# FINM3133 Time Series for Finance and Macroeconomics

## Chapter 8 Exercises

1. For an AR(1) model with $\phi \approx 0.5$ and $n = 100$, the lag 1 sample autocorrelation of the residuals is 0.5. Should we consider this unusual? Why or why not?

2. Repeat Exercise 1 for an MA(1) model with $\theta \approx 0.5$ and $n = 100$.

3. Based on a series of length $n = 200$, we fit an AR(2) model and obtain residual autocorrelations of $\hat{r}_1 = 0.13, \hat{r}_2 = 0.13$, and $\hat{r}_3 = 0.12$. If $\hat{\phi}_1 = 1.1$ and $\hat{\phi}_2 = -0.8$, do these residual autocorrelations support the AR(2) specification? Individually? Jointly?

4. Simulate an AR(1) model with $n = 30$ and $\phi = 0.5$.

   (a) Fit the correctly specified AR(1) model and look at a time series plot of the residuals. Does the plot support the AR(1) specification?

   (b) Display a normal quantile-quantile plot of the standardized residuals. Does the plot support the AR(1) specification?

   (c) Display the sample ACF of the residuals. Does the plot support the AR(1) specification?

   (d) Calculate the Ljung-Box statistic summing to $K = 8$. Does this statistic support the AR(1) specification?

5. The data file named **robot** contains a time series obtained from an industrial robot. The robot was put through a sequence of maneuvers, and the distance from a desired ending point was recorded in inches. This was repeated 324 times to form the time series. Compare the fits of an AR(1) model and an IMA(1,1) model for these data in terms of the diagnostic tests discussed in this chapter.

6. The data file named **deere3** contains 57 consecutive values from a complex machine tool at Deere & Co. The values given are deviations from a target value in units of ten millionths of an inch. The process employs a control mechanism that resets some of the parameters of the machine tool depending on the magnitude of deviation from target of the last item produced. Diagnose the fit of an AR(1) model for these data in terms of the tests discussed in this chapter.