

When asked to explain something, provide an explanation that could be understood by someone who does not have formal training in statistical methods.

1. Concisely explain *how* and *why* plots of “sample” ACF and plots of “true” ACF differ from each other.

2. A sample realization of a time series can be described by the model

$$Z_t = Z_{t-1} + a_t, \quad a_t \sim \text{nid}(0, \sigma^2).$$

An analyst decides to try the differencing scheme

$$W_t = (1 - B)^2 Z_t$$

- (a) Is Z_t stationary? Why or why not?

- (b) Write down the model equation for W_t . This equation should *not* contain any Z terms.

- (c) Is W_t stationary? Why or why not?

- (d) Is W_t invertible? Why or why not?

- (e) Draw a picture describing what you would expect to see in the sample ACF and sample PACF for W_t

3. Suppose that you have been given a realization Z_1, \dots, Z_{100} , from the model

$$Z_t = Z_{t-1} + \theta_0 + a_t, \quad a_t \sim \text{nid}(0, \sigma^2).$$

Suppose further that economic theory suggests this model and that there is nothing in the data that would refute this model.

(a) List the unknown parameter(s) in this model and explain what you would do to compute estimates for it (them), using the available realization.

(b) Give an expression that can be used to compute a point prediction for Z_{102} , using Z_{100} as the forecast origin.

(c) What are ψ_1 and ψ_2 for this model?

(d) Give an expression that can be used to compute a 95% prediction interval for Z_{102} , using Z_{100} as the forecast origin.

(e) *List* three important assumptions behind this prediction interval.

-
-
-

4. Consider the model

$$(1 - \phi_1 B)Z_t = a_t \quad a_t, \sim \text{nid}(0, \sigma^2).$$

(a) Derive expressions for ψ_1 and ψ_2 for this model.

(b) Derive $\text{Cov}(Z_t, a_{t-2})$ for this model.

5. Consider the model

$$(1 - B)(1 - .1B - .1B^2)Z_t = (1 - .3B)a_t$$

Is this model stationary? Why or why not?

6. Box and Jenkins emphasize the importance of using a parsimonious time series model, at least for certain kinds of situations.

(a) *List* three important reasons for using a parsimonious time series model.

-
-
-

(b) Explain when it might not be so important to use a parsimonious model.