

1. (5 marks) Consider the following process:

$$Y_t = e_t - 0.6e_{t-1} + 0.4e_{t-2}$$

Suppose that the variance of the white noise terms is $\sigma_e^2 = 1$.

- (a) Create a detailed plot of ρ_k vs. k , for lags going out to $k = 10$. Label the value of each point in the plot, and show *all* your work and calculations leading to these values.
- (b) Create an *approximate* plot of what you think a realization of this process might look like. You do not have to label the values on this plot. However, do provide an explanation of why you believe the plot will have this general appearance.

2. (2 marks) Consider the following process:

$$Y_t = e_t + 0.5e_{t-1} - 0.6e_{t-2}$$

Is this process invertible? Show all your work, and clearly write out each expression you use.

3. (4 marks) Consider the following process:

$$Y_t = 0.2Y_{t-1} - 0.5Y_{t-2} + e_t$$

Suppose that the variance of the white noise terms is $\sigma_e^2 = 1$.

- (a) Is this process stationary? Show all your work, and clearly write out each expression you use.
 - (b) Calculate the value of the autocorrelation function at lag 3, rounding to 2 decimal places if necessary. Show all your work, and clearly write out each equation you use.
4. (9 marks) Identify each of the following as a specific ARIMA model, along with its values of p , d and q , and give all values of the parameters. Remember to show all your work.

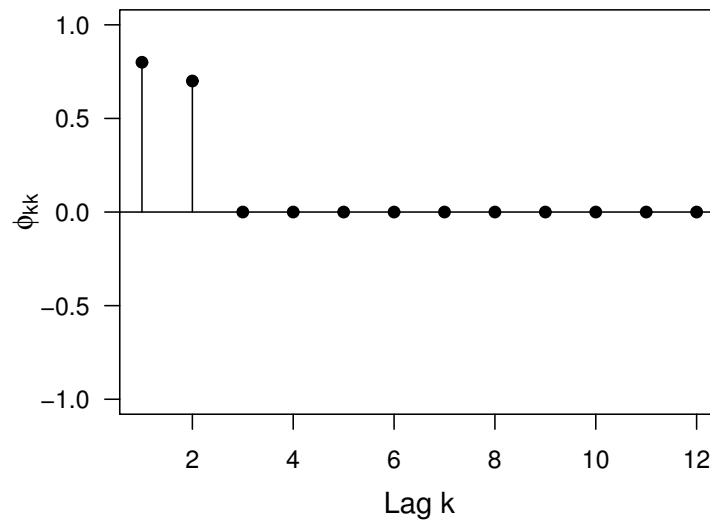
(a) $Y_t = 0.3Y_{t-1} + 0.7Y_{t-2} + e_t$

(b) $Y_t = 1.3Y_{t-1} - 0.3Y_{t-3} + e_t - 0.2e_{t-1}$

(c) $Y_t = 2.7Y_{t-1} - 2.6Y_{t-2} + 1.1Y_{t-3} - 0.2Y_{t-4} + e_t + 0.8e_{t-1}$

5. (4 marks)

- (a) Suppose that the second difference $\{W_t\}$ of a non-stationary process is stationary, and has the following theoretical partial autocorrelation function:



Does it appear that the original non-stationary process can be represented by an ARIMA model? If so, give the values of p , d and q . Explain your reasoning.

- (b) Write out the difference equation form of the non-stationary ARIMA model in part (a). Show all your work.
- (c) Using the difference equation form you obtained in part (b), double-check that the original process is indeed non-stationary. Show all your work.