Time Series Analysis

Assignment

(1) Let

$$X_t = \begin{cases} Y_t & \text{if t is even} \\ Y_t + 1 & \text{if t is odd,} \end{cases}$$

where Y_t is stationary time series. Is X_t stationary ?

(2) Suppose that

$$X_t = (1 + 2t)S_t + Z_t$$

where $S_t = S_{t-12}$. Suggest a transform for X_t so that the transformed series is stationary.

(3) Derive ACFs ρ_k, $k = 1, 2, \ldots$ for the following models.

(a) $X_t = Z_t - \theta_1 Z_{t-1} - \theta_2 Z_{t-3}$

(b) $X_t - 0.5X_{t-1} = Z_t$, where $\{Z_t\} \sim WN(0, 1)$.

(4) If the ACF of some stationary time series is

$$\rho_1 = 0.5467, \quad \rho_2 = 0.3667, \quad \rho_3 = 0.2, \quad \rho_k = 0, \text{for} k \geq 4$$

what kind of model you would like to choose for the time series ?

(5)

(a) Suppose $\mathbb{R}$ calculations of fitting an AR(2) model to the data are

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{\sf
Call: arima(x = x, order = c(2, 0, 0))

Coefficients:

\begint{rrrr}
      &   ar1   &   ar2 & intercept \\
      & 1.1503  & -0.8009 &    0.8738\\
s.e.  & 0.1250  & 0.1184  &   0.0623
\endt

sigma\^{}2 estimated as 0.03005: log likelihood = 5.38,  aic =
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-2.77 }

write down the estimated AR model
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(6) Based on the time plot of International Airline Passengers. Answer the following questions.

- ▷ (a) Is it stationary ? Justify it .
- ▷ (b) What kind of time series components do the data contain ?
- ▷ (c) Suggest a transformation so that it may equalize the seasonal variation.