

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
SECOND SEMESTER- 2022-2023
Comprehensive Exam (Closed Book)
Part A

Course No. : **ECON F215**
 Course Title : **Computational Methods Economics**
 Date : **06/5/2023**
 Time : **09.30 AM – 12.30 PM**

Max. Marks : **15.00**
 Total Duration : **180 mints**
 Weightage : **35%**

Instructions:

- **Answer all the questions and it should be precise and complete.**
- **Start each question on a fresh page.**

Q1. Let the regression model in a matrix notation as **[3M]**

$$Y_t = X_t\beta + \varepsilon_t; \text{ then proof that } \hat{\beta} = (X^T X)^{-1} X^T Y$$

Q2. Let the MA(4) process is as follows: **[4M]**

$$Y_t = \varepsilon_t - 0.6\varepsilon_{t-1} + 0.3\varepsilon_{t-2} - 0.5\varepsilon_{t-3} + 0.5\varepsilon_{t-4} . \text{ Calculate the autocorrelation function for white noise.}$$

Q3. Assume that a stationary the AR(1) process as **[4M]**

$Y_t = \delta + \theta Y_{t-1} + \varepsilon_t$, where $|\theta| < 1$, $t= 1, 2, \dots, T$ and $\varepsilon_t \sim IID(0, \sigma^2)$. The optimal forecast of Y_{t+k} given $I_T = \{Y_1, Y_2, \dots, Y_T\}$ then calculate the point forecast i.e. $Y_{t+1/T}, Y_{t+2/T}, \dots, Y_{t+k/T}$. Also Show that as k increases, the Y_t becomes less informative about $Y_{t+k/T}$.

Q4. Consider the data **[4M]**

Y	X ₂	X ₃
1	1	2
3	2	1
8	3	-3

Based on these data, estimate the following regression:

$$Y_t = \alpha_1 + \alpha_2 X_{2t} + \mu_{1t} \quad (1)$$

$$Y_t = \gamma_1 + \gamma_3 X_{3t} + \mu_{2t} \quad (2)$$

$$Y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + \mu_{3t} \quad (3)$$

Note: estimate only the coefficients and not the standard error.

- (a) Is $\alpha_2 = \beta_2$? Why or why not?
- (b) Is $\gamma_3 = \beta_3$? Why or why not?
- (c) What important conclusion do you draw from this exercise?

*****END*****

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
SECOND SEMESTER- 2022-2023
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Part B

Course No. : **ECON F215**
Course Title : **Computational Methods Economics**
Date : **06/5/2023**
Time : **09.30 AM – 12.30 PM**

Max. Marks : **20.00**
Total Duration : **180 mints**
Weightage : **35%**

Instructions:

- **Answer all the questions, and it should be precise and complete.**
- **Start each question on a fresh page.**

Q1. Let the hypothetical data on weekly family consumption expenditure (Y) and weekly family income (X) be as follows. **[10M]**

Y, \$	70	65	90	95	110	115	120	140	155	150
X, \$	80	100	120	140	160	180	200	220	240	260

- a) Fit the regression line where Y is the dependent variable.
- b) Calculate R^2 and adjusted R^2 of the above regression line.
- c) Find Residual Sum Square (RSS) and Explained Sum Square (ESS).
- d) Find the t-value for both intercept and slope coefficients.
- e) Calculate the Root Mean square value (RMSE).
- f) Find the value of the regression line's Akaike Information Criteria (AIC).
- g) Calculate the d- value of the regression line.

Q2. How does a sample correlogram determine if a particular time series is stationary? **[5M]**

Q3. Explain the importance of theoretical knowledge of computational methods for economics helps to use the EViews, STATA, and Python software efficiently. **[5M]**

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