Quiz 9

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## In this question, you are required to use ar() from the package {stats}. In this function, you should use “mle” as the method input and answer following questions:

library("stats")  
sample\_data <- read.csv("sample\_data.csv", header=T)  
sampleData <- sample\_data$x  
model1 <- ar(sampleData, method="mle")

**# Problem 1. What is the order of the AR model.**  
model1\_order <- model1$order  
#Order:  
model1\_order

## [1] 4

**# Problem 2. What is/are the coefficients of the model.**  
model1\_coefficients <- model1$ar  
#Coefficients:  
model1\_coefficients

## [1] 0.3127814 0.1181541 -0.2098132 0.5823371

**# After determining the order of AR model, use arima() from the package {stats} to build a model and call it Model 2.**  
model2 <- arima(sampleData, order=c(model1\_order,0,0))

**# Problem 3. Predict 10 points using the Model 2. Report the predictions and standard deviations.**   
model2\_predictions <- predict(model2, 10)  
#Predictions:  
model2\_predictions$pred

## Time Series:  
## Start = 1001   
## End = 1010   
## Frequency = 1   
## [1] -0.20997250 0.21656414 -0.18310954 0.10119398 -0.15006820  
## [6] 0.13719597 -0.09505500 0.08453880 -0.09333437 0.08827576

#Standard Deviations:  
model2\_predictions$se

## Time Series:  
## Start = 1001   
## End = 1010   
## Frequency = 1   
## [1] 0.4209389 0.4410407 0.4503119 0.4524897 0.5007034 0.5147374 0.5296748  
## [8] 0.5299684 0.5410676 0.5462847

**# Problem 4. Write down the mathematical expression of your AR model in comments**  
model1$x.mean #Model 1 Mean

## [1] 0.03853392

#Mathematical Model:  
# x[t] - 0.03853392 = 0.3127814 \* (x[t-1] - 0.03853392) + 0.1181541 \* (x[t-2] - 0.03853392) - 0.2098132 \* (x[t-3] - 0.03853392) + 0.5823371 \* (x[t-4] - 0.03853392) + e[t]