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III SEMESTER | **MBA (Business Analytics)**

END SEMESTER EXAMINATION *Nov/Dec-2019*

MB 314: Time Series Analytics

Time: 3:00 Hours *Max. Marks : 60*

Note :
1. The question paper consists of four sections. All the sections are compulsory.
2. All parts within each section are to be answered in a continuous manner on the answer sheet.
3. Internal choice is given in some sections.
4. Use of scientific calculator is allowed.

SECTION A [1x5=5]

Q.1 Choose the correct alternative:

[a] A stationary time series is one with
(i) Time-varying mean
(ii) Time-varying variance
(iii) Both (i) and (ii)
(iv) Time invariant mean and variance

[b] A white noise process is a stochastic process with

(i) Zero mean
(ii) Constant variance
(iii) Serially uncorrelated error term
(iv) All of the above

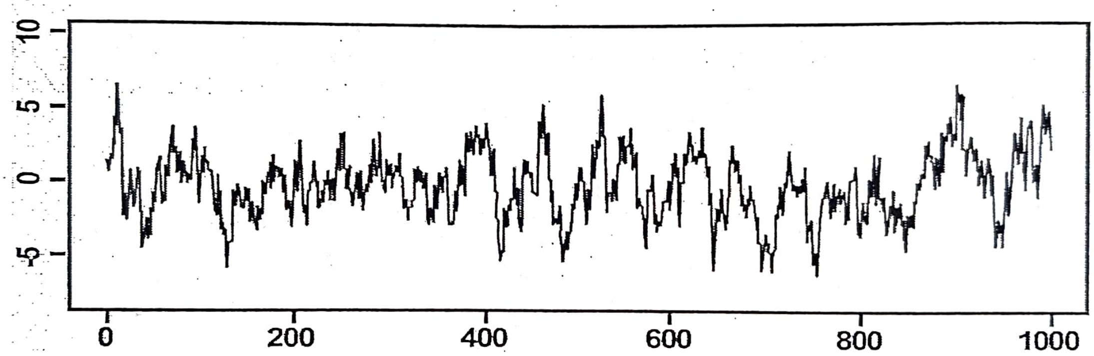
[c] An example of a difference stationary process

(i) Random walk with drift
(ii) Random walk without drift
(iii) Both (a) and (b)
(iv) Neither (a) nor (b)

[d] A non-stationary series that becomes stationary on differencing the series twice is

(i) Integrated of order 0
(ii) Integrated of order 1
(iii) Integrated of order 2
(iv) Integrated of order 3

[e] The following graph is generated by the equation $Y_t = \theta Y_{t-1} + \varepsilon_t$



The likely value of θ is:
(i) 1
(ii) 1.5
(iii) -1.5
(iv) 0.8

SECTION B [1x5=5]

Q.2 Explain the following terms:

[a] Spurious Regression
[b] Cointegration
[c] Correlogram
[d] First order and second order stationarity
[e] Panel Data

SECTION C [5x3=15]

Attempt any three questions

Q.3 Find out the order of integration for the following models:

(a) $Y_t = \mu + 2Y_{t-1} - Y_{t-2} + \epsilon_t$
(b) $Y_t = \mu + 1.25Y_{t-1} - 0.25Y_{t-2} + \epsilon_t$
(c) $Y_t = 1.5Y_{t-1} + Y_{t-2} + \epsilon_t$

In case the models are non-stationary in parts (a)-(c), show how can these be made stationary.

Q.4 Explain the methodology and the steps involved in checking the stationarity of a time series using the Dickey-Fuller test.

Q.5 Consider the difference equation:

$$y_t = a_0 + a_1 y_{t-1} + bd^{rt}$$

Find a particular solution to this equation and verify your answer. What happens if $|d^r|<1$?

Q.6 Explain how the values of Autocorrelation Function (ACF) can be used for stationarity analysis.

SECTION D [7x5=35]

Attempt any five questions

Q.7 Show that the near Random Walk Model $Y_t = \mu + \Phi Y_{t-1} + \varepsilon_t$ with $0 < \Phi < 1$ is asymptotically stationary.

Q.8 The population figures of India from 1911-1971 are as follows:

Census Year	1911	1921	1931	1941	1951	1961	1971
Population (in crores)	25	25.1	27.9	31.9	36.1	43.9	54.7

Estimate an exponential trend equation $y = ab^t$ for the above data. Estimate the population for 1981.

Q.9 Consider the second order homogeneous difference equation:

$$y_t = a_1 y_{t-1} + a_2 y_{t-2}$$

Suppose $a_2 < 0$.

Show that the solution of this equation is $y_t^h = \beta_1 r^t \, Cos\,(t\theta + \beta_2)$, where β_1 and β_2 are arbitrary constants and $r = (-a_2)^{1/2}$.

Using this, or otherwise, solve the following equations and comment on the stability of the solutions:

(a) $y_t = 1.6y_{t-1} - 0.9y_{t-2}$

(b) $y_t = -0.6y_{t-1} - 0.9y_{t-2}$

Q.10 Consider the following model:

$$Y_t = \beta_1 + \beta_2 t + \beta_3 Y_{t-1} + u_t$$

Characterise the nature of the time series for the following cases:

(i) $\beta_1 = 0, \beta_2 = 0 \; and \; \beta_3 = 1$
(ii) $\beta_1 \neq 0, \beta_2 = 0 \; and \; \beta_3 = 1$
(iii) $\beta_1 \neq 0, \beta_2 \neq 0 \; and \; \beta_3 = 0$
(iv) $\beta_1 \neq 0, \beta_2 \neq 0 \; and \; \beta_3 = 1$
(v) $\beta_1 \neq 0, \beta_2 \neq 0 \; and \; \beta_3 < 1$

Q.11 Consider the second order homogeneous equation:

$$y_t - a_1 y_{t-1} - a_2 y_{t-2} = 0$$

Summarise the general stability conditions for the above equation for different values of a_1 and a_2 by means of a stability triangle and unit root circle.

Q.12 Consider the first order difference equation:

$$y_t = a_0 + a_1 y_{t-1} + \varepsilon_t$$

(a) Find the solution to this equation using the method of iteration.
(b) Now solve this equation by taking the challenge solution

$$y_t = b_0 + b_1 t + \sum_{i=0}^{\infty} \propto_i \epsilon_{t-i}$$

Are the results obtained in (a) and (b) same?