

A feast of time series tools

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June 2019

Outline

- 1 Overview
- 2 Time series in R
- 3 Graphics

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Overview



Feature Extraction And Statistics for Time Series

- works with tidy temporal data provided by the tsibble package.
- produces time series features, decompositions, statistical summaries and visualisations.

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tsibble objects

A `tsibble` allows storage and manipulation of time series in R.

It contains:

- Measured variable(s): numbers of interest
- Key variable(s): unique identifiers for each series
- An index: time information about the observation

Australian Exports

```
global_economy
```

```
## # A tsibble: 15,150 x 9 [1Y]
```

```
## # Key:           Country [263]
```

| ## | Country | Code | Year | GDP | Growth | CPI | Imports | Exports |
|----|-----------|-------|-------|--------|--------|-------|---------|---------|
| ## | <fct> | <fct> | <dbl> | <dbl> | <dbl> | <dbl> | <dbl> | <dbl> |
| ## | 1 Afghan~ | AFG | 1960 | 5.38e8 | NA | NA | 7.02 | 4.1 |
| ## | 2 Afghan~ | AFG | 1961 | 5.49e8 | NA | NA | 8.10 | 4.4 |
| ## | 3 Afghan~ | AFG | 1962 | 5.47e8 | NA | NA | 9.35 | 4.8 |
| ## | 4 Afghan~ | AFG | 1963 | 7.51e8 | NA | NA | 16.9 | 9.1 |
| ## | 5 Afghan~ | AFG | 1964 | 8.00e8 | NA | NA | 18.1 | 8.8 |
| ## | 6 Afghan~ | AFG | 1965 | 1.01e9 | NA | NA | 21.4 | 11.3 |
| ## | 7 Afghan~ | AFG | 1966 | 1.40e9 | NA | NA | 18.6 | 8.5 |
| ## | 8 Afghan~ | AFG | 1967 | 1.67e9 | NA | NA | 14.2 | 6.7 |
| ## | 9 Afghan~ | AFG | 1968 | 1.37e9 | NA | NA | 15.2 | 8.9 |

Australian Exports

```
global_economy %>% filter(Country=="Australia")
```

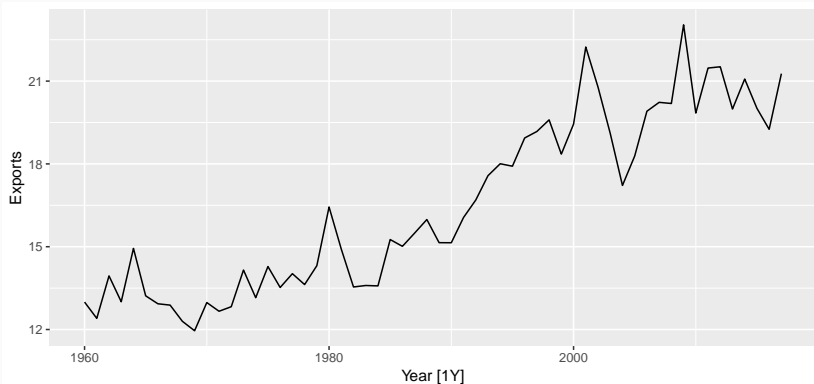
```
## # A tibble: 58 x 9 [1Y]
```

```
## # Key:           Country [1]
```

| ## | Country | Code | Year | GDP | Growth | CPI | Imports | Exports |
|----|---------|---------|-------|-------|---------|-------|---------|---------|
| ## | <fct> | <fct> | <dbl> | <dbl> | <dbl> | <dbl> | <dbl> | <dbl> |
| ## | 1 | Austra~ | AUS | 1960 | 1.86e10 | NA | 7.96 | 14.1 |
| ## | 2 | Austra~ | AUS | 1961 | 1.96e10 | 2.49 | 8.14 | 15.0 |
| ## | 3 | Austra~ | AUS | 1962 | 1.99e10 | 1.30 | 8.12 | 12.6 |
| ## | 4 | Austra~ | AUS | 1963 | 2.15e10 | 6.21 | 8.17 | 13.8 |
| ## | 5 | Austra~ | AUS | 1964 | 2.38e10 | 6.98 | 8.40 | 13.8 |
| ## | 6 | Austra~ | AUS | 1965 | 2.59e10 | 5.98 | 8.69 | 15.3 |
| ## | 7 | Austra~ | AUS | 1966 | 2.73e10 | 2.38 | 8.98 | 15.1 |
| ## | 8 | Austra~ | AUS | 1967 | 3.04e10 | 6.30 | 9.29 | 13.9 |
| ## | 9 | Austra~ | AUS | 1968 | 3.27e10 | 5.10 | 9.52 | 14.5 |

Australian Exports

```
global_economy %>% filter(Country=="Australia") %>%  
  autoplot(Exports)
```

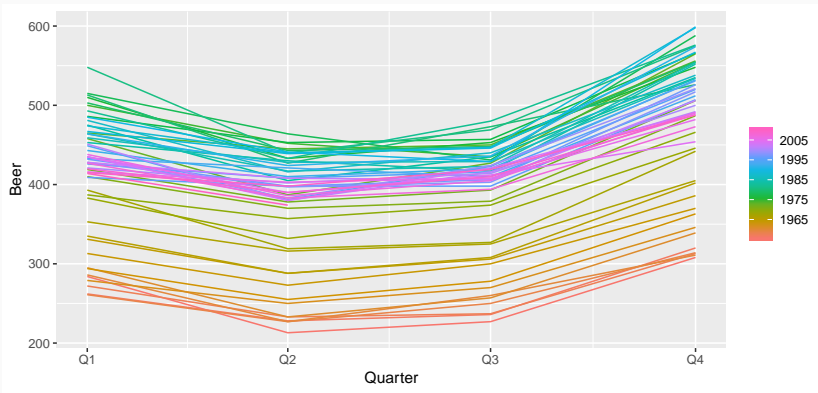


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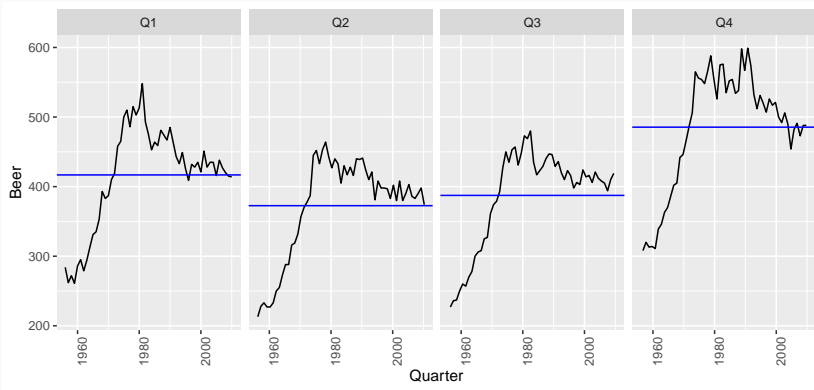
Graphics

```
aus_production %>% gg_season(Beer)
```



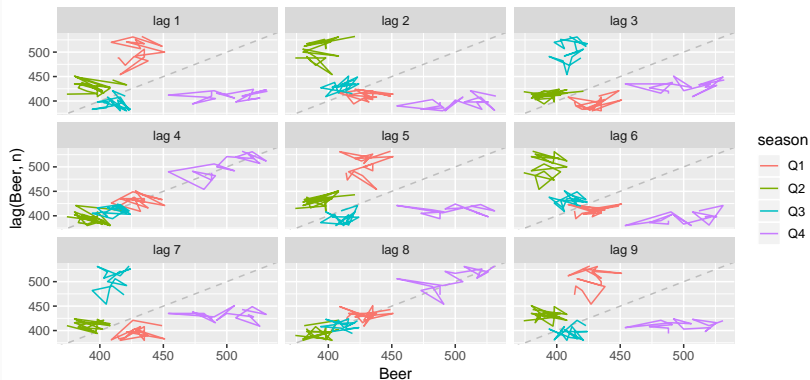
Graphics

```
aus_production %>% gg_subseries(Beer)
```



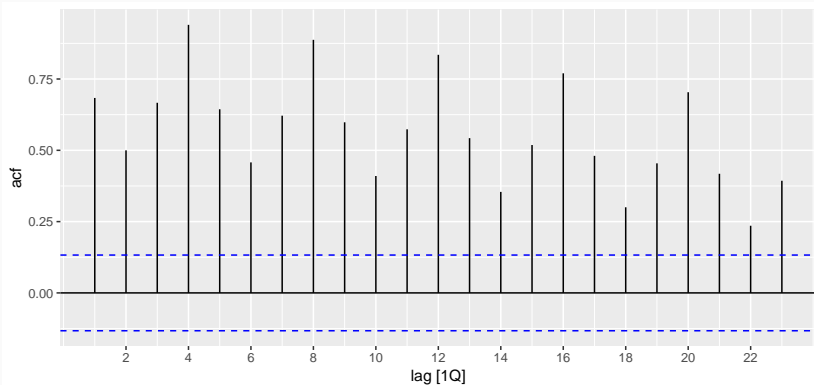
Graphics

```
aus_production %>% filter(year(Quarter) > 1991
```



Graphics

```
aus_production %>% ACF(Beer) %>% autoplot()
```



Decompositions

A common task in time series analysis is decomposing a time series into some simpler components. The feasts package supports four common time series decomposition methods:

- Classical decomposition
- STL decomposition
- X11 decomposition
- X-13ARIMA-SEATS decomposition

```
aus_production %>% STL(Beer ~ season(window =
```


Feature extraction and statistics

Extract features and statistics across a large collection of time series to identify unusual/extreme time series, or find clusters of similar behaviour.

```
aus_retail %>%
```

```
  features(Turnover, features_stl)
```

```
## # A tibble: 152 x 9
```

```
##       State Industry trend_strength seasonal_s
```

```
##       <chr> <chr>                <dbl>
```

```
##    1 Aust~ Cafes, ~                0.989
```

Acknowledgements



Earo Wang



Mitchell O'Hara-Wild



Di Cook