**Tutorial set #2**

**Question 1:**

1. What is the difference between strict and weak stationarity? When we can say that weak stationarity leads to strict stationarity?
2. An analyst has a time series data representing number of daily car accidents in a major road at Riyadh city. He applied the techniques of regression analysis to analyze the data set, by considering the dependent variable $y\_{t}$ as the number of daily car accidents, and the independent variable the time indices t=1,2,3,4,… representing days. So he applied the following simple linear regression model, $y\_{t}=β\_{0}+β\_{1}t+ε\_{t}$ comment on what he have done, do you think his analysis is always valid, discuss.

**Question 2:**

1. Assume the model:

$$Y\_{t}=1+ε\_{t}+ε\_{t-1}$$

where $\left\{ε\_{t}\right\}$ is a sequence of independent and identically distributed random variables with mean zero, and variance $σ\_{ε}^{2}$ . Find the autocorrelation function for the process $\left\{Y\_{t}\right\}$, plot it and comment on the graph.

1. Find the autocorrelation function for the process, $Y\_{t}=1+ε\_{t}-ε\_{t-1}$ , plot it and compare it with the ACF in part (1).

**Question 3:**

If the series $\left\{Y\_{t} \right\}$ ca n be expressed in the form:

$$Y\_{t}=β\_{0}+β\_{1}t+β\_{2}t^{2}+ε\_{t}$$

where $\left\{ε\_{t}\right\}$ as defined as in Q.2.

1. Find the expectation, the variance and the autocorrelation function of the series.
2. Does this series fulfill the stationarity conditions? Discuss.

**Question 4:**

The following data represent the total profit (in million riyals) for a company:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year | 1430 | 1431 | 1432 | 1433 | 1434 | 1435 | 1436 | 1437 |
| Profit $y\_{t}$ | 3 | 2 | 2 | 4 | 5 | 6.1 | 4.4 | 5.5 |

1. Calculate the coefficients of the sample autocorrelation function (SACF) $r\_{k}$, and plot it.
2. Calculate the standard errors for these estimates.