Handling missingness

CASE STUDIES: MANIPULATING TIME SERIES DATA IN R

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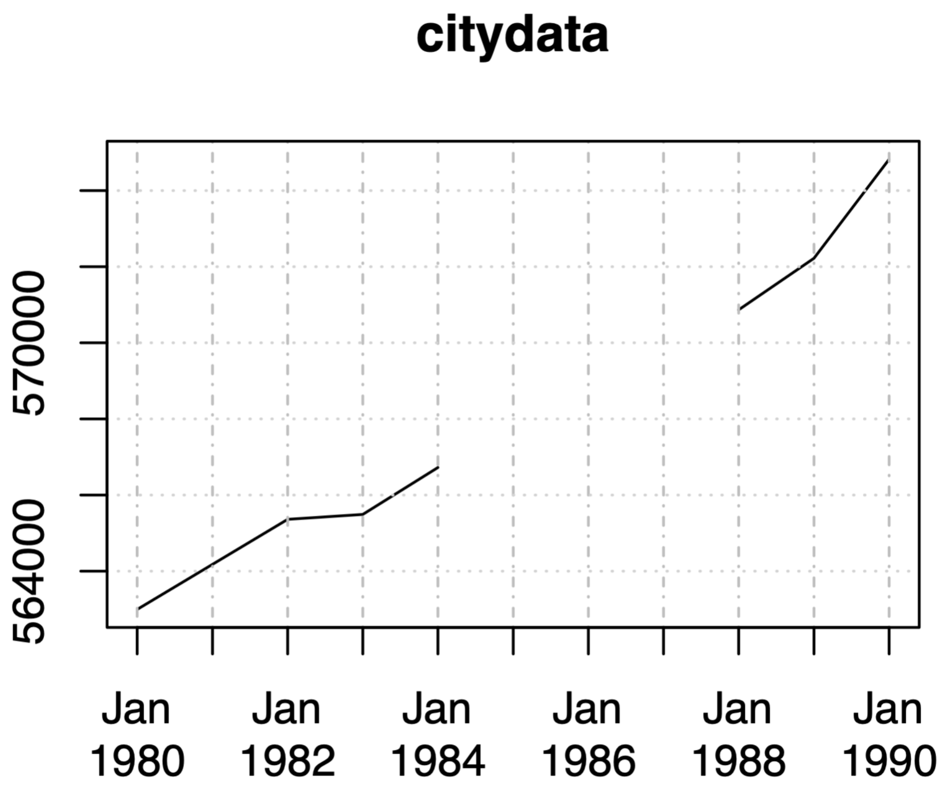
Missingness

```
citydata
```

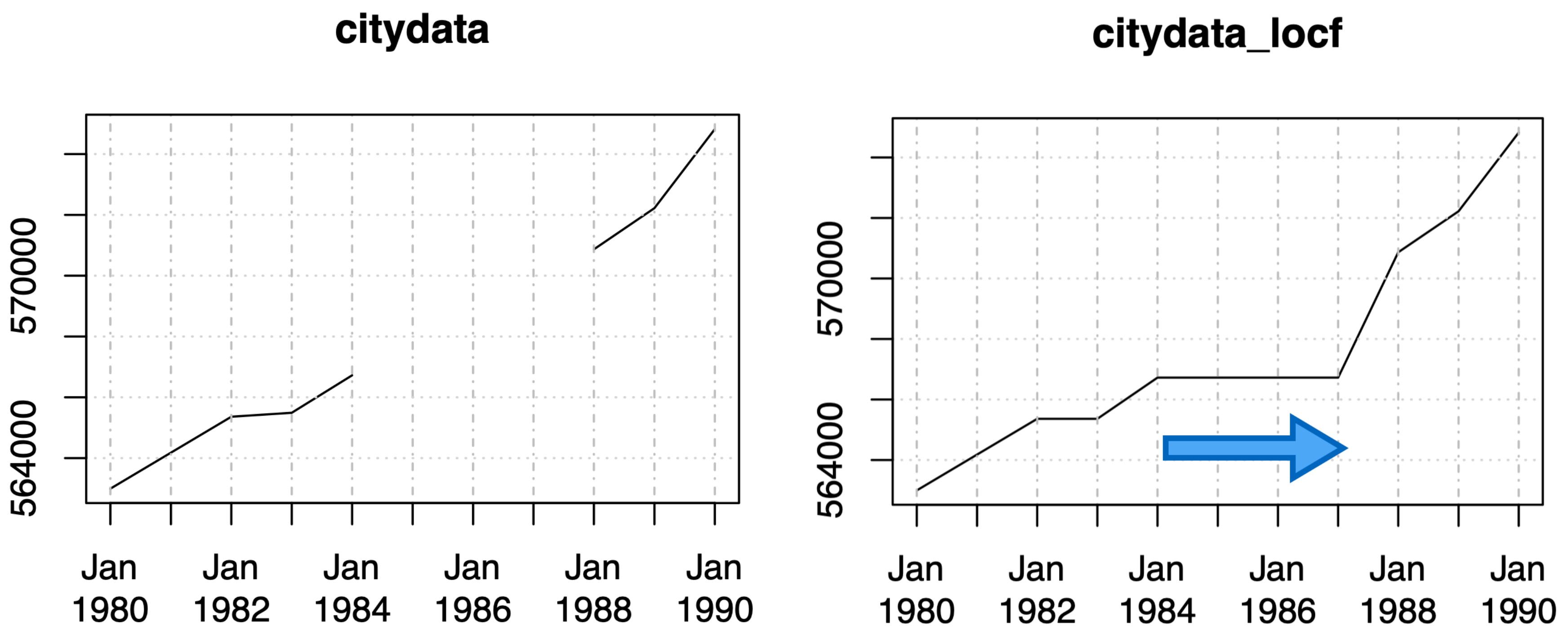
```
                  pop
1980-01-01 562994
1981-01-01 564179
1982-01-01 565361
1983-01-01 565491
1984-01-01 566723
1985-01-01     NA
1986-01-01     NA
1987-01-01     NA
1988-01-01 570867
1989-01-01 572222
1990-01-01 574823
```



Fill NAs with last observation

- Last observation carried forward (LOCF)

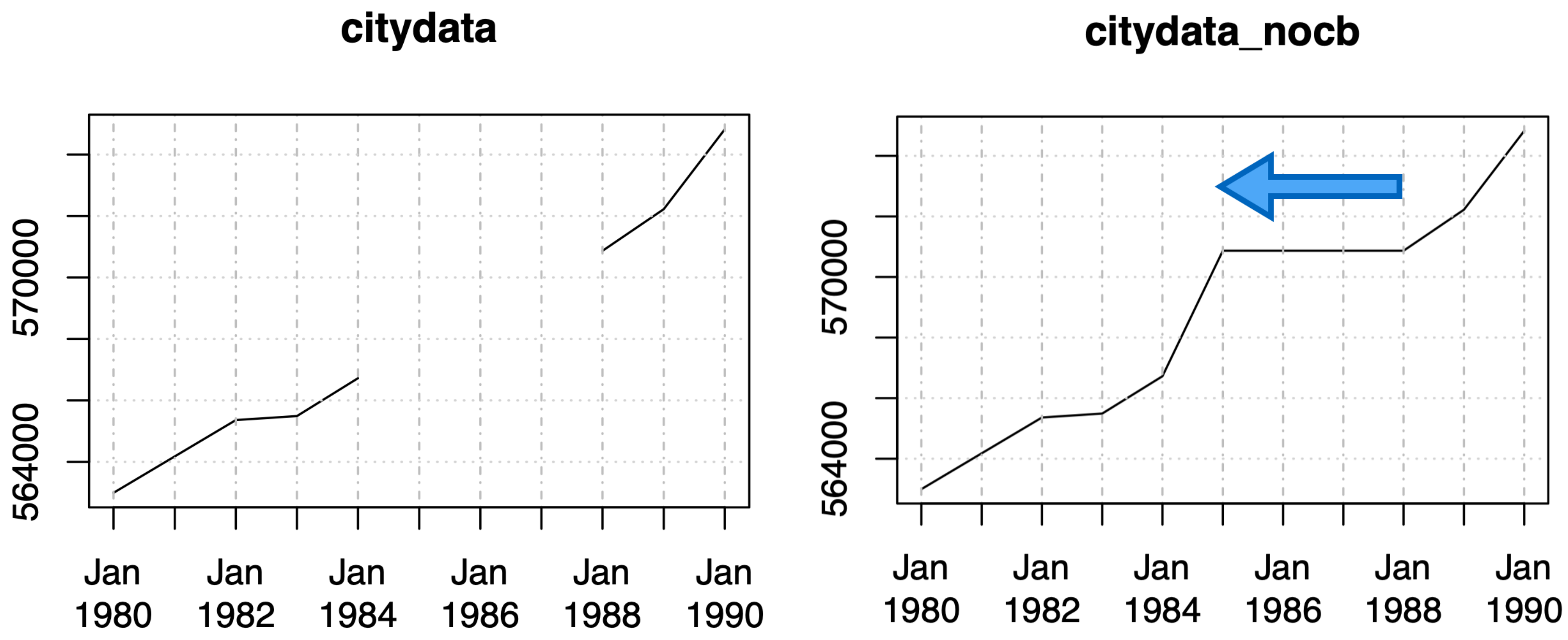
```
citydata_locf <- na.locf(citydata)


plot.xts(citydata)
plot.xts(citydata_locf)
```



Fill NAs with next observation

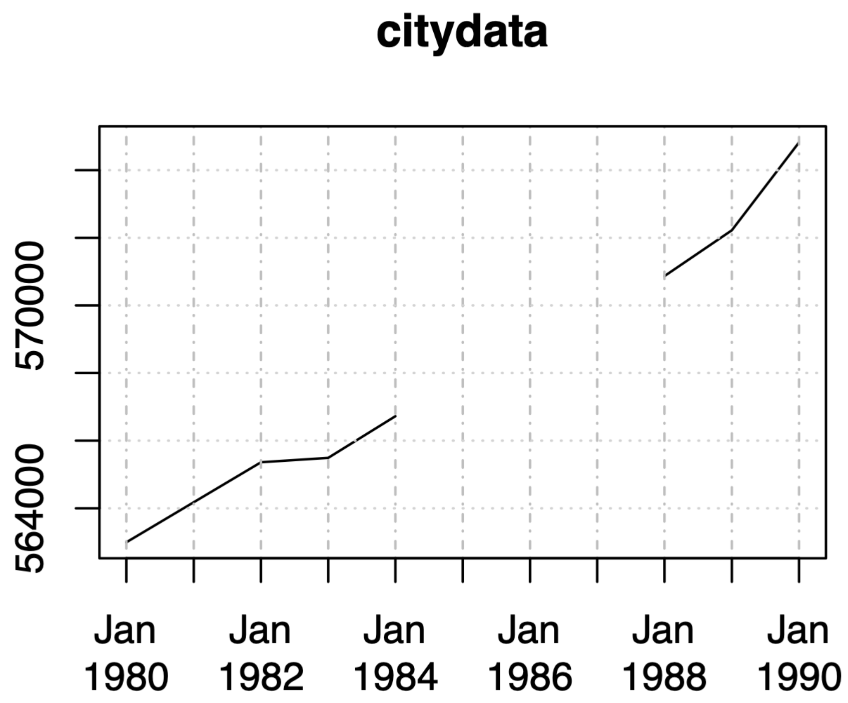
- Next observation carried backward (NOCB)

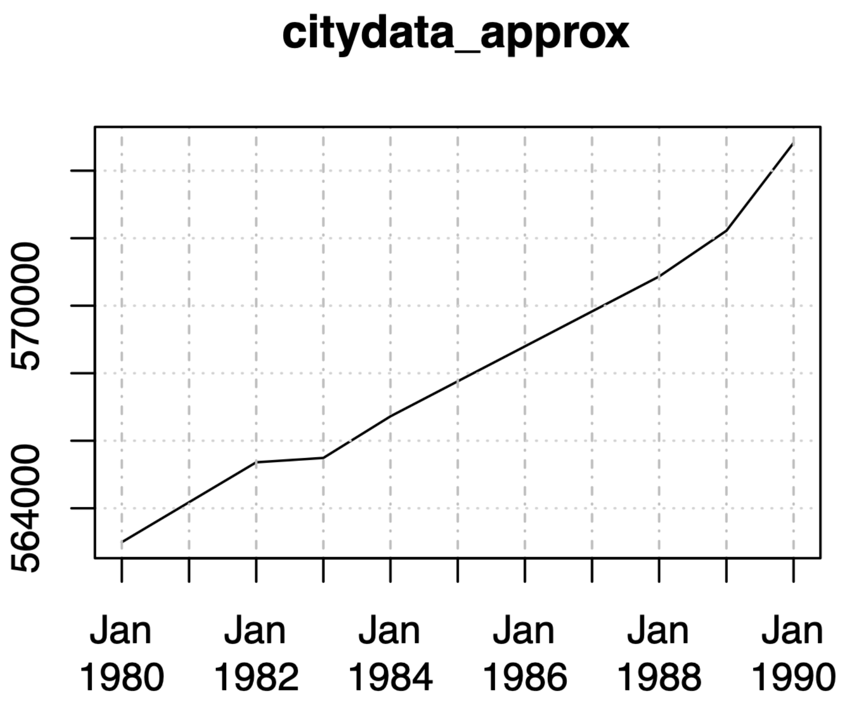
```
citydata_nocb <- na.locf(citydata, fromLast = TRUE)


plot.xts(citydata)
plot.xts(citydata_nocb)
```



Linear interpolation

```
citydata_approx <- na.approx(citydata)


plot.xts(citydata)
plot.xts(citydata_nocb)
```





Let's practice!

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Lagging and differencing

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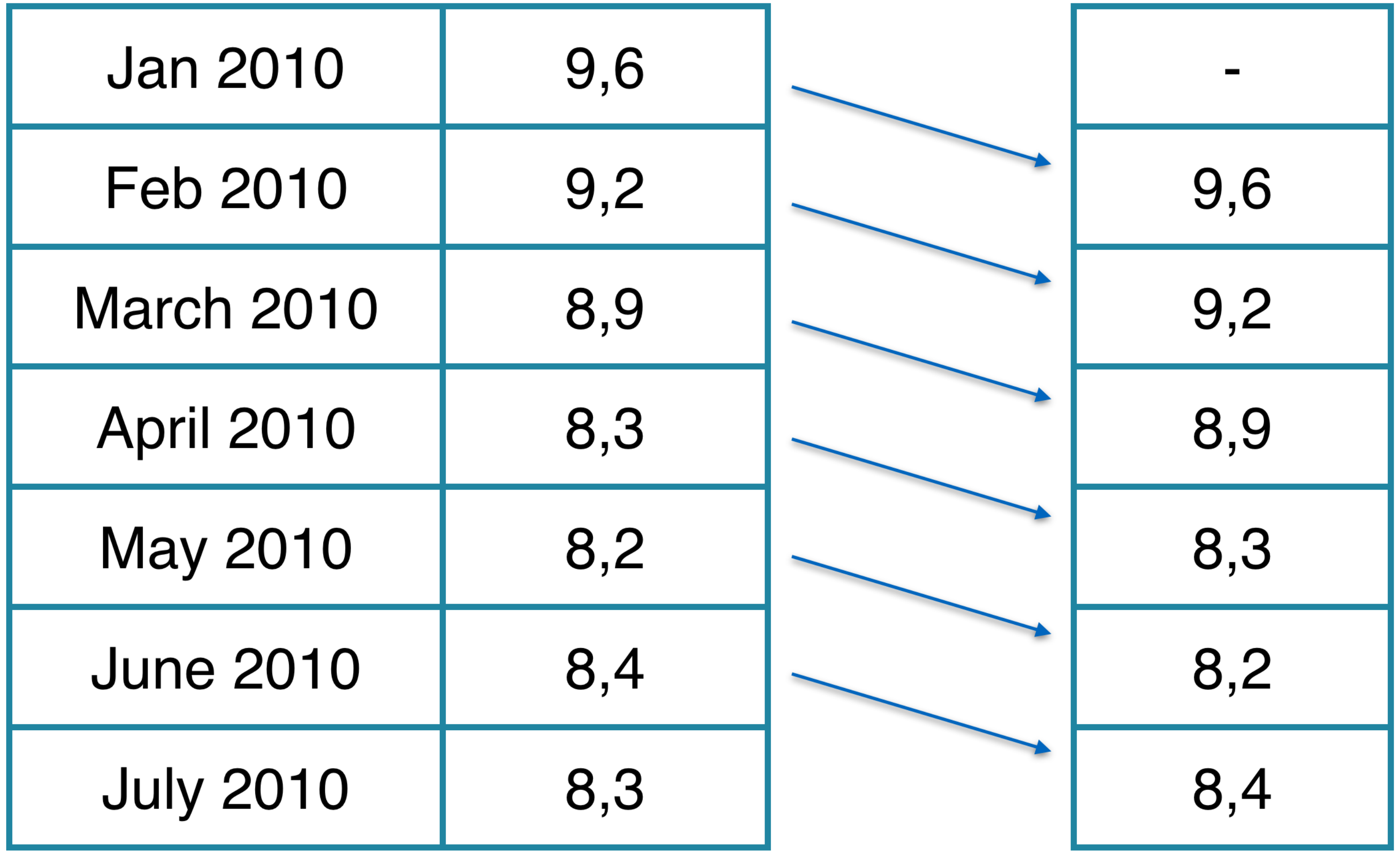
datacamp

Lagging

- `lag()` offsets observations in time

```
lag(unemployment, k = 1, ...)
```



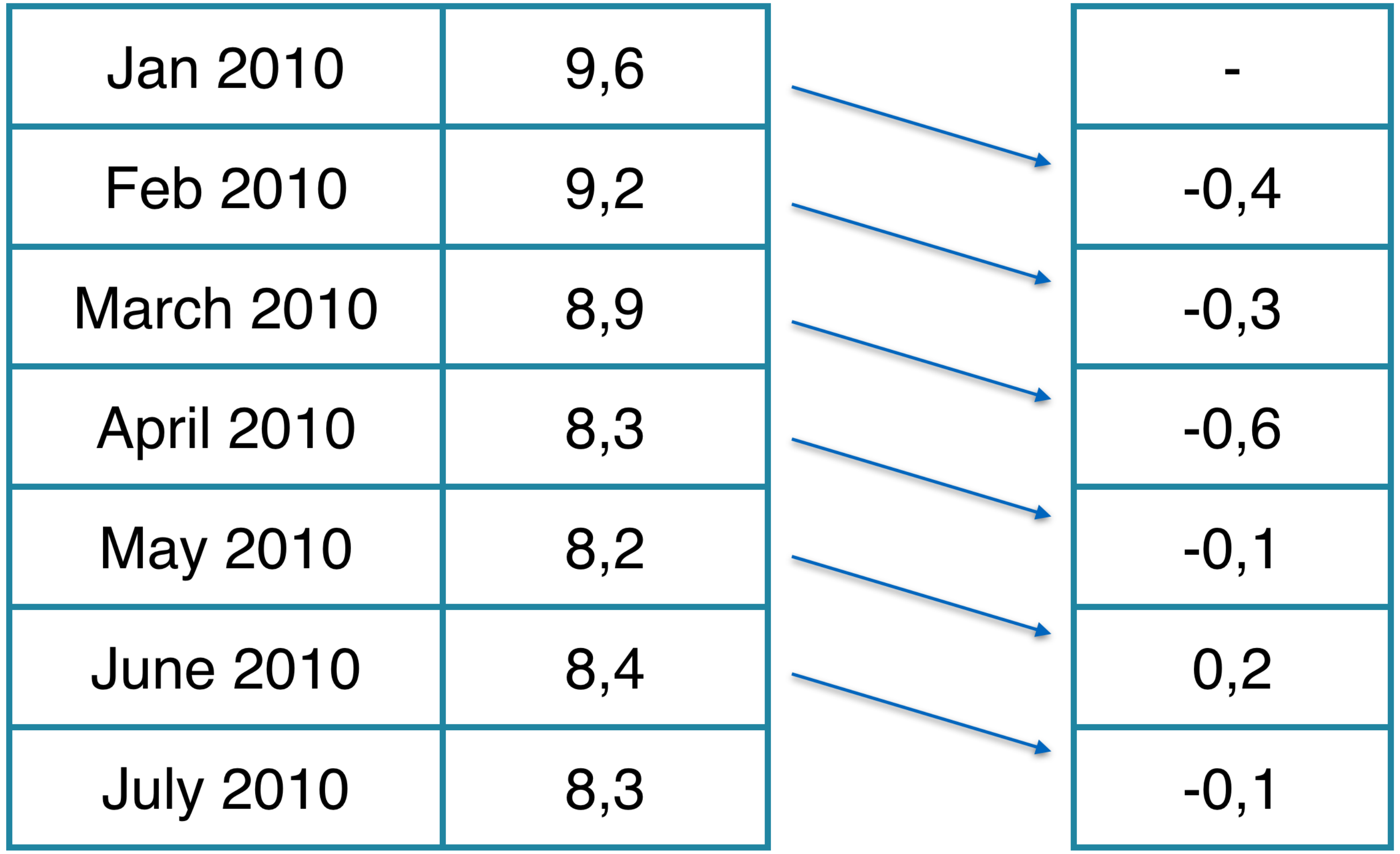
Jan 2010	9,6
Feb 2010	9,2
March 2010	8,9
April 2010	8,3
May 2010	8,2
June 2010	8,4
July 2010	8,3

-
9,6
9,2
8,9
8,3
8,2
8,4

Differencing

- `diff()` measures change between periods

```
diff(unemployment, lag = 1, ...)
```



Jan 2010	9,6
Feb 2010	9,2
March 2010	8,9
April 2010	8,3
May 2010	8,2
June 2010	8,4
July 2010	8,3

-
-0,4
-0,3
-0,6
-0,1
0,2
-0,1

Let's practice!

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Rolling functions

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Discrete windows

- Split the data according to period

```
unemployment_yrs <- split(unemployment, f = "years")
```

- Apply function within period

```
unemployment_yrs <- lapply(unemployment_yrs, cummax)
```

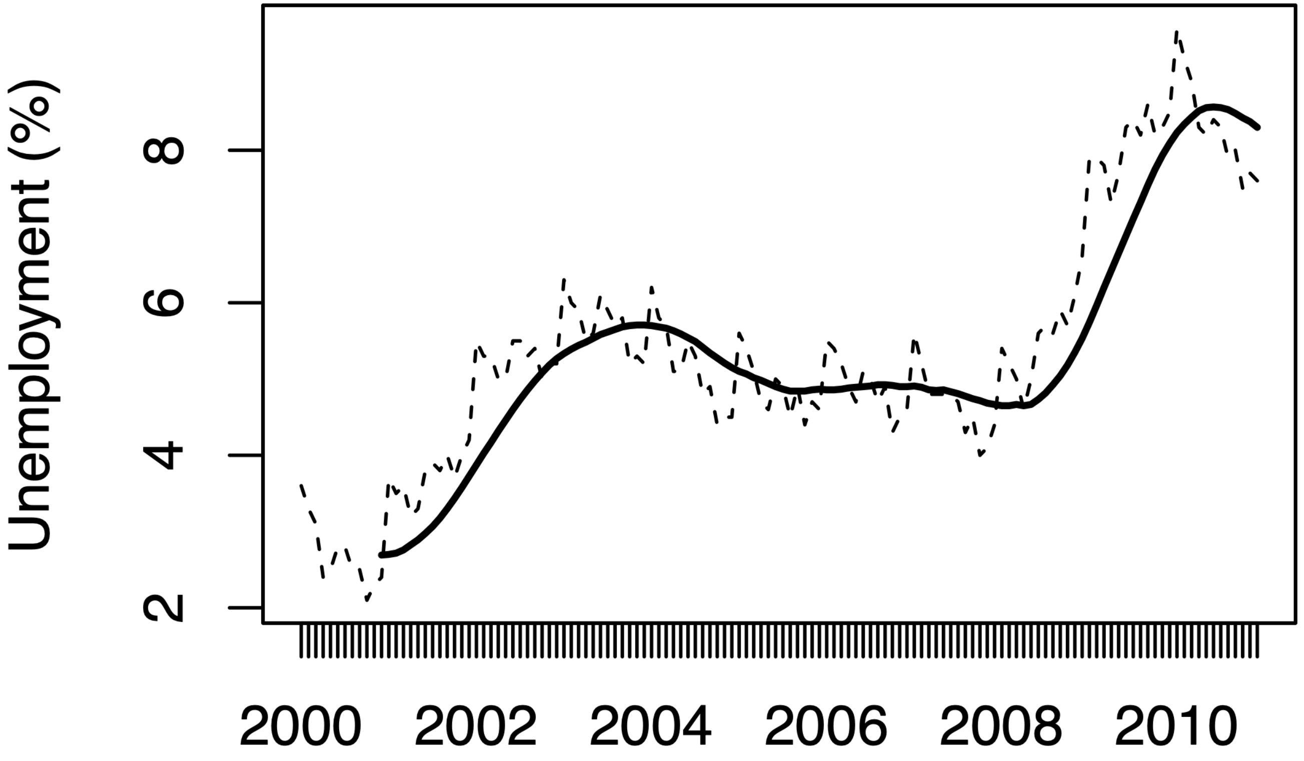
- Bind new data into xts object

```
unemployment_ytd <- do.call(rbind, unemployment_yrs)
```

Rolling windows

- `rollapply()` applies a function to a rolling window

```
unemployment_avg <- rollapply(unemployment,
                              width = 12,
                              FUN = mean)
```



Let's practice!

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