

Examples in Time Series Analysis and Application

Youngrok Lee

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Preface

This is a R implementation of examples in “Time Series Analysis and Application” by Chi-Hyuck Jun.

1 Smoothing

```
library(tidyverse)
```

```
-- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
v dplyr      1.1.4      v readr      2.1.5
v forcats    1.0.0      v stringr    1.5.1
v ggplot2     3.5.1      v tibble     3.2.1
v lubridate  1.9.3      v tidyr      1.3.1
v purrr       1.0.2
-- Conflicts ----- tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()     masks stats::lag()
i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become
```

```
library(tsibble)
```

Registered S3 method overwritten by 'tsibble':

```
method          from
as_tibble.grouped_df dplyr
```

Attaching package: 'tsibble'

The following object is masked from 'package:lubridate':

```
interval
```

The following objects are masked from 'package:base':

```
intersect, setdiff, union
```

```
library(feasts)
```

Loading required package: fabletools

1.1 Example 1.1

1.1.1 Data

Create a data frame.

```
forest_fire <- tribble(
  ~year, ~cnt,
  2006, 369,
  2007, 418,
  2008, 389,
  2009, 570,
  2010, 282,
  2011, 277,
  2012, 197,
  2013, 296,
  2014, 492,
  2015, 623,
  2016, 391
)
```

1.1.2 Convert to time-series data

Convert the data frame to time series data frame (`tsibble`) object. You must set `index` with a column that represents timepoints for the series. Please note that `tsibble` automatically notice that the index is year and that the series is regular yearly series.

```
forest_fire_ts <-
  forest_fire |>
  as_tsibble(index = year)
```

```
forest_fire_ts
```

```
# A tsibble: 11 x 2 [1Y]
```

| | year | cnt |
|---|-------|-------|
| | <dbl> | <dbl> |
| 1 | 2006 | 369 |
| 2 | 2007 | 418 |
| 3 | 2008 | 389 |
| 4 | 2009 | 570 |
| 5 | 2010 | 282 |

| | | |
|----|------|-----|
| 6 | 2011 | 277 |
| 7 | 2012 | 197 |
| 8 | 2013 | 296 |
| 9 | 2014 | 492 |
| 10 | 2015 | 623 |
| 11 | 2016 | 391 |

1.1.3 Moving average

Compute moving average by calling `slider::slide_mean()`. Set `complete = TRUE` to return missing value NA when there are missing observations in the sliding window.

```
forest_fire_ma <-
  forest_fire_ts |>
  mutate(
    ma3 = slider::slide_mean(cnt, before = 2, after = 0, complete = TRUE),
    ma6 = slider::slide_mean(cnt, before = 5, after = 0, complete = TRUE)
  )

forest_fire_ma
```

```
# A tsibble: 11 x 4 [1Y]
   year   cnt  ma3  ma6
  <dbl> <dbl> <dbl> <dbl>
1  2006   369  NA   NA
2  2007   418  NA   NA
3  2008   389 392   NA
4  2009   570 459   NA
5  2010   282 414.  NA
6  2011   277 376. 384.
7  2012   197 252 356.
8  2013   296 257. 335.
9  2014   492 328. 352.
10 2015   623 470. 361.
11 2016   391 502 379.
```

Now, `forest_fire_ma` is a time series data frame with three series: original value `cnt`, 3-yr moving average `ma3`, and 6-yr moving average `ma6`.

1.1.4 Visualization

Covert this to a long form by calling `pivot_longer()`. The resulting time series data frame will have `key` that is a label of each series.

```
forest_fire_ma_long <-  
  forest_fire_ma |>  
  pivot_longer(c(cnt, ma3, ma6), names_to = "statistics")  
  
forest_fire_ma_long
```

```
# A tsibble: 33 x 3 [1Y]  
# Key:      statistics [3]  
   year statistics value  
   <dbl> <chr>      <dbl>  
1  2006 cnt         369  
2  2006 ma3          NA  
3  2006 ma6          NA  
4  2007 cnt         418  
5  2007 ma3          NA  
6  2007 ma6          NA  
7  2008 cnt         389  
8  2008 ma3         392  
9  2008 ma6          NA  
10 2009 cnt         570  
# i 23 more rows
```

Visualize time series data. `autoplot()` for time series data frame draws line plot, where each line is corresponding to each key value.

```
autoplot(forest_fire_ma_long)
```

Plot variable not specified, automatically selected ``value``

Warning: Removed 7 rows containing missing values or values outside the scale range (``geom_line()``).

