```r
rm(list=ls()) # clearing the workspace

set.seed(1234) # Setting the seed allows for the same randomly
generated
                # numbers to be replicated

# Setting the number of observations

n <- 100

# Generating the data

x <- rnorm(n, mean = 0, sd = 1)
y <- rnorm(n, mean = 5, sd = 3)

xy_pre <- cbind(x, y) # What a bind looks like

# Turning x and y into time series

x <- ts(x)
y <- ts(y)

# Doing a bad bind for time series work

xy_bad <- cbind(x,y)

xy_bad$x.lag <- lag(xy_bad$x, -1) # Won't work

# Doing a good bind for time series work
# Create lags first

x.lag <- lag(x, -1)
y.lag <- lag(y, -1)

# Now bind if you need to do a mathematical operation

xy <- cbind(xy_bad, x.lag, y.lag)

# Plotting with using ts() objects

plot(x, main="Plot with ts()", col="blue")
lines(x.lag, col="red")

# Same thing but with the Shift Function

# Bringing in the shift function

# Shift function from r-bloggers.com
# http://www.r-bloggers.com/generating-a-laglead-variables/
#
```

```
# Used to create lag and lead variables in a data frame

shift<-function(x,shift_by){
  stopifnot(is.numeric(shift_by))
  stopifnot(is.numeric(x))

  if (length(shift_by)>1)
    return(sapply(shift_by,shift, x=x))

  out<-NULL
  abs_shift_by=abs(shift_by)
  if (shift_by > 0 )
    out<-c(tail(x,-abs_shift_by),rep(NA,abs_shift_by))
  else if (shift_by < 0 )
    out<-c(rep(NA,abs_shift_by), head(x,-abs_shift_by))
  else
    out<-x
  out
}

# Remember to use a data.frame
xy_shift <- data.frame(x, y)

# Lagging - use negative numbers

xy_shift$x.lag_a <- shift(xy_shift$x, -1)
class(xy_shift$x.lag_a) # x.lag_a is not a time series - it's numeric

xy_shift$x.lag_b <- ts(shift(xy_shift$x, -1))
class(xy_shift$x.lag_b) # x.lag_b is a time series

plot(xy_shift$x, col="blue", main="Plot with shift function")
lines(xy_shift$x.lag_b, col="red")
```