
Stat 336 – Time Series Analysis

- 1- Define what do we mean by time series and give two examples of time series.
- 2- Explain briefly meaning of each component of a time series.
- 3- Mention three ad hoc methods that are used in forecasting a time series.
- 4- What does **weak stationarity** mean for a stochastic process $\{Y_t\}$?
- 5- Derive the autocorrelation function ρ_k for the white noise process.
- 6- If $y_t = 1.5y_{t-1} + \varepsilon_t + 0.25\varepsilon_{t-1}$; $\varepsilon_t \sim WN(0, \sigma_\varepsilon^2)$, state its type, and check its stationarity and/or invertibility.
- 7- If the series $\{Y_t\}$ can be expressed in the form:

$$Y_t = \beta_0 + \beta_1 t + \beta_2 t^2 + \varepsilon_t$$

where $\{\varepsilon_t\}$ is the white noise process.

- i- Show that $\{Y_t\}$ is **not** a stationary process?
 - ii- Use the difference operator ∇^r to render $\{Y_t\}$ to a stationary process .
 - iii- Derive the autocorrelation function ρ_k for the stationary process you found in part (ii).
- 8- The following data represent the total profit (in million riyals) for a company:

Year	1435	1436	1437	1438	1439
Profit	4	5	6	4	5

Calculate all the coefficients of the sample autocorrelation function (SACF) and calculate the standard errors for these estimates.

9- Let the process $\{y_t\}$ follows an AR(2) model, with the following special form: $y_t = \phi_2 y_{t-2} + \varepsilon_t$, use the general method to find the values of ϕ_2 that make the process stationary.

10- Let the process $\{y_t\}$ follows an AR(2) model, with the following parameter values: $\phi_1 = 0.5$, $\phi_2 = -0.5$:

i- is the process $\{y_t\}$ stationary?

ii- find the ψ_j weights in the general linear process.