

BACHELOR OF ARTS EXAMINATION, 2025**ECONOMICS****2nd Year, 2nd Semester****Subject Code : ECO/B/SE 3.2/1 (OLD)****APPLIED ECONOMETRICS****Time : Two Hours****Full Marks : 30****Answer all the questions :**

1. You want to find out whether there is an association between the quantity of customer purchase (y) and customer income ϵ (x). For 715 customers, you calculate a covariance between income and purchase quantity of $S_{xy} = 2.4$ for 715.

- (a) What does covariance tell us about trait association?
 (b) Calculate Pearson's correlation coefficient assuming that:

$$\sum_{i=1}^n (x_i - \bar{x})^2 = 22,500 \qquad \sum_{i=1}^n (y_i - \bar{y})^2 = 17000$$

- (c) Describe the association between the traits based on the calculated correlation coefficient. Explain.
 (d) How Multicollinearity can be detected. What is VIF? 2+2+1+5=10
2. Answer any two of the following 5×2=10
- a. How the problem of Autocorrelation may be identified in OLS estimation. What is RUN test? 5
 b. What is Heteroscedasticity? State the steps for White Test for testing Heteroscedasticity. 5
 c. When Chow test is applicable? Briefly explain the steps for Chow Test. 5
3. (i) Show what steps are followed to estimate parameters if Heteroscedasticity is present in the LOS regression model.
 (ii) The following two estimated models are used to explain how House price depends on different factors like bedrooms, squarefeet etc.

where price i = house price in \$1000s, bdrms = number of bedrooms, lotsize = size of lot in square feet. sqrft = size of house in square feet, $\text{lprice} = \log(\text{price})$ $\text{llotsize} = \log(\text{lotsize})$ $\text{lsqrft} = \log(\text{sqrft})$

Model 1:

$$\hat{price} = -21.77 + .00207 \text{ lotsize} + .123 \text{ sqrft} + 13.85 \text{ bdrms}$$

$$(29.48) \quad (.00064) \quad (0.013) \quad (9.01)$$

$n = 88, R^2 = .672.$

The R -squared from the regression of squared OLS estimated residuals on $lotsize$, $sqrft$, and $bdrms$ is $R^2_{\hat{u}_2} = .1601.$

(i) Compute Breusch Pagan F Statistic and LM Statistic for Heteroscedasticity for model.

Model 2:

$$1 \hat{price} = 5.61 + .1681 \text{ lotsize} + 0.7001 \text{ sqrft} + 0.037 \text{ bdrms}$$

$$(.65) \quad (.038) \quad (.093) \quad (.028)$$

$n = 88, R^2 = .643.$

Regressing the squared OLS estimated residuals for model 2 from this regression on $\log(lotsize)$, $\log(sqrft)$, and $bdrms$ gives $R^2_{\hat{u}_2} = .0480.$

(i) Compute Breusch Pagan F Statistic and LM Statistic for model 2.

(ii) Comment on the presence of Heteroscedasticity in the above models, 2+2+2+2+2=10

Relevant F Table 10% critical Values F Distribution

denominator	1	2	3	4	5
60	4	3.15	2.76	2.53	2.37
90	3.95	3.1	2.71	2.47	2.32
120	3.92	3.07	2.68	2.45	2.29

Relevant F Table 5% critical Values F Distribution

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Critical Value for Chi-Square - Significance Level

Df	1%	5%	10%
1	2.71	3.84	6.63
2	4.61	5.99	9.21
3	6.25	7.81	11.34
4	7.78	9.49	13.28
....			
30	50.89	43.77	40.26
