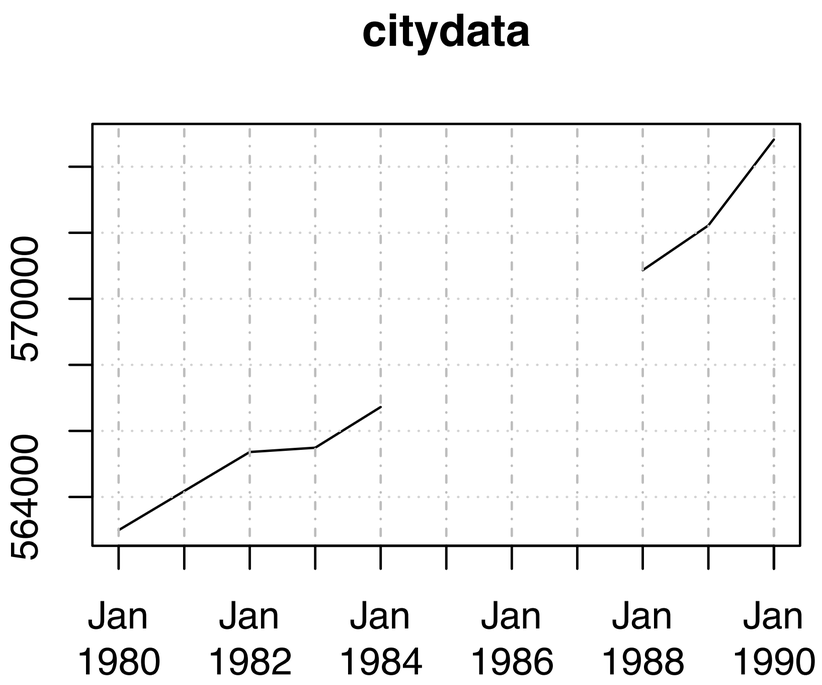
MANIPULATING TIME SERIES DATA IN R: CASE STUDIES

Handling Missingness

Missingness

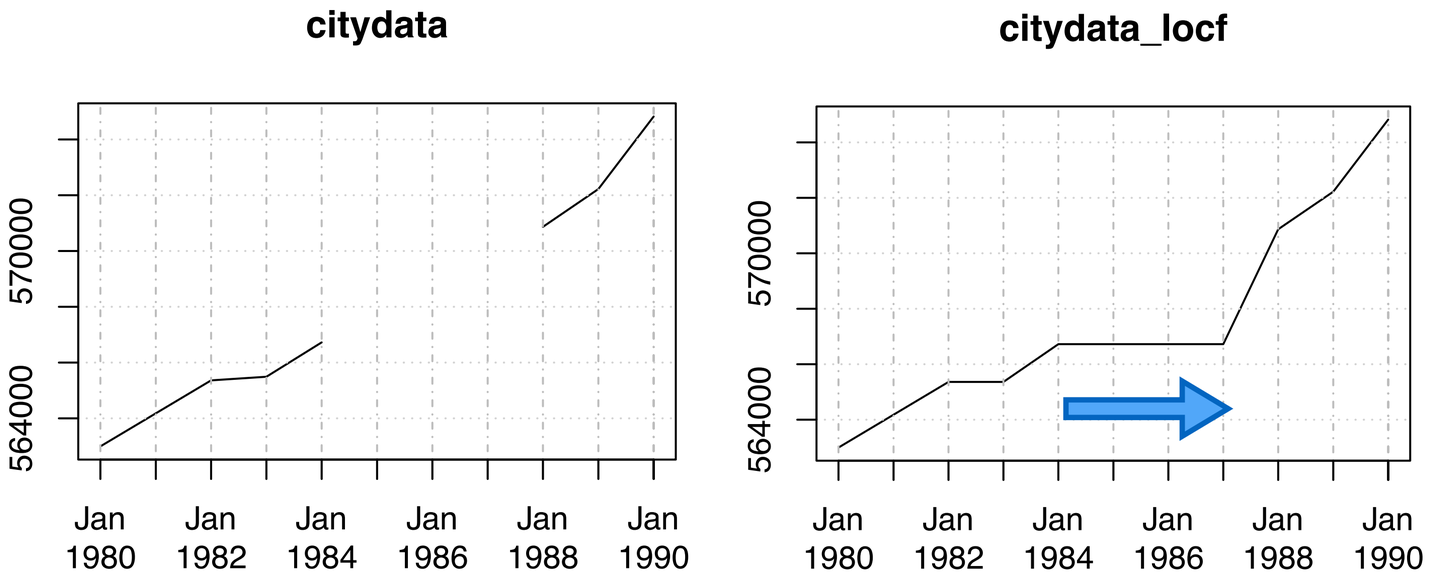
```
> citydata
                pop
1980-01-01 562994
1981-01-01 564179
1982-01-01 565361
1983-01-01 565491
1984-01-01 566723
1985-01-01     NA
1986-01-01     NA
1987-01-01     NA
1988-01-01 570867
1989-01-01 572222
1990-01-01 574823
```



Fill NAs with Last Observation

- Last observation carried forward (LOCF)

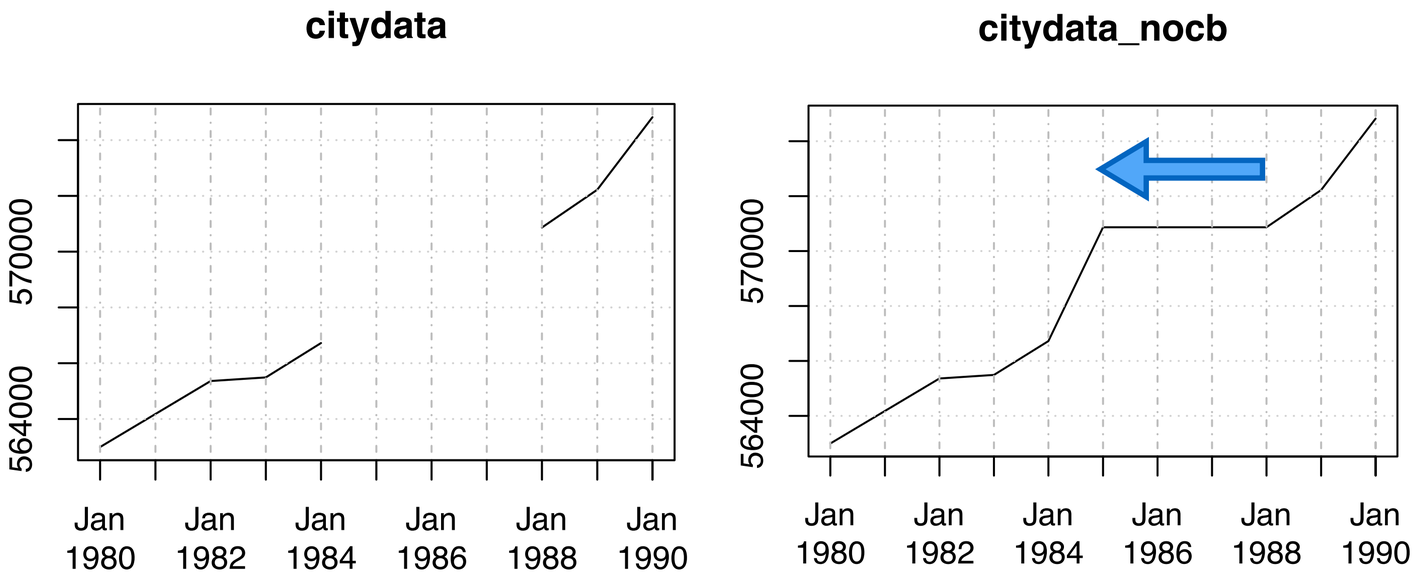
```
> citydata_locf <- na.locf(citydata)

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



Fill NAs with Next Observation

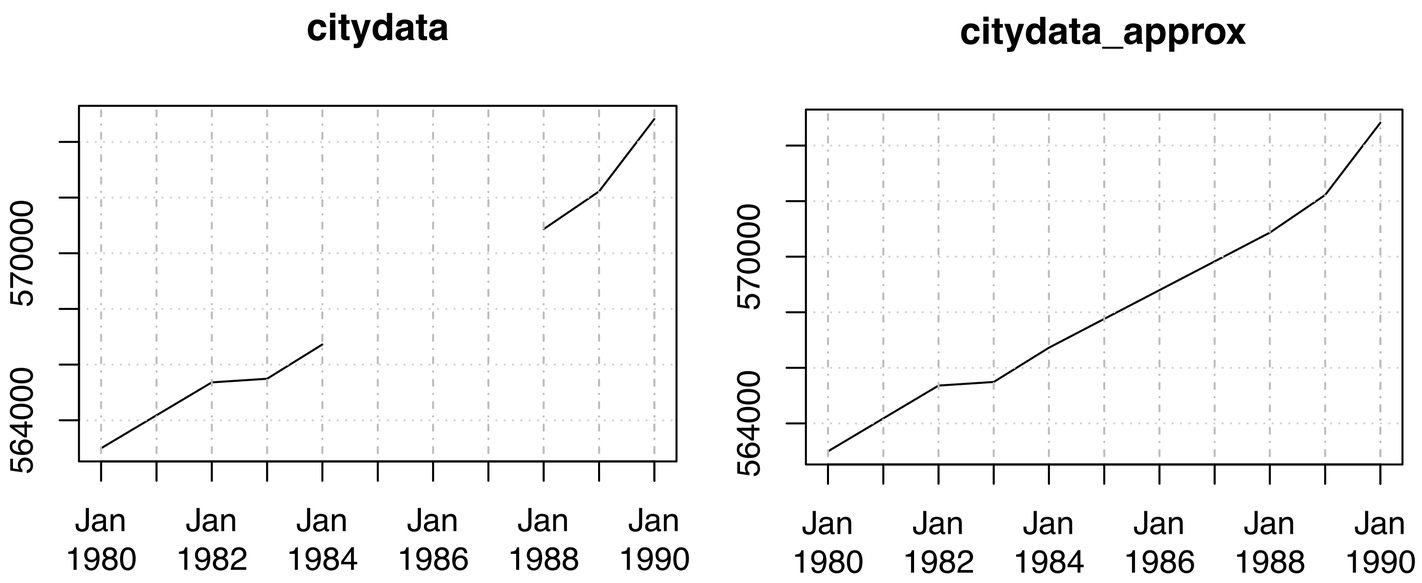
- Next observation carried backward (NOCB)

```
> 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)
```



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Let’s practice!

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Lagging and Differencing

Lagging

- lag() offsets observations in time

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

Jan 2010	9.6	-
Feb 2010	9.2	9.6
March 2010	8.9	9.2
April 2010	8.3	8.9
May 2010	8.2	8.3
June 2010	8.4	8.2
July 2010	8.3	8.4

Differencing

- diff() measures change between periods

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

Jan 2010	9.6	-
Feb 2010	9.2	-0.4
March 2010	8.9	-0.3
April 2010	8.3	-0.6
May 2010	8.2	-0.1
June 2010	8.4	0.2
July 2010	8.3	-0.1

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Let’s practice!

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Rolling Functions

Discrete Windows

- **Split** the data according to period

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

- **Apply** function within period

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

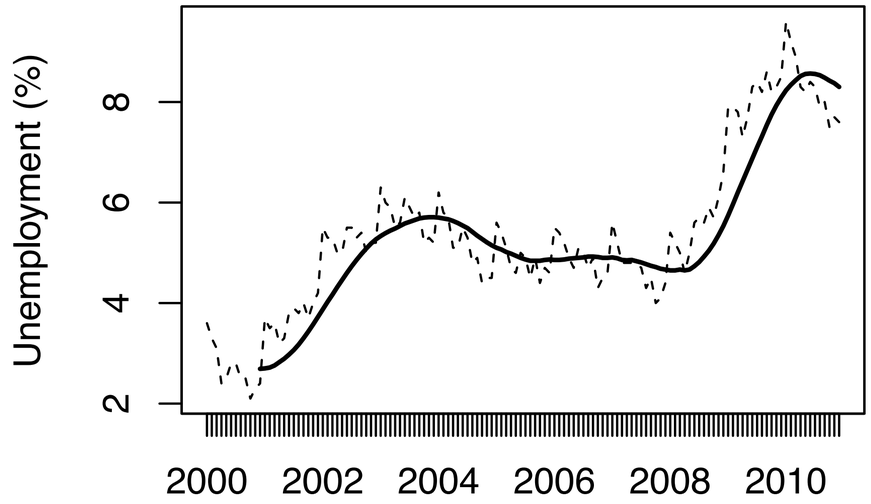
- **Bind** new data into xts object

```
> 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)
```



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Let’s practice!