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Your Roll No.....

Sr. No. of Question Paper : 1005

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Unique Paper Code : 2922104801

Name of the Paper : Time Series Econometrics

Name of the Course : **B.A. (H) Business Economics**

Semester : VIII

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. Attempt any **five** questions, **all** questions carry equal marks.
3. The answers should be short and to the point.
4. Use of simple calculator is allowed, Log and 'e' table permitted
5. If any assumption is made while solving a problem, the same must be stated clearly and mentioned in the paper that the same was required to solve the problem.

1. (a) What is Stationarity and why do you think there is a need for a time series to be stationary? Distinguish between a non-stationary time series which is due to trend and stochastic properties. What corrective measures need to be undertaken to make such a series stationary?
- (b) What is the difference between a Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests? State the Null and Alternate Hypothesis for carrying out such a test.
- (c) How would you convert a variable say which is non stationary to stationary by first applying first difference and then by using second difference? Can differenced series be termed as 'Integrated Series'? Discuss. (6,6,6)
2. (a) The regression for MCX Crude prices was fitted by a BBE fourth year student and following results were obtained for the same.

P.T.O.

$$\Delta \text{Crude}_{t-1} = 113.4 - 0.06 \text{Crude}_{t-1} + 1.3949t$$

‘t’
(-1.56)
(1.51)

‘t’ values given only for slope coefficients, Model R Square = 0.029, DW (d) = 1.35, Given : ‘t’ table tau (DF) = -2.89 (5%)

- (a) What kind of statistical relation is being depicted in the model? Why do you think the researcher felt the need for carrying out such a regression? State the Null and Alternative Hypothesis to test for the above relation. Interpret the results obtained.

The student then fitted another model whose results are as under

$$\Delta \text{Crude}_t = 3.9 - 0.08 \text{Crude}_{t-1} + 1.89t + 0.9 \Delta \text{Crude}_{t-1}$$

‘t’ comp
(-2.2)
(2.15)
(2.51)

‘t’ values given only for slope coefficients, Model R Square = 0.15, DW (d) = 2.08, ‘Given : ‘t’ table tau (DF) = -2.89 (5%)

- (b) Why do you think the student fitted a new model? Do you think this model is an improvement over the earlier model? If yes, then in what respect this is an improvement over earlier model, if no then why not?
- (c) Do you think the student could achieve its objective by establishing a new model? Further, suggest what should be the next step to be taken by the student? (6,6,6)
3. A BBE fourth year student ran a regression between Personal Consumption Expenditure (PCE) as a function of Personal Disposable Income (PDI) and following are the results

$$\text{PCE}_t = -1.7144 + 0.967 \text{PDI}_t$$

‘t’
(-7.48)
(119.87)
Model R Square = 0.99, DW(d)=0.5316

- (a) Interpret the results of above model. Are these statistically significant?
- (b) The student started doubting the results obtained. Why do you think such a suspicion arose in the mind of the student and what remedial action would you suggest for the same.
- (c) Taking your own set of variables develop a Granger Causality Model, clearly showing the restrictive and unrestrictive equations. Which statistical test is applied to detect the Granger Causality? Write down the relevant formula for the same. (4,4,10)

4. (a) What do you understand by the term 'Co-integrated Variables'? What kind of stationary assumption is required for a pair of variables to be co-integrated? Can you relate the term to two variables which have a problem of unit root? Discuss.
- (b) Discuss with relevant equations, the two step Engle-Granger Procedure to detect co-integration amongst variables.
- (c) What do you understand by Information Criteria? Why do you think this criteria has become extremely popular in econometric research? State any two techniques falling under information criteria and write down appropriate formula for each. (6,6,6)
5. (a) Explain with your own example, the difference between Lag 1 and Lag 2 autocorrelation. Do you think Lag 1 autocorrelation would always be more than Lag 2 autocorrelation? Give reason to prove your point. Further, a researcher found significant autocorrelation between Lag 1 and Lag 4 but not between Lag 1 and Lag 2. What could be the reason for the same?
- (b) What are Naive forecasts? Construct a Naive based forecast model where the data includes a trend. Do you think a typical Naive forecast would include an MA term? Prove your point?
- (c) Apply a Moving Averaging technique to develop a one step forecasting model for year 2026 where the window size is fixed at '4'. (6,6,6)
6. You are given the following information about a company (1) Time Period & (2) Sales

Year and Quarter	(Co. Sales Actual, Rs crores)		Trend()		Forecast Error (F.E)
2025,Q1	450	450	0	450	0
2025,Q2	425				
2025,Q3	460				
2025,Q4	470				

- (a) Write down the three equations for trend adjusted exponential smoothening (Holt's Method).
- (b) Consider two smoothening parameters ; one for estimated change in prices (Sales) as ' α ' = 0.6 and second for trend as ' α ' = 0.1, complete the table given above (given figures for initial period, 2025 Q)
- (c) Someone suggested to change the smoothening parameter to say ' α ' as 0.1 while retaining the trend parameter. What changes do you notice in the results in terms of superiority of results if the exercise is undertaken again using these revised parameters? Which tool (select specifying any one) have you applied for the same? What does this tool measure? Show with calculations. (6,6,6)
7. (a) Develop an MA(3) model with lagged error structure. For such a model should a researcher use error terms generated of another model; an AR(3) which has same variable. Explain. Further, the researcher wanted to include error terms which were non linear in MA(3) model. Will such a model be correct technically. Comment.
- (b) What should be the guiding principle behind the weights attached to the lagged error terms in the above model, explain using your own hypothetical example.
- (c) Extend the above model developed by you to make it ARMA(3,3) Model and ARIMA(3,1,3) Model. Can you explain the difference between the two models. (6,6,6)