

**Q3.** Consider the following regression output:

$$\hat{Y}_i = 0.2033 + 0.6560 X_i$$
$$\text{se} = (0.0976) \ (0.1961)$$
$$r^2 = 0.397 \quad RSS = 0.0544 \quad ESS = 0.0358$$

10

where $Y$ = labor force participation rate (LFPR) of women in 1972 and $X$ = LFPR of women in 1968. The regression results were obtained from a sample of 19 cities in the United States.

a. How do you interpret this regression?

b. Test the hypothesis: $H_0: \beta_2 = 1$ against $H_1: \beta_2 > 1$. Which test do you use? And why? What are the underlying assumptions of the test(s) you use?

c. Suppose that the LFPR in 1968 was 0.58 (or 58 percent). On the basis of the regression results given above, what is the mean LFPR in 1972? Establish a 95% confidence interval for the mean prediction.

d. How would you test the hypothesis that the error term in the population regression is normally distribute? Show the necessary calculations.

**Q4.** Consider the sets of data given in the following two tables:

| Table 1 | | | | Table 2 | | |
|---|---|---|---|---|---|---|
| $Y$ | $X2$ | $X3$ | | $Y$ | $X2$ | $X3$ |
| 1 | 2 | 4 | | 1 | 2 | 4 |
| 2 | 0 | 2 | | 2 | 0 | 2 |
| 3 | 4 | 12 | | 3 | 4 | 0 |
| 4 | 6 | 0 | | 4 | 6 | 12 |
| 5 | 8 | 16 | | 5 | 8 | 16 |

10

The only difference between the two tables is that the third and fourth values of $X3$ are interchanged.

a) Regress $Y$ on $X2$ and $X3$ in both tables, obtaining the usual OLS output.

b) What difference do you observe in the two regressions? And what accounts for this difference?

**Q5.** From the data for 46 states in the United States for 1992, Baltagi obtained the following regression results[1]:

$$\widehat{\log C} = 4.30 - 1.34 \log P + 0.17 \log Y$$
$$\text{se} = (0.91) \quad (0.32) \qquad (0.20) \qquad \bar{R}^2 = 0.27$$

10

where $C$ = cigarette consumption, packs per year
  $P$ = real price per pack
  $Y$ = real disposable income per capita

a. What is the elasticity of demand for cigarettes with respect to price? Is it statistically significant? If so, is it statistically different from one?

b. What is the income elasticity of demand for cigarettes? Is it statistically significant? If not, what might be the reasons for it?

c. How would you retrieve $R^2$ from the *adjusted* $R^2$ given above?

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

1. What is Chow test? Explain its usage.
2. How correlation analysis differs from regression analysis?
3. What are the assumptions of classical linear regression model?
4. What is the OLS criterion of best fitted line?
5. Explain $R^2$ and adjusted $R^2$.
6. Differentiate between high and perfect multicollinearity.

## Answer the following questions.      (3x10=30)

### Question 2

An economist is trying to establish the extent of the relationship between the amount earned by a taxpayer during the year and his charitable contributions which are tax deductible. A random selection of 9 tax returns are analyzed and the results are tabulated below. The income and contributions are expressed in lakhs of rupees.

| Y (Contributions) | 2.0 | 2.5 | 2.7 | 2.5 | 3.8 | 4.2 | 4.3 | 4.4 | 4.45 |
|---|---|---|---|---|---|---|---|---|---|
| X (Income) | 25 | 29 | 32 | 32 | 40 | 43 | 50 | 55 | 57 |

i. Compute values of regression coefficients and interpret estimated parameters.
ii. For a person earning Rs. 65 lakhs per year, how much contribution do you expect him to make?

### Question 3

Define Multicollinearity and discuss its consequences, detection methods and remedial measures.

### Question 4.

From the following data find regression coefficients and test individual statistical significance of the coefficients.

| Year | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Qd (Y) | 100 | 75 | 80 | 70 | 50 | 65 | 90 | 100 |
| Price (X1) | 15 | 17 | 16 | 16 | 18 | 17 | 15 | 14 |
| Income (X2) | 1000 | 600 | 1200 | 500 | 300 | 400 | 1300 | 1100 |