Rob J Hyndman George Athanasopoulos

FORECASTING PRINCIPLES AND PRACTICE



2. Time series graphics

2.3 Time series patterns
OTexts.org/fpp3/

Trend pattern exists when there is a long-term increase or decrease in the data.

Seasonal pattern exists when a series is influenced by seasonal factors (e.g., the quarter of the year, the month, or day of the week).

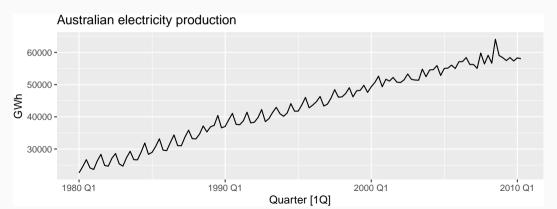
Cyclic pattern exists when data exhibit rises and falls that are not of fixed period (duration usually of at least 2 years).

Time series components

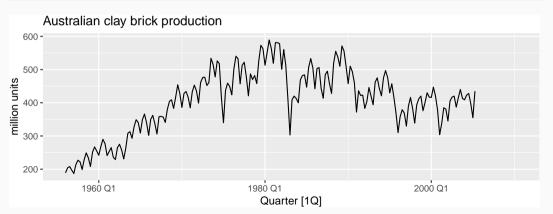
Differences between seasonal and cyclic patterns:

- seasonal pattern constant length; cyclic pattern variable length
- average length of cycle longer than length of seasonal pattern
- magnitude of cycle more variable than magnitude of seasonal pattern

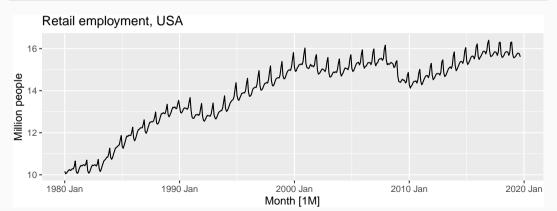
```
aus_production |>
  filter(year(Quarter) >= 1980) |>
  autoplot(Electricity) +
  labs(y = "GWh", title = "Australian electricity production")
```



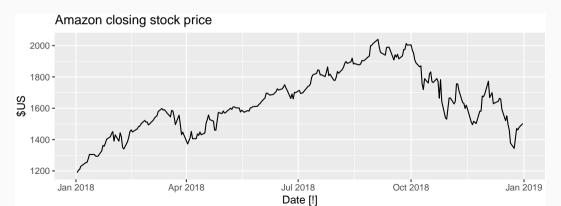
```
aus_production |>
  autoplot(Bricks) +
  labs(y = "million units", title = "Australian clay brick production")
```



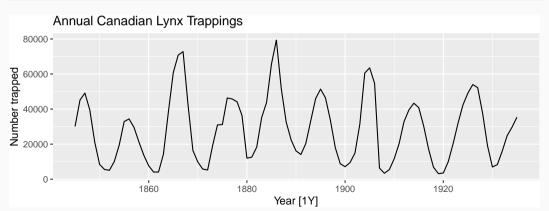
```
us_employment |>
filter(Title == "Retail Trade", year(Month) >= 1980) |>
autoplot(Employed / 1e3) +
labs(y = "Million people", title = "Retail employment, USA")
```



```
gafa_stock |>
  filter(Symbol == "AMZN", year(Date) >= 2018) |>
  autoplot(Close) +
  labs(y = "$US", title = "Amazon closing stock price")
```



```
pelt |>
  autoplot(Lynx) +
  labs(y = "Number trapped", title = "Annual Canadian Lynx Trappings")
```



Seasonal or cyclic?

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The timing of peaks and troughs is predictable with seasonal data, but unpredictable in the long term with cyclic data.