MFE Programming Workshop Class 2

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Any questions before we start?

- `example(plot)`
- `example(hist)`

- Base R dates are annoying to say the least
- Use a package!

Example

```
# install.packages("lubridate")
library(lubridate)
```

Parse a date

- Lubridate accepts lots of formats

Example

```r
ymd("20110604")

## [1] "2011-06-04 UTC"

mdy("06-04-2011")

## [1] "2011-06-04 UTC"

dmy("04/06/2011")

## [1] "2011-06-04 UTC"
```

Example

```
ymd_hms("2011-06-04 12:00:00", tz = "Pacific/Auckla

## [1] "2011-06-04 12:00:00 NZST"
```

Extraction

Example

```
arrive <- ymd_hms("2011-06-04 12:00:00")
second(arrive)

## [1] 0

second(arrive) <- 25
arrive

## [1] "2011-06-04 12:00:25 UTC"
```

Example

```
arrive <- ymd_hms("2011-06-04 12:00:00")
leave <- ymd_hms("2011-08-10 14:00:00")
interval(arrive, leave)

## [1] 2011-06-04 12:00:00 UTC--2011-08-10 14:00:00
```

Arithmetic

Example

```
mydate <- ymd("20130130")
mydate + days(2)

## [1] "2013-02-01 UTC"

mydate + months(5)

## [1] "2013-06-30 UTC"
```

Arithmetic

Example

```
mydate <- ymd("20130130")
mydate + days(1:5)

## [1] "2013-01-31 UTC" "2013-02-01 UTC" "2013-02-0
## [5] "2013-02-04 UTC"
```

End of (next) month

Example

```
jan31 <- ymd("2013-01-31")
jan31 + months(1)

## [1] NA

ceiling_date(jan31, "month") - days(1)

## [1] "2013-01-31 UTC"

floor_date(jan31, "month") + months(2) - days(1)

## [1] "2013-02-28 UTC"
```

- xts is a package for ordered data in R
- xts objects can be treated like data frames much of the time
- but, they have other featuers

Example

```
# install.packages("xts")
library(xts)
```

Data from quantmod

- quantmod allows you to download stock data into xts objects

Example

```
library(quantmod)
getSymbols("SPY", src="google",
           from = "2008-01-01")

## [1] "SPY"

head(SPY,3)

##            SPY.Open SPY.High SPY.Low SPY.Close S
## 2008-01-02   146.53   146.99  143.88    144.93
```
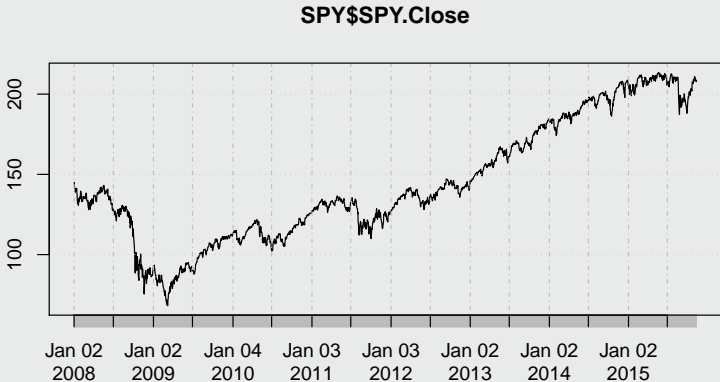
Plot

Example

```
plot(SPY$SPY.Close)
```


SPY$SPY.Close

Subset

Example

```
dim(SPY)

## [1] 1979    5

mysub <- SPY['2010-01/2010-12-31']
dim(mysub)

## [1] 252    5
```

Switch period

- get end of month observations

```r
eom <- to.period(SPY,'months')

## Warning in to.period(SPY, "months"):
missing values removed from data

head(eom,3)

##              SPY.Open SPY.High SPY.Low SPY.Close S
## 2008-01-31    146.53   146.99   126.00   137.37
## 2008-02-29    137.94   139.61   131.73   133.82  1
## 2008-03-31    133.14   135.81   126.07   131.89  1
```

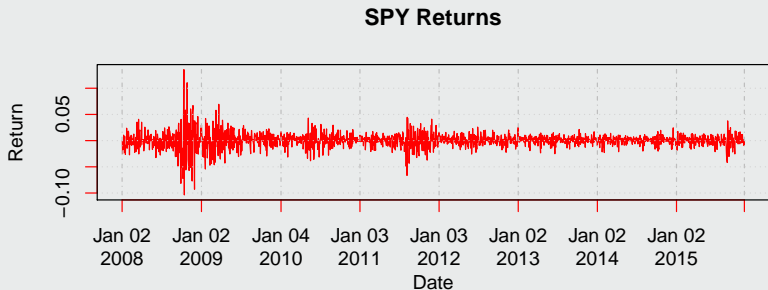## Differencing

Example

```
SPY$ret <- diff(log(SPY$SPY.Close), lag=1)
head(SPY$ret)

##                           ret
## 2008-01-02                 NA
## 2008-01-03 -0.0004831085
## 2008-01-04 -0.0248117002
## 2008-01-07 -0.0008495576
## 2008-01-08 -0.0162802596
## 2008-01-09  0.0104555521
```

Another Plot

Example

```
plot(SPY$ret, main = "SPY Returns",
     col = "red", xlab = "Date", ylab = "Return",
     major.ticks='years',
     minor.ticks=FALSE)
```


SPY Returns

- As usual, read the manuals and vignettes for help
- Google: "cran xts"