Extracting columns from financial time series

IMPORTING AND MANAGING FINANCIAL DATA IN R

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datacamp

OHLC

- Stands for "Open High Low Close"
- *Open and Close*: first and last observed prices
- *High and Low*: largest and smallest observed prices
- Often *Volume*: sum of all contracts traded

OHLC data

```
head(DC)
```

```
                    DC.Open DC.High DC.Low DC.Close DC.Volume
2016-01-16 01:00:00  20.845  20.850 20.835   20.845       157
2016-01-16 02:00:00  20.845  20.850 20.835   20.845       214
2016-01-16 03:00:00  20.845  20.850 20.835   20.845       103
2016-01-16 04:00:00  20.845  20.855 20.835   20.845       180
2016-01-16 05:00:00  20.845  20.845 20.845   20.845       211
2016-01-16 06:00:00  20.845  20.845 20.840   20.845        35
```

Single-column extractor functions

- `Op()` - opening price
- `Hi()` - high price
- `Lo()` - low price
- `Cl()` - close price
- `Vo()` - traded volume
- `Ad()` - adjusted close price

Single-column extractor functions

```
# Open price
dc_open <- Op(DC)
head(dc_open, 4)
```

```
                    DC.Open
2016-01-16 01:00:00   20.84
2016-01-16 02:00:00   20.85
2016-01-16 03:00:00   20.85
2016-01-16 04:00:00   20.85
```

```
# High price
dc_high <- Hi(DC)
head(dc_high, 4)
```

```
                    DC.High
2016-01-16 01:00:00   20.85
2016-01-16 02:00:00   20.85
2016-01-16 03:00:00   20.85
2016-01-16 04:00:00   20.85
```

Multi-column extractor functions

```
# Extract multiple columns
dc_ohlc <- OHLC(DC)
head(dc_ohlc)
```

```
                    DC.Open DC.High DC.Low DC.Close
2016-01-16 01:00:00   20.84   20.85  20.83    20.84
2016-01-16 02:00:00   20.85   20.85  20.83    20.85
2016-01-16 03:00:00   20.85   20.85  20.84    20.85
2016-01-16 04:00:00   20.85   20.85  20.84    20.85
2016-01-16 05:00:00   20.85   20.85  20.84    20.85
2016-01-16 06:00:00   20.84   20.85  20.84    20.85
```

getPrice()

- 3 arguments
  - `x` : object that contains data
  - `symbol` : optional symbol if `x` contains multiple symbols
  - `prefer` : optional preferred price
- If `prefer` not specified:
  - `"price"` , then `"trade"` , then `"close"`

```
head(DC)
```

```
                    Price Volume Bid.Price Bid.Size Ask.Price Ask.Size
2016-01-16 00:00:07    NA     NA     20.84      198     20.85      684
2016-01-16 00:00:08    NA     NA     20.84      198     20.85      683
2016-01-16 00:00:08    NA     NA     20.84      198     20.85      682
2016-01-16 00:00:11    NA     NA     20.84      198     20.85      683
2016-01-16 00:00:25    NA     NA     20.84      198     20.85      684
2016-01-16 00:00:44 20.84      1     20.84      198     20.85      684
```

```
dc_bid <- getPrice(DC, prefer = "bid")
head(dc_bid)
```

```
                    Bid.Price
2016-01-16 00:00:07     20.84
2016-01-16 00:00:08     20.84
2016-01-16 00:00:08     20.84
2016-01-16 00:00:11     20.84
2016-01-16 00:00:25     20.84
2016-01-16 00:00:44     20.84
```

Let's practice!

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Importing and transforming multiple instruments

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Aggregating with Quandl()

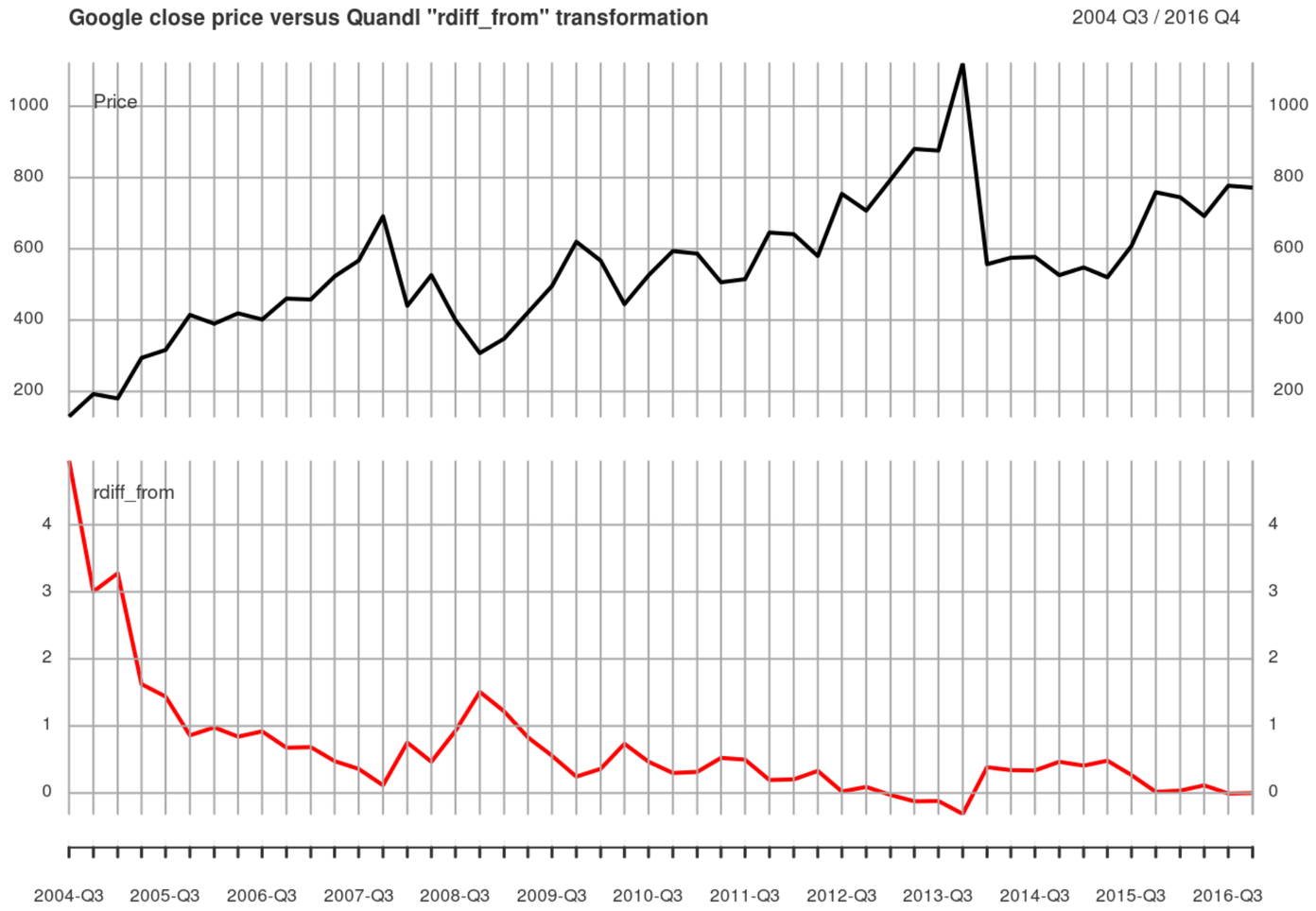
- Use `collapse` argument to aggregate
  - daily
  - weekly
  - monthly
  - quarterly
  - annual
- Always returns last observation for given time period
  - Can cause issues for some columns (e.g., opening price)

Transforming with Quandl()

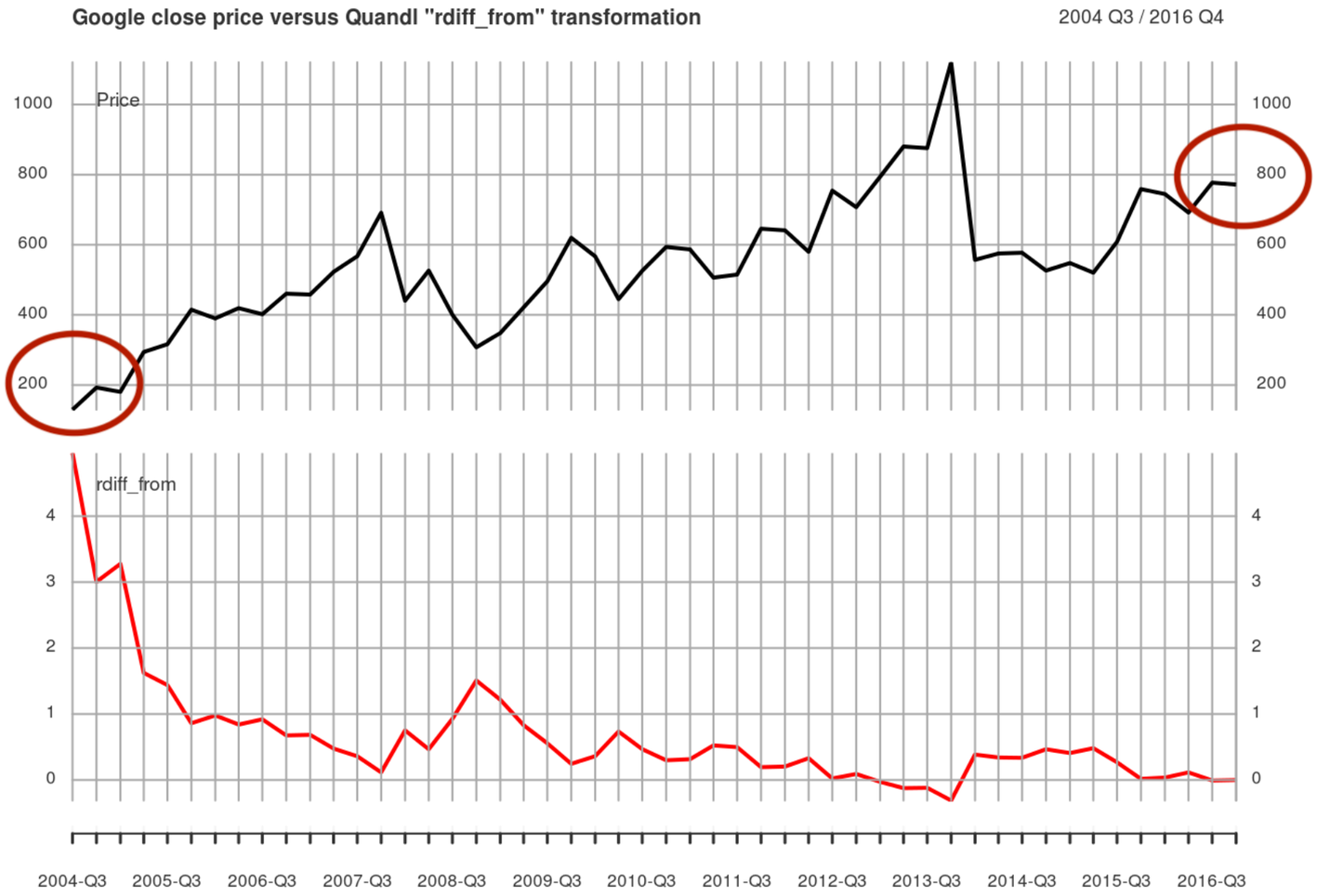
- Use `transform` argument to perform simple calculations before downloading

Name	Effect	Formula
none	no effect	$y'_t = y_t$
diff	row-on-row change	$y'_t = y_t - y_{t-1}$
rdiff	row-on-row % change	$y'_t = (y_t - y_{t-1})/y_{t-1}$
rdiff-from	latest value as % increment	$y'_t = (y_{latest} - y_t)/y_t$
cumul	cumulative sum	$y'_t = y_0 + y_1 + \cdots + y_t$
normalize	scale series to start at 100	$y'_t = y_t \div y_0 * 100$

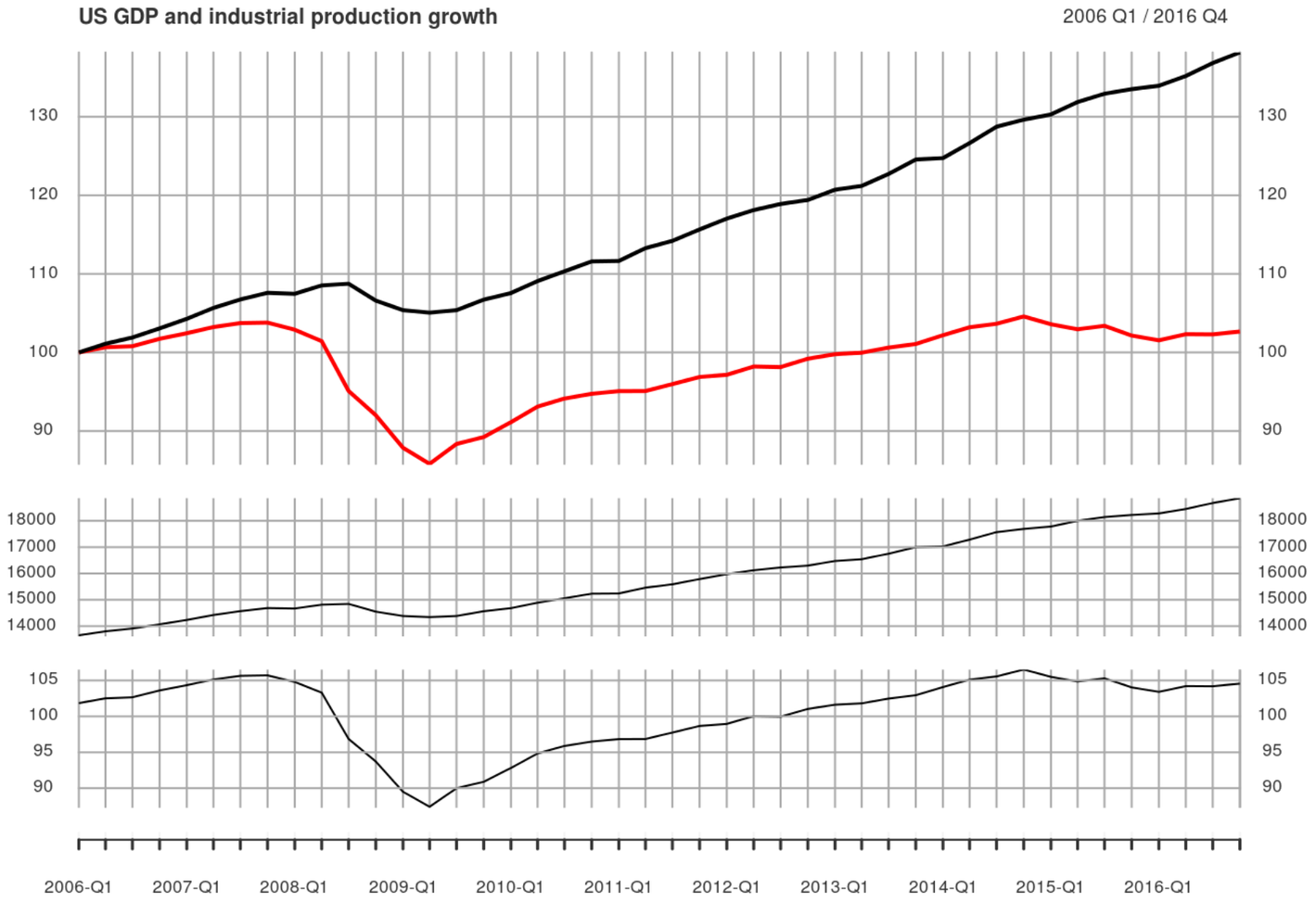
Quandl() rdiff_from transformation



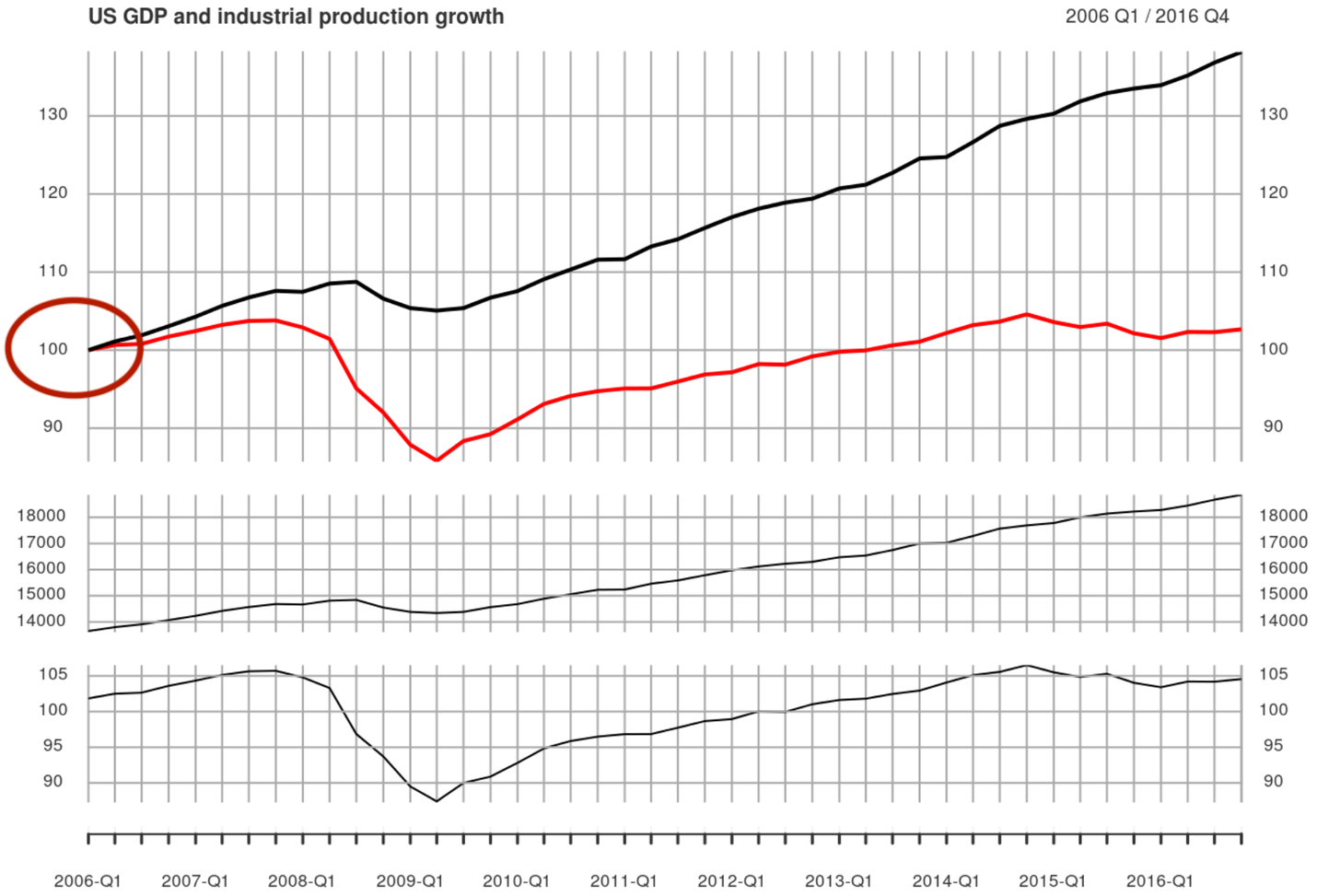
Quandl() rdiff_from transformation



Quandl() normalize transformation



Quandl() normalize transformation



Download instruments into a custom environment

```
# Create new environment
data_env <- new.env()
# Use getSymbols to load data into the environment
getSymbols(c("SPY", "QQQ"), env = data_env, auto.assign = TRUE)
```

```
"SPY" "QQQ"
```

```
# Look at a few rows of the SPY data
head(data_env$SPY, 3)
```

```
           SPY.Open SPY.High SPY.Low SPY.Close SPY.Volume SPY.Adjusted
2007-01-03   142.25   142.86  140.57    141.37   94807600     114.8094
2007-01-04   141.23   142.05  140.61    141.67   69620600     115.0530
2007-01-05   141.33   141.40  140.38    140.54   76645300     114.1353
```

Using lapply()

- Loops over all objects in environment
- Combine list of function results into one object using `do.call()`
  - First argument (`what`) is the function to be called
  - Second argument (`args`) is a list of arguments to pass

Extract volume and merge into one object

```
# Extract volume column from each object
adjusted_list <- lapply(data_env, Ad)
# Merge each list element into one object
adjusted <- do.call(merge, adjusted_list)
```

```
head(adjusted)
```

```
           QQQ.Adjusted SPY.Adjusted
2007-01-03     39.47694     114.8094
2007-01-04     40.22558     115.0530
2007-01-05     40.03385     114.1353
2007-01-08     40.06124     114.6632
2007-01-09     40.26210     114.5658
2007-01-10     40.73684     114.9475
```

Let's practice!

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