Basic Time Series patterns

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Time Series Analysis

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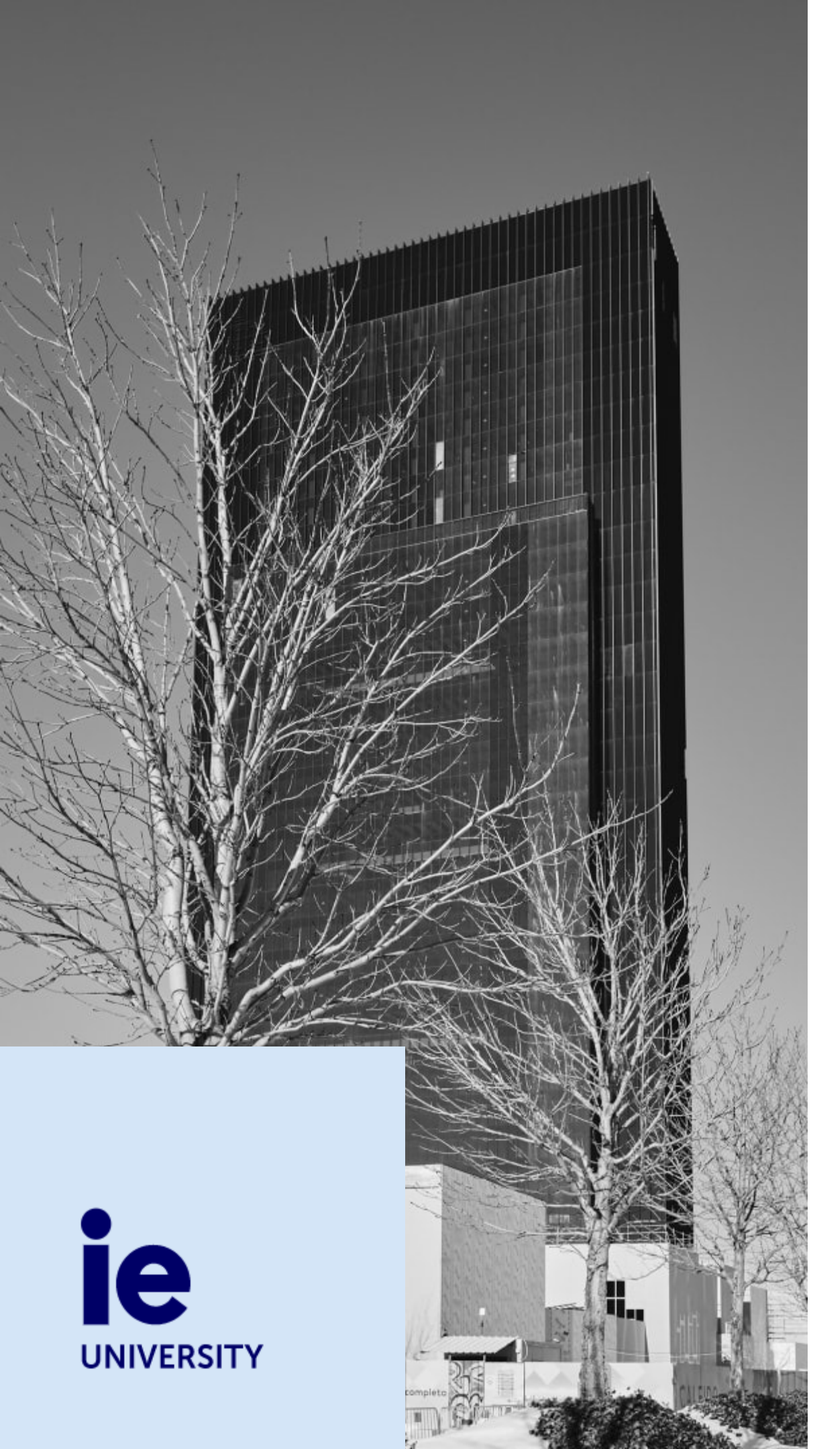

01 Description of patterns

02 Examples

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Description of basic time series patterns

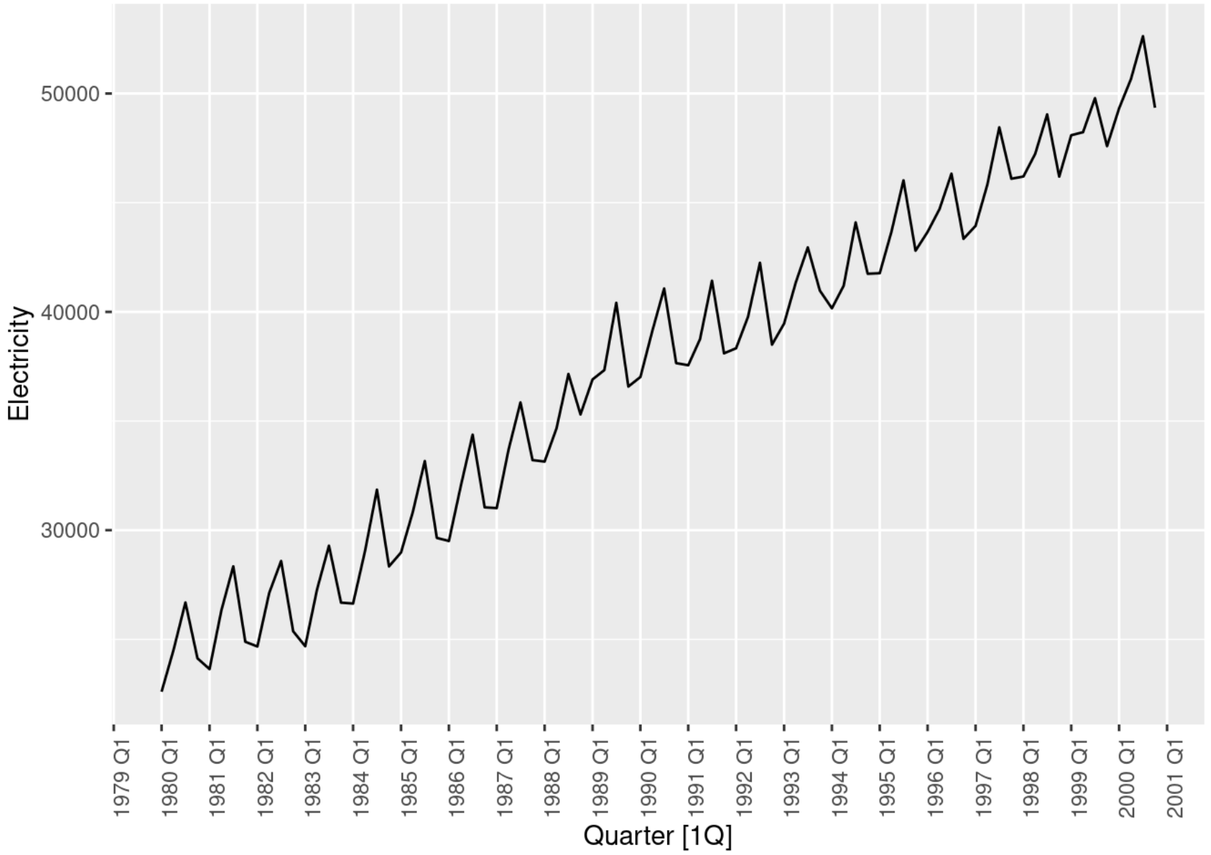
Time series patterns

Pattern	Description
Trend	Long-term increase OR decrease in the data
Seasonal	Periodic pattern due to the calendar (quarter, month, day of the week...)
Cyclic	Pattern where data exhibits rises and falls that are NOT FIXED IN PERIOD (typically duration of at least 2 years)

Seasonal or cyclic

Seasonal	Cyclic
Seasonal pattern of constant length	Cyclic patern of variable length
Shorter than cyclic pattern	Longer than periodic pattern
Magnitude less variable than cyclic pattern	Magnitude more variable than periodic pattern

Quarterly electricity production in Australia



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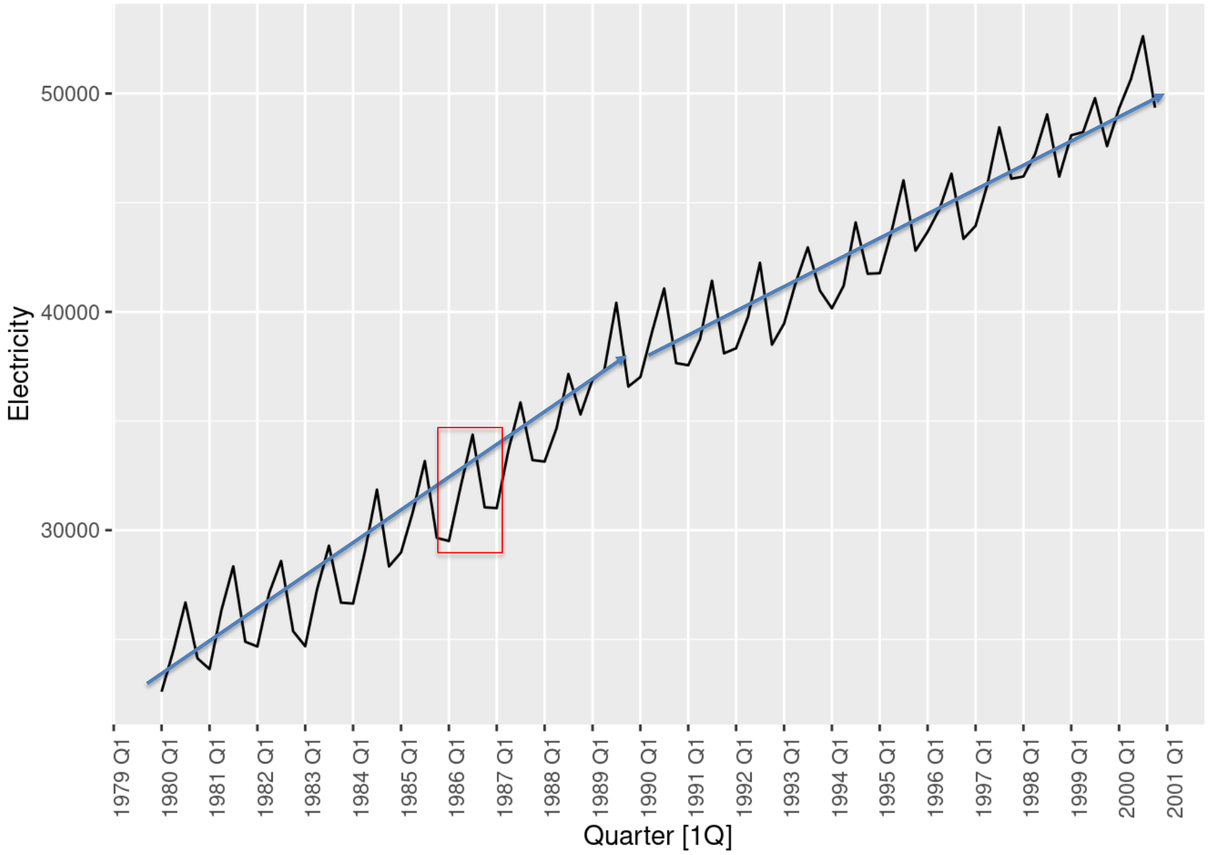
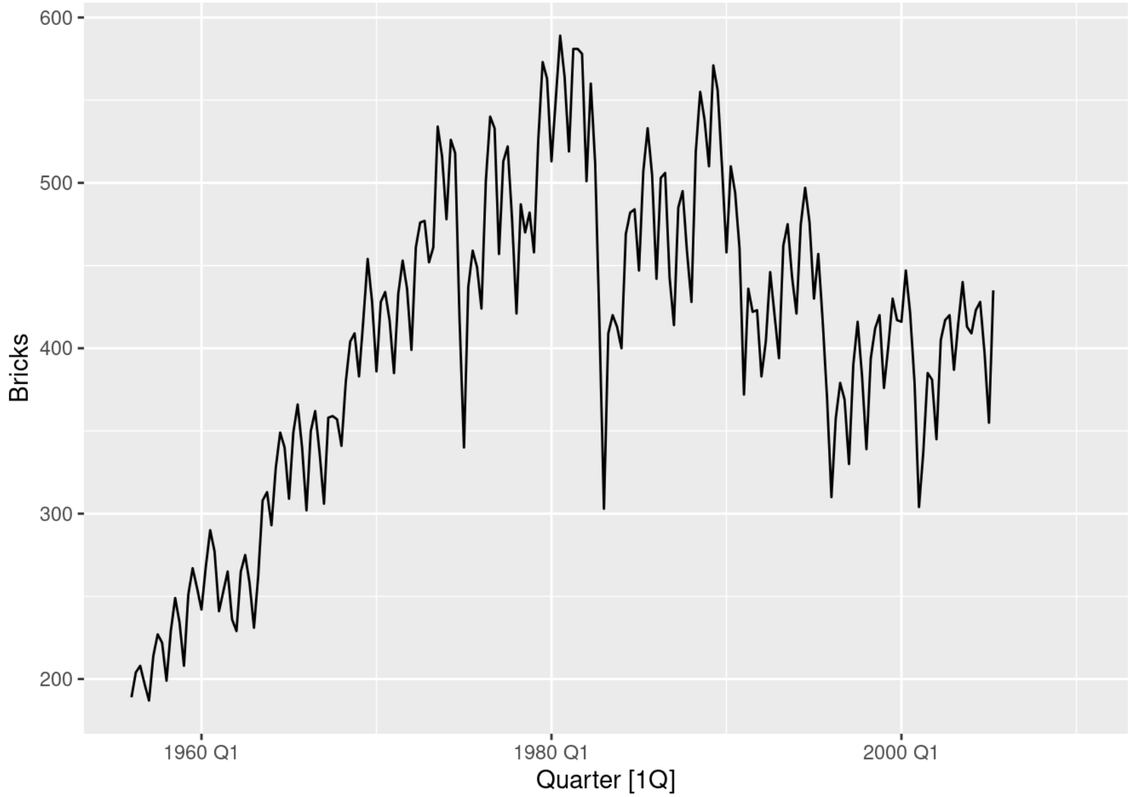


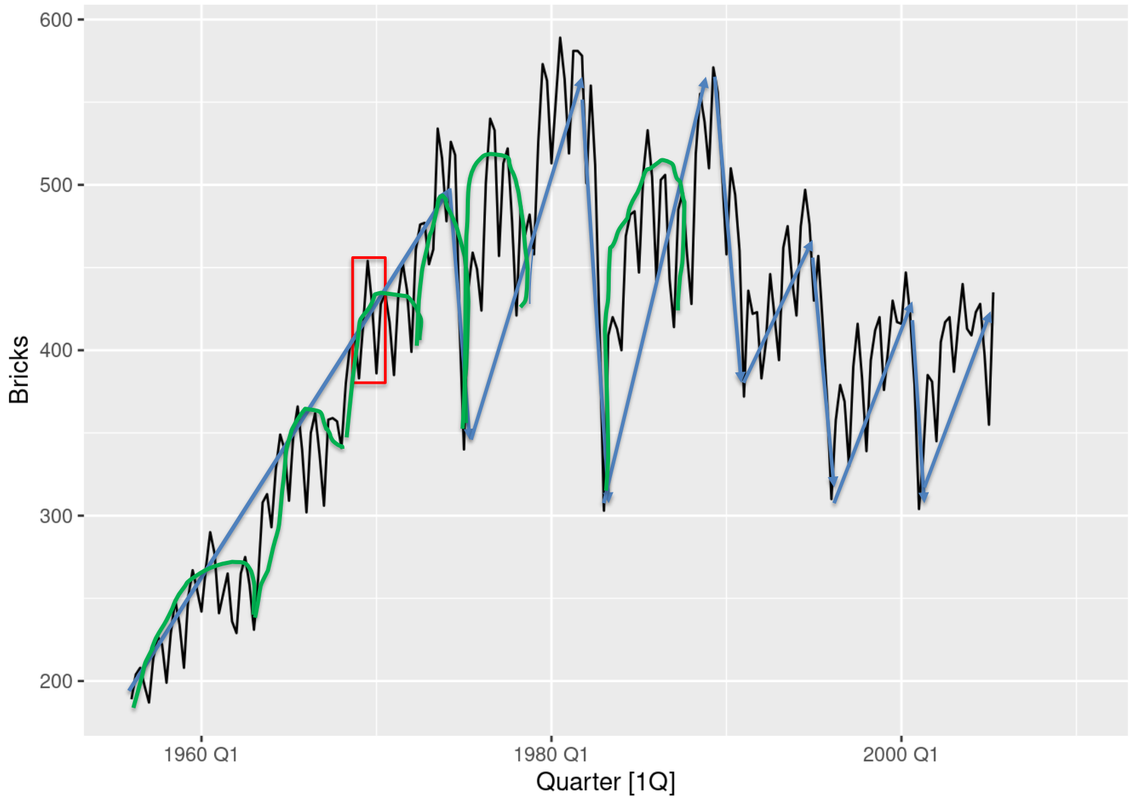
Trended data with change of slope around 1990 (blue)

Seasonal pattern of length 1 year (red)

Quarterly bricks production in Australia



Quarterly bricks production in Australia

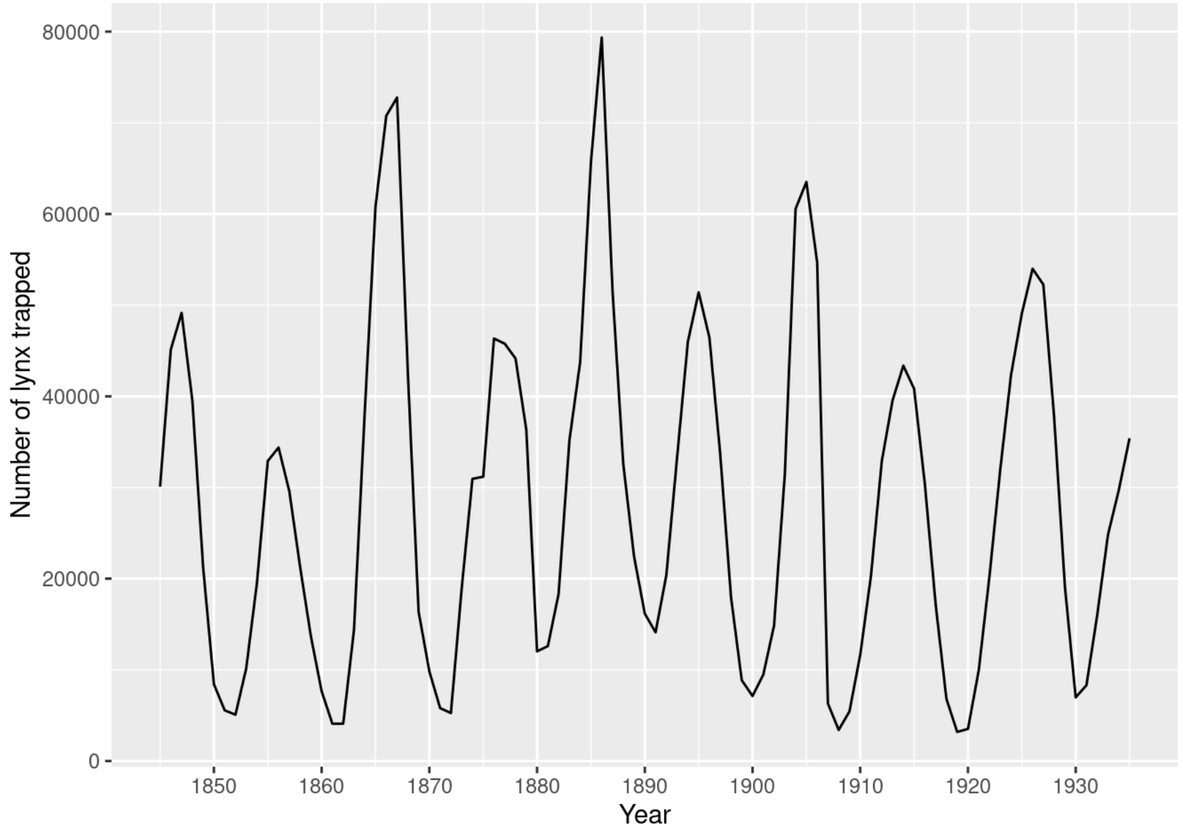


Trended data with recessions (blue arrows)

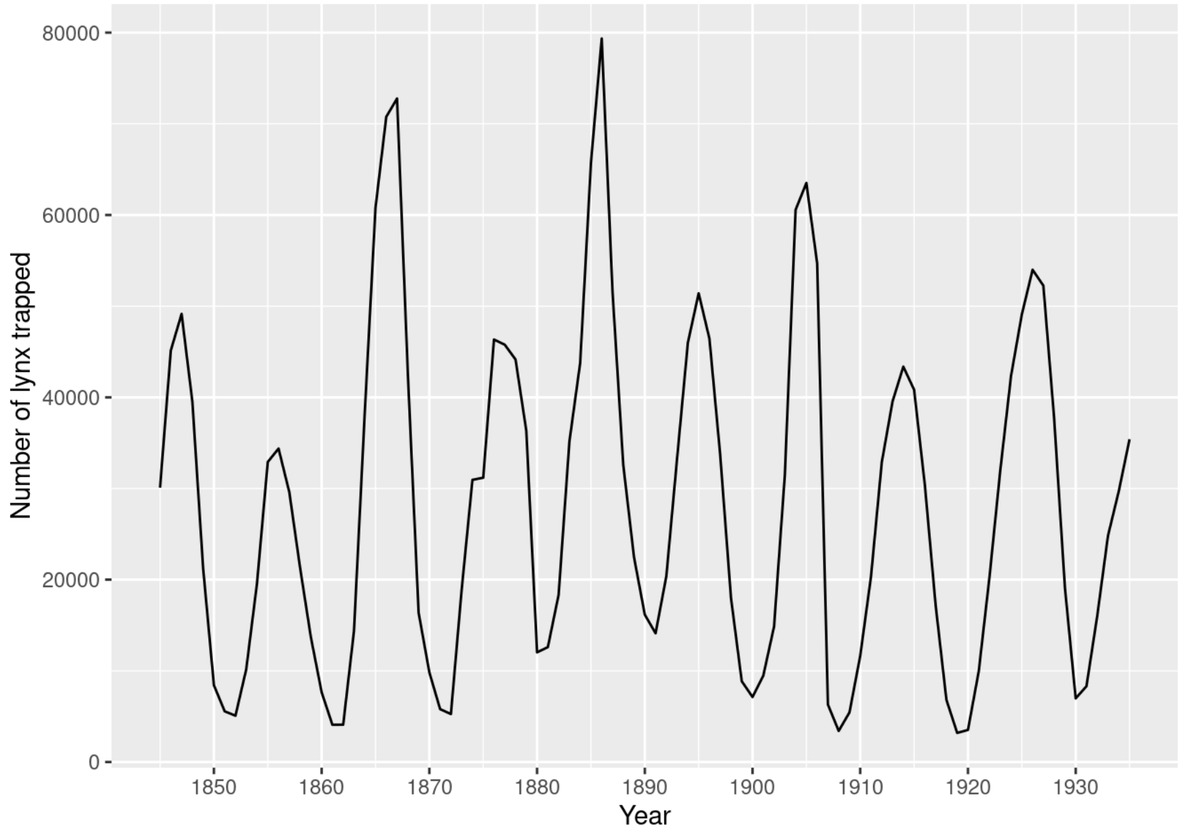
Seasonal pattern of length 1 year (red). Repeats every year.

Cicles of variable length and variance (green). Not all cycles have been signalled.

Number of lynxes trapped in a particular region



Number of lynxes trapped in a particular region



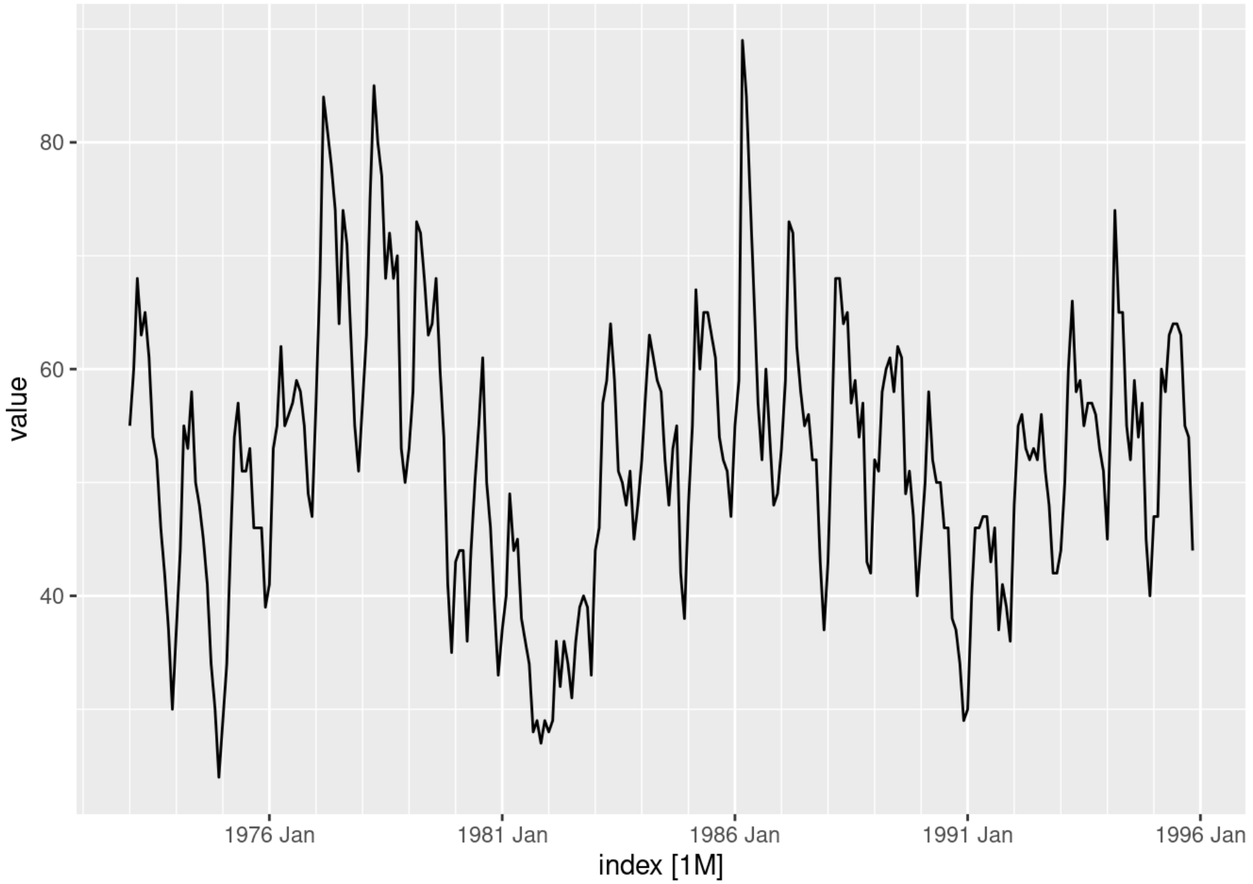
Untrended data.

No seasonality since this is yearly data and seasonality is caused by calendar variations

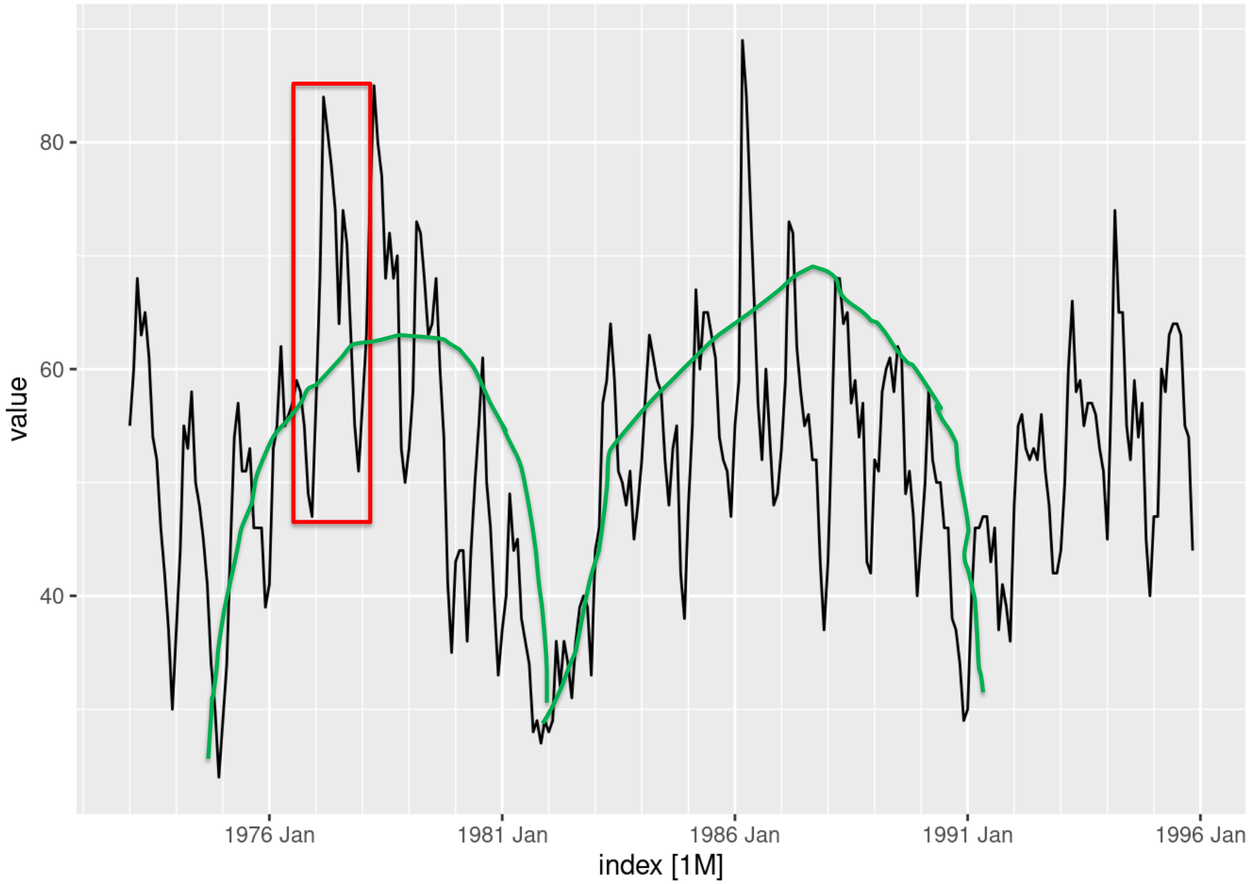
Cycles of variable length in time and of different strength.

In this particular case the cycles are explained by the decrease in population when too many lynxes are trapped. This leads to a ban that results in their population growth, after which the the number of trapped lynxes increases.

Monthly sales of new one-family houses sold in US since 1973.



Monthly sales of new one-family houses sold in US since 1973.

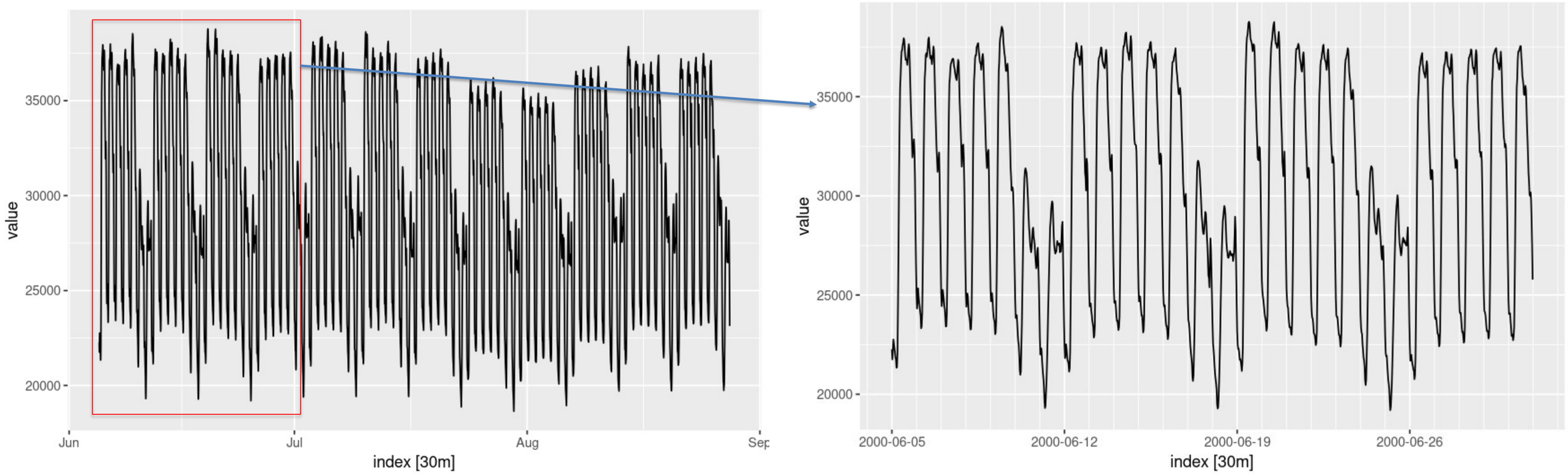


Untrended data.

Seasonal pattern of length one year (red)

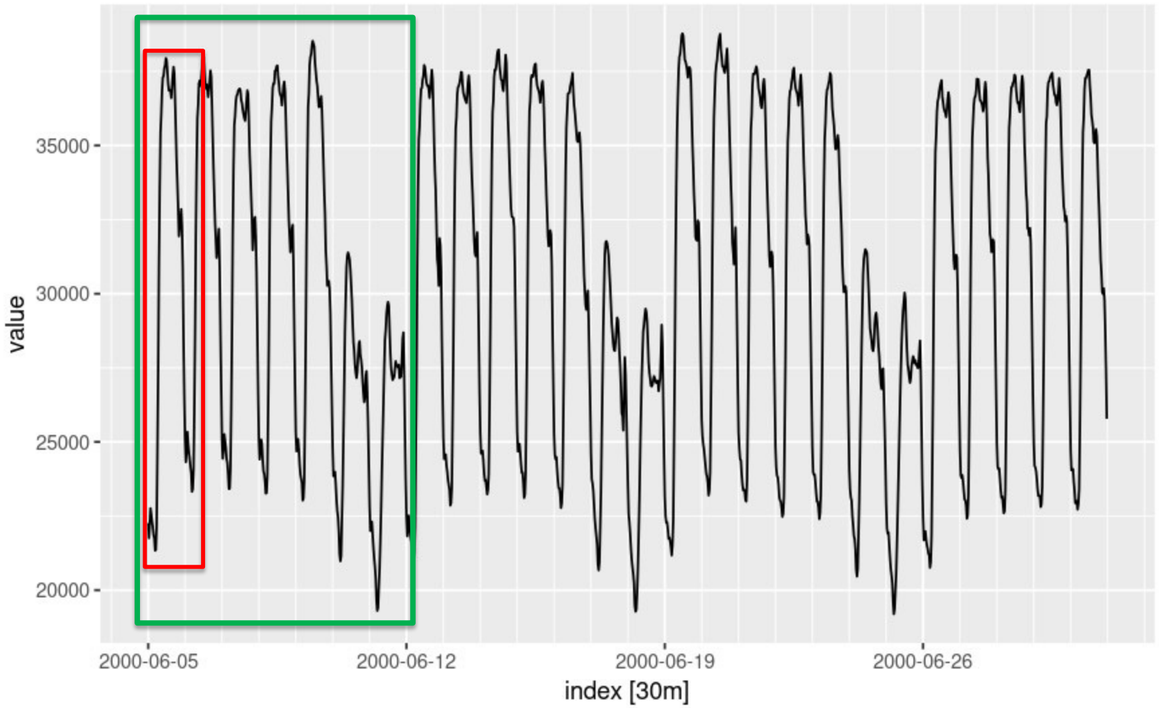
Cycles of different strength and duration (green). The last one is not fully developed in the graph.

Half-hourly electricity demand in England and Wales



Filter first four weeks to make patterns more clear

Half-hourly electricity demand in England and Wales



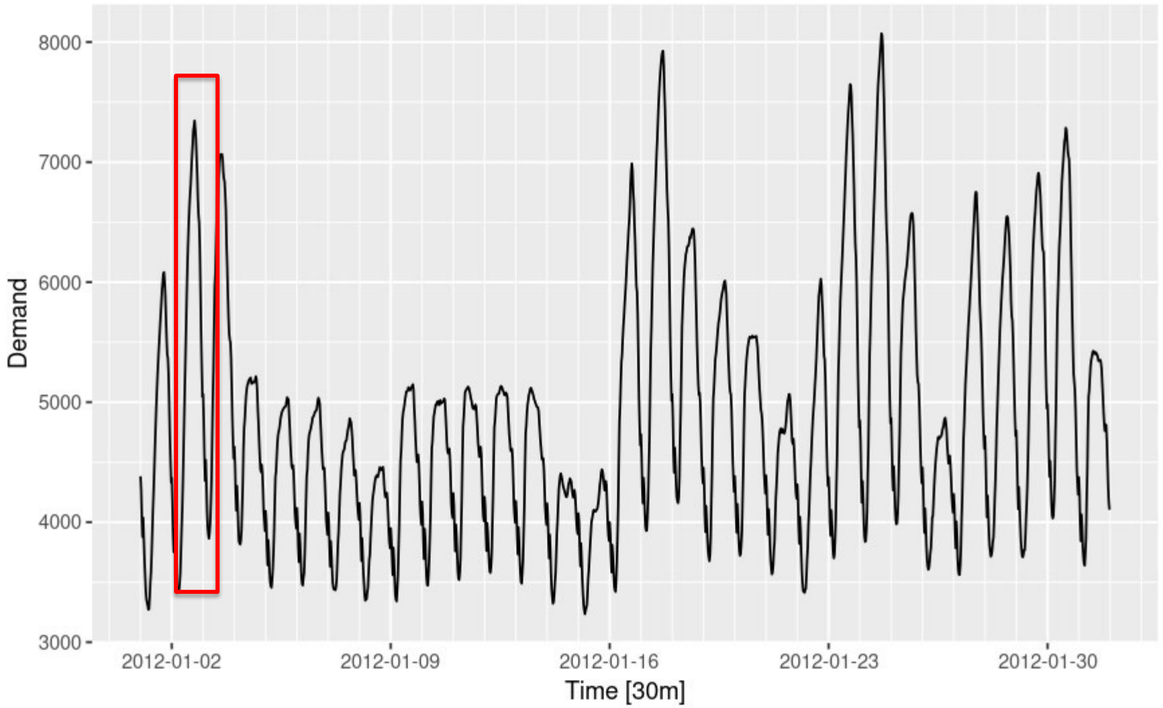
Data with multiple seasonal patterns.

Daily seasonal pattern (red)

Weekly seasonal pattern (green)

Note that electricity demand is lower during the weekends in these regions, probably due to the shutdown of the industry.

Half-hourly electricity demand in Victoria (Australia)



Daily seasonal pattern (red)

No clear weekly seasonal pattern

A time series will not always exhibit seasonal patterns at every possible seasonal period.

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