

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1148

L

Unique Paper Code : 2922072401

Name of the Paper : Basics of Econometrics

Name of the Course : BBA (FIA)

Semester : IV

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Use of a scientific (non-programmable) calculator is permitted.
3. No negative marking.
4. Marks are indicated against each question.
5. Answer **all** questions.

Question 1: For each of the following statements, indicate whether it is True or False, and provide a clear and rigorous justification. Responses without explanation or with incorrect reasoning will not be awarded any marks.

5 x 3 = 15 Marks

1. In multiple regression, adding more variables always improves the model?
2. Joint hypothesis testing examines multiple coefficients simultaneously?
3. Multicollinearity affects the unbiasedness of OLS estimators.
4. Heteroscedasticity leads to inefficient estimates and incorrect standard errors.
5. Endogeneity affects the unbiasedness of OLS estimators.

Question 2: Consider the following regression equation, in regression equation researcher mark 1 for boys and 0 for girls:

15 Marks

Dependent Variable: WEIGHT				
Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	48.99445	0.405106	120.9422	0
FAMILY_INCOME	0.016077	0.00743	2.163671	0.0348
DUMMY	4.482883	0.733385	6.112594	0
DUMMY*FAMILY_INCOME	-0.029963	0.011474	-2.611304	0.0116

A study is conducted to examine the relationship between **family income** and the **weight of children**, separately for boys and girls. Using regression analysis, the researcher aims to understand how changes in family income influence the weight of children.

Based on the given data, answer the following questions:

1. Formulate the regression equations for boys and girls.
2. Interpret the slope coefficient for boys by calculating the change in weight associated with a one-unit increase in family income.

P.T.O.

3. Interpret the slope coefficient for girls by calculating the change in weight associated with a one-unit increase in family income.
4. Estimate the expected weight of boys when family income is zero, and interpret its meaning.
5. Estimate the expected weight of girls when family income is zero, and interpret its meaning.
6. Estimate the expected weight of boys when family income is 100 units.
7. Estimate the expected weight of girls when family income is 100 units.

Question 3: Regression Model: $\text{Wage_Rate} = \alpha + \beta_1 \times \text{Education_Years} + \beta_2 \times \text{Experience} + \text{Error Term}$

(15 Marks)

Given the following data:

- Number of Observations (n): 60
- Mean Sum of Squares of Regression (MSR): 10.245312
- Mean Sum of Squares of Residual (MSE): 1.024531
- Intercept (α) Coefficient: 6.982154321
- Standard Error of Intercept: 0.812345672
- Coefficient of Education_Years (β_1): 0.152451236
- Standard Error of β_1 : 0.041245678
- Coefficient of Experience (β_2): 0.276543219
- Standard Error of β_2 : 0.065432187

Required:

1. Compute Multiple R.
2. Compute R^2 (Coefficient of Determination).
3. Compute Adjusted R^2 .
4. Compute the Standard Error of Regression.
5. Based on the calculated t-statistics, Test whether the intercept, β_1 (Education_Years), and β_2 (Experience) are significantly different from zero at the 5% level of significance.

Null Hypotheses:

- i. $H_0: \alpha = 0$
- ii. $H_0: \beta_1 = 0$
- iii. $H_0: \beta_2 = 0$

Question 4: A researcher is studying the factors influencing whether an individual purchases a health insurance policy. The dependent variable is binary:

15 Marks

- $Y=1$ Y, if the individual purchases insurance
- $Y=0$, otherwise

The following Logit model is estimated:

$$\ln\left(\frac{P}{1-P}\right) = -2.184 + 0.045 \times \text{Income} + 0.80 \times \text{Education} - 0.60 \times \text{Age}$$

Where:

- Income = Monthly income (in ₹10,000 units)
- Education = Years of schooling
- Age = Age in years
- PPP = Probability of purchasing insurance

Required:

1. Interpret the coefficients of Income, Education, and Age in the context of the Logit model.
2. Calculate the probability that an individual with the following characteristics purchases insurance:
 - Income = 5
 - Education = 12
 - Age = 40
3. Compute the odds ratio for Education and interpret its meaning.
4. Explain whether Income has a significant positive or negative impact on the probability of purchasing insurance.
5. If the coefficient of Age were statistically insignificant, what would be the implication for the model?

Question 5a: A researcher is examining the presence of multicollinearity in a multiple regression model with three explanatory variables: Advertising_Expenditure (X_1), Product_Price (X_2), and Distribution_Cost (X_3). (9 Marks)

The coefficient of determination (R^2) values obtained by regressing each independent variable on the remaining independent variables are as follows:

- R^2 for Advertising_Expenditure (X_1) = 0.52
- R^2 for Product_Price (X_2) = 0.68
- R^2 for Distribution_Cost (X_3) = 0.41

Required:

1. Calculate the Variance Inflation Factor (VIF) for each independent variable.
2. Examine whether multicollinearity is present in the model and provide a suitable interpretation.
3. Write the auxiliary regression equations corresponding to each R^2 value.

Question 5b: Given that: $Y = \alpha + \beta_1 X + \beta_2 X^2 + \beta_3 X^3 + \epsilon$, calculate how much Y will be change with the change of 1 unit of X. (6 Marks)

Question 6: Answer the Following (15 Marks)

- (a) Homoscedastic and Autocorrelation
- (b) Different Functional of Regression.
- (c) A researcher is examining does education benefit women or men more in the labor market?

$$\text{incwage}_i = \beta_0 + \beta_1 \text{female}_i + \beta_2 \text{education}_i + \beta_3 (\text{female}_i \times \text{education}_i) + u_i$$

Where

Female=1

Male=0

Education = years of education

Interaction Models: Interpretation

$$\text{incwage}_i = -51,559 + 16,056 \text{female}_i + 7,762 \text{education}_i - 2,639 (\text{female}_i \times \text{education}_i)$$

Required

1. Comment on β_0
2. Interpret the coefficient of female
3. Interpret the coefficient of education
4. Interpret the coefficient of interaction variable ($\text{female}_i \times \text{education}_i$)