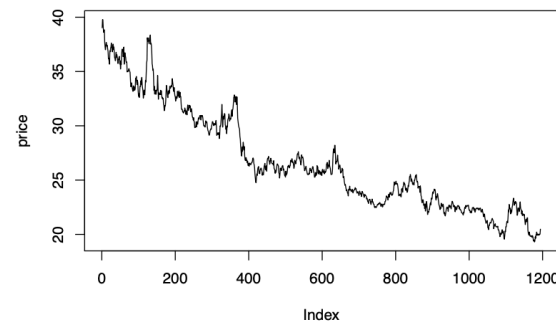


Time Series Cheat Sheet



Plotting

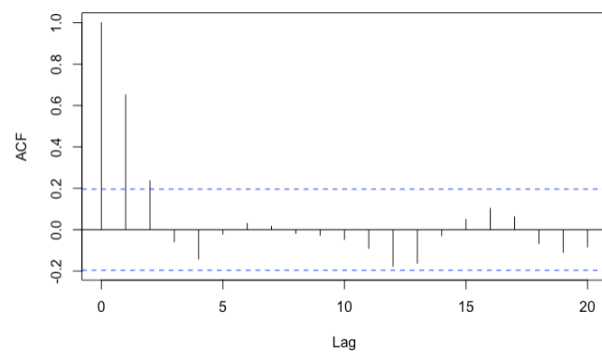
```
plot(x, type="l")  
OR  
plot.ts(x)
```



Auto-correlation

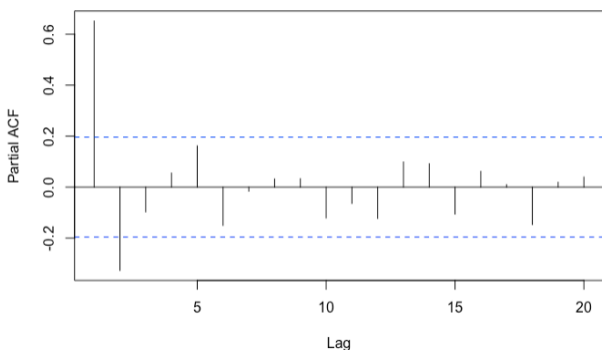
1. Auto-correlation Function (ACF)

```
acf(x, lag.max = NULL,  
    type = c("correlation", "covariance"),  
    plot = TRUE, na.action = na.fail, ...)
```



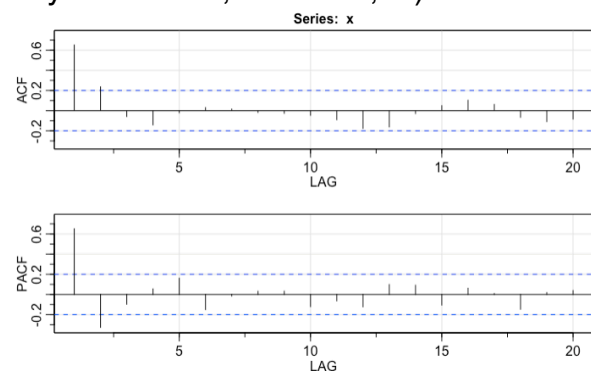
2. Partial Auto-correlation Function (PACF)

```
pacf(x, lag.max, plot, na.action, ...)
```



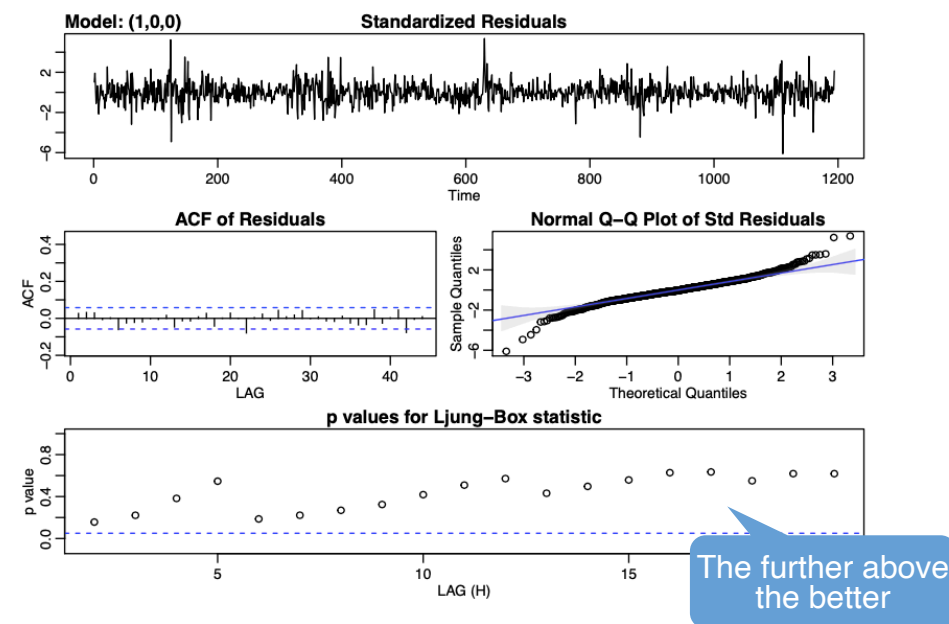
3. Combined

```
astsa::acf2(series, max.lag, plot, main = NULL,  
            ylim = NULL, na.action, ...)
```



Modeling

- arima**(x, order = c(p, d, q),
 seasonal = list(order = c(p, d, q), period = NA),
 method = c("CSS-ML", "ML", "CSS"), n.cond, ...)
- astsa::sarima**(xdata, p, d, q, P = 0, D = 0, Q = 0, S = -1, ...)



Model Selection

- AIC(arima_model, k=2)
- BIC(arima_model)
- AICc(arima_model)
- Ljung-Box Test: shown above

Forecasting

- predict**(arima_model, n.ahead)
pred = predict(arima(x, order = c(1, 0, 0)), 10)
plot(c(time, length(time) + 1:10), c(x, pred\$pred), type = "l")
lines(length(time) + 1:10, pred\$pred, col = 'red')

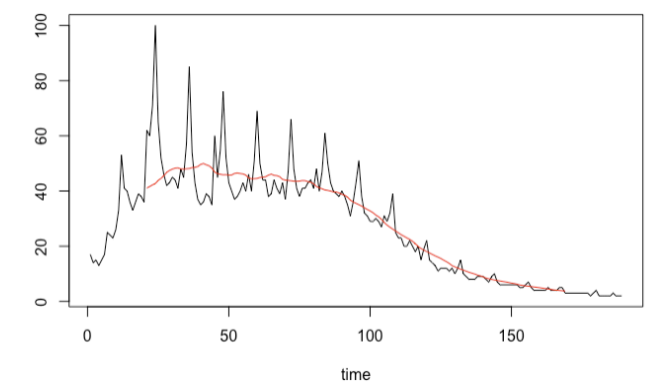


Filtering

To stabilize time series

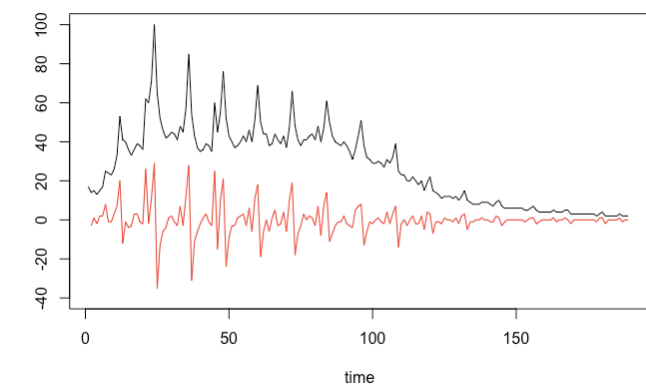
1. Smoothing (q-smoothing)

```
smooth = filter(x, filter = rep(1/41, 41)) # q=20  
plot(time, x, type = 'l')  
lines(smooth, col = 'red')
```



2. Differencing

```
difff = diff(x)  
plot(time[-1], difff, type = 'l', ylim = c(-40, 100),  
      xlab = 'time', col = 'red')  
lines(x)
```



- astsa::sarima.for**(x, n.ahead, p, d, q, P = 0, D = 0, Q = 0,
 S = -1, ...)
sarima.for(x, 10, 1, 0, 0)

