Returns

Case Study: IBM

```
date.from <- "2010-12-31"; date.to <- "2013-12-31"

raw.IBM <- getSymbols("IBM", from = date.from, to = date.to, auto.assign = F)
```

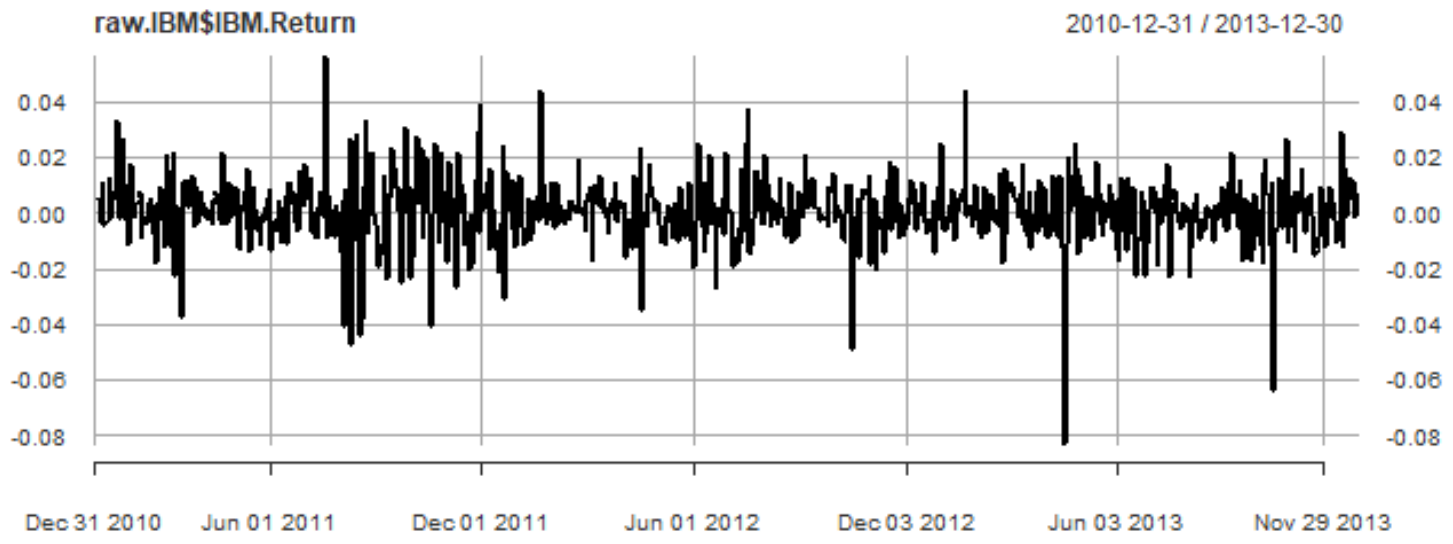
```
'getSymbols' currently uses auto.assign=TRUE by default, but will
use auto.assign=FALSE in 0.5-0. You will still be able to use
'loadSymbols' to automatically load data. getOption("getSymbols.env")
and getOption("getSymbols.auto.assign") will still be checked for
alternate defaults.

This message is shown once per session and may be disabled by setting
options("getSymbols.warning4.0"=FALSE). See ?getSymbols for details.
```

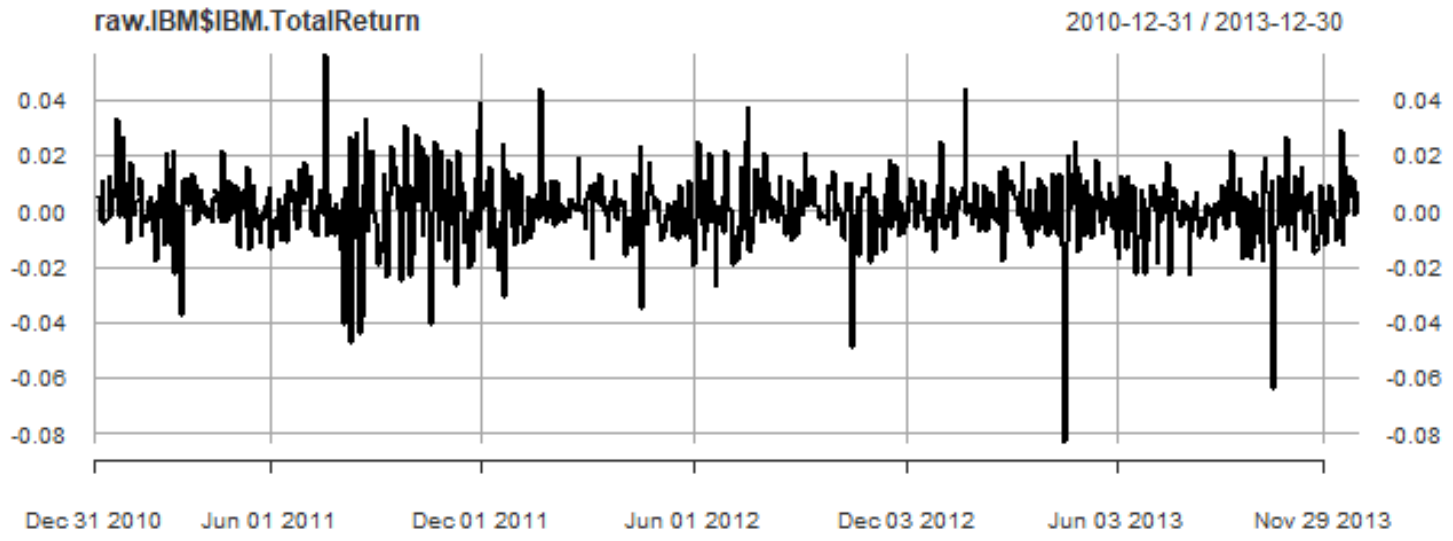
```
raw.IBM$IBM.Return <- Delt(raw.IBM$IBM.Close)
raw.IBM$IBM.TotalReturn <- Delt(raw.IBM$IBM.Adjusted)
raw.IBM$LogReturn <- diff(log(raw.IBM$IBM.Adjusted))
```

```
plot(raw.IBM$IBM.Adjusted)
```

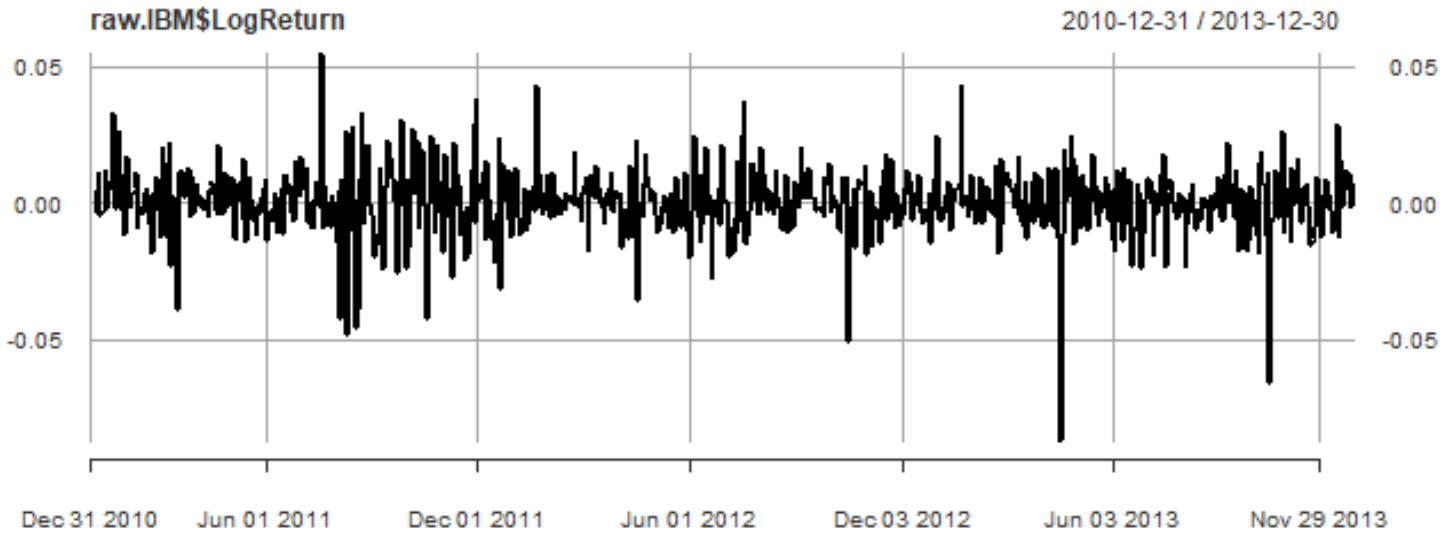

```
plot(raw.IBM$IBM.Return)
```




```
plot(raw.IBM$IBM.TotalReturn)
```




```
plot(raw.IBM$LogReturn)
```




```
raw.IBM$GrossReturn <- 1 + raw.IBM$IBM.TotalReturn
raw.IBM[1, ]$GrossReturn <- 1
raw.IBM$GrossCumulative <- cumprod(raw.IBM$GrossReturn)
raw.IBM$NetCumulative <- raw.IBM$GrossCumulative - 1
```

```
raw.IBM[nrow(raw.IBM), ]$NetCumulative
```

```
            NetCumulative
2013-12-30     0.3388801
```

```
plot(raw.IBM$NetCumulative)
```


```
raw.IBM$CumLog <- raw.IBM$LogReturn
raw.IBM[1, ]$CumLog <- 0
```

```
ibm.log.ret <- sum(raw.IBM$CumLog)
exp(ibm.log.ret) - 1
```

```
[1] 0.3388801
```

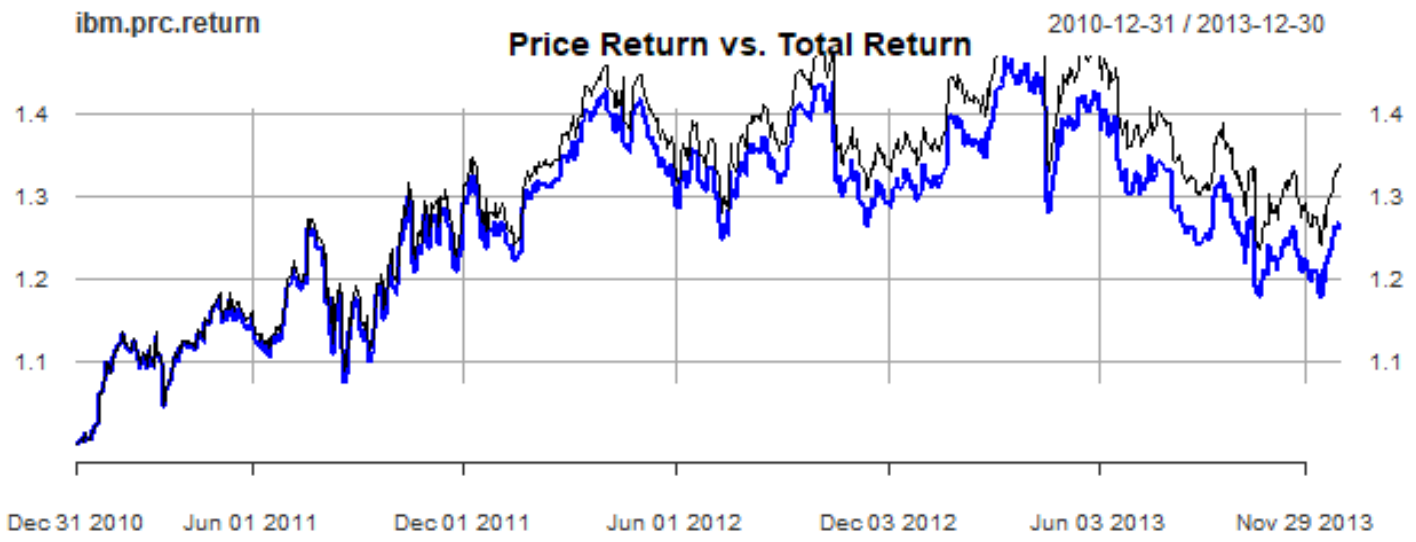
```
raw.IBM$PrcReturn <- raw.IBM$IBM.Return
raw.IBM$TotReturn <- raw.IBM$IBM.TotalReturn

raw.IBM[1, ]$PrcReturn <- 0
raw.IBM[1, ]$TotReturn <- 0

ibm.prc.return <- cumprod(1 + raw.IBM$PrcReturn)
ibm.tot.return <- cumprod(1 + raw.IBM$TotReturn)

plot(ibm.prc.return, col = "blue")
```


```
lines(ibm.tot.return, col = "black")
title(main = "Price Return vs. Total Return")
```




```
data.AMZN <- getSymbols("AMZN", from = date.from, to = date.to, auto.assign = F)

amzn.returns <- data.table(index(data.AMZN), Delt(data.AMZN$AMZN.Adjusted))
colnames(amzn.returns) <- c("Date", "Return")

amzn.returns[1, ]$Return <- 0

amzn.returns$CumReturn <- cumprod(1 + amzn.returns$Return)

wk <- data.AMZN; amzn.weekly <- to.weekly(wk)

AMZN.weekly <- Delt(wk$AMZN.Adjusted); AMZN.weekly <- amzn.weekly[-1]
```

```
data.AMZN <- getSymbols("AMZN", from = date.from, to = date.to, auto.assign = F)
data.IBM <- getSymbols("IBM", from = date.from, to = date.to, auto.assign = F)
data.MSFT <- getSymbols("MSFT", from = date.from, to = date.to, auto.assign = F)
data.NFLX <- getSymbols("NFLX", from = date.from, to = date.to, auto.assign = F)
```

```
multi <- data.table(Date = index(data.AMZN), data.AMZN$AMZN.Adjusted, data.IBM$IBM.Adjusted, da

names(multi) <- c("Date", "AMZN", "IBM", "MSFT", "NFLX")

multi.growth <- data.table(Date = multi$Date, apply(multi[, !"Date"], 2, function(x) x / x[1]))
```

```
multi.growth.long <- reshape2::melt(multi.growth, id.vars = "Date")

ggplot(multi.growth.long, aes(Date, value, group = variable)) +
   geom_line(aes(col = variable)) +
   labs("Growth of $1 over Period")
```


2.0
1.5
1.0
0.5
value
2011
2012
2013
2014
Date
variable
AMZN
IBM
MSFT
NFLX