Time series decomposition II

EC 361–001

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Materials

Required readings:

- `Hyndman & Athanasopoulos, ch. 3`
  - Sections 3.5—3.6.

Motivation

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Time series **decomposition methods** help us extracting the main *features* of time series data.

In addition to **disentangling** the variable into its trend-cycle, seasonal, and remainder components, it also allows us to obtain **seasonally adjusted** data.

The starting point is the **classical decomposition** method, which is based on *moving averages* and on a *constant seasonal* component.

Given such **limitations**, we will now explore more **robust** decomposition techniques.

STL decomposition

STL decomposition

A more robust decomposition method is the so-called **STL decomposition**.

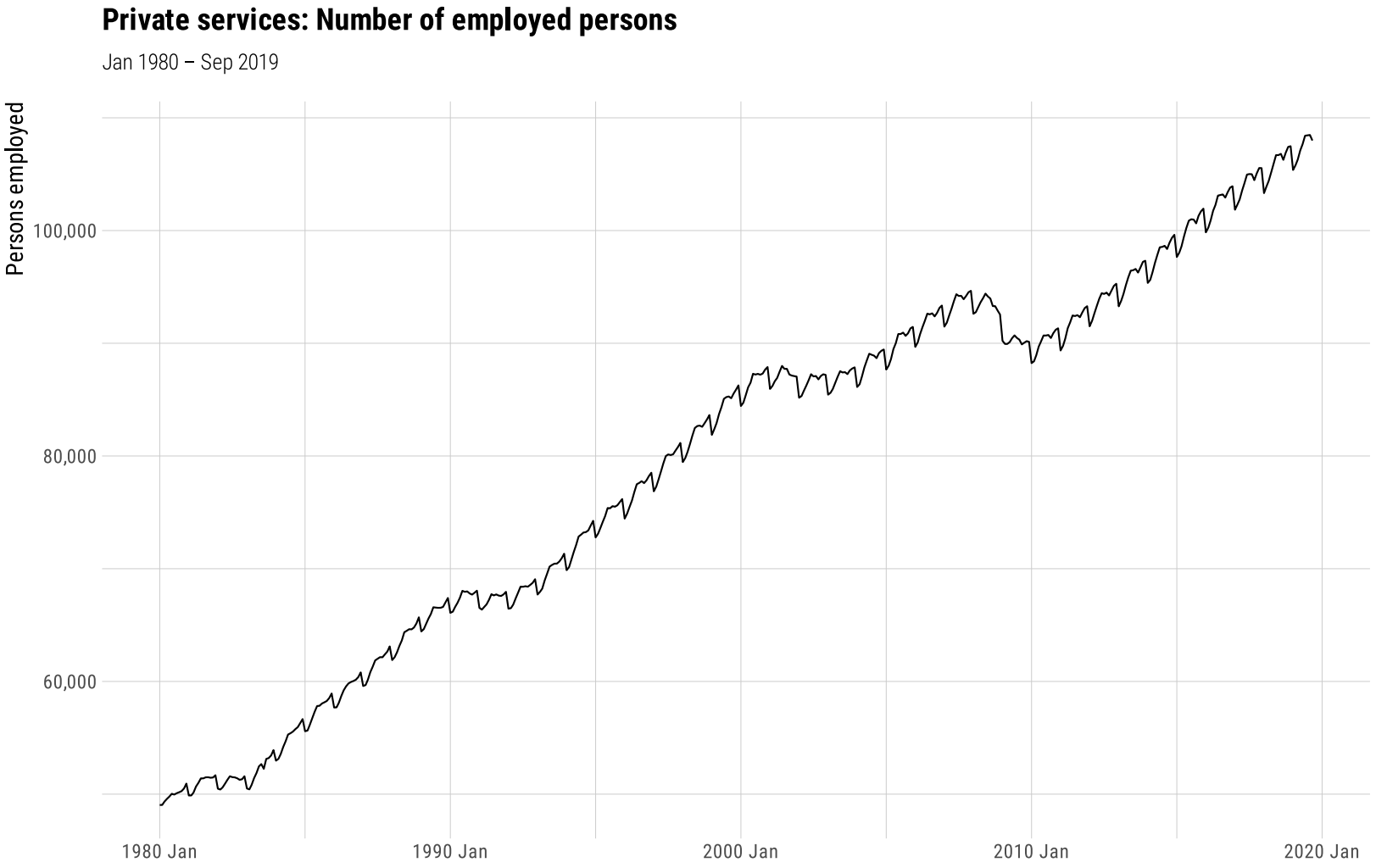
> **STL** = *"Seasonal and Trend decomposition using Loess"*

It was first introduced by `Cleveland et al. (1990)`, and provides a more **robust** decomposition relative to the classical method.

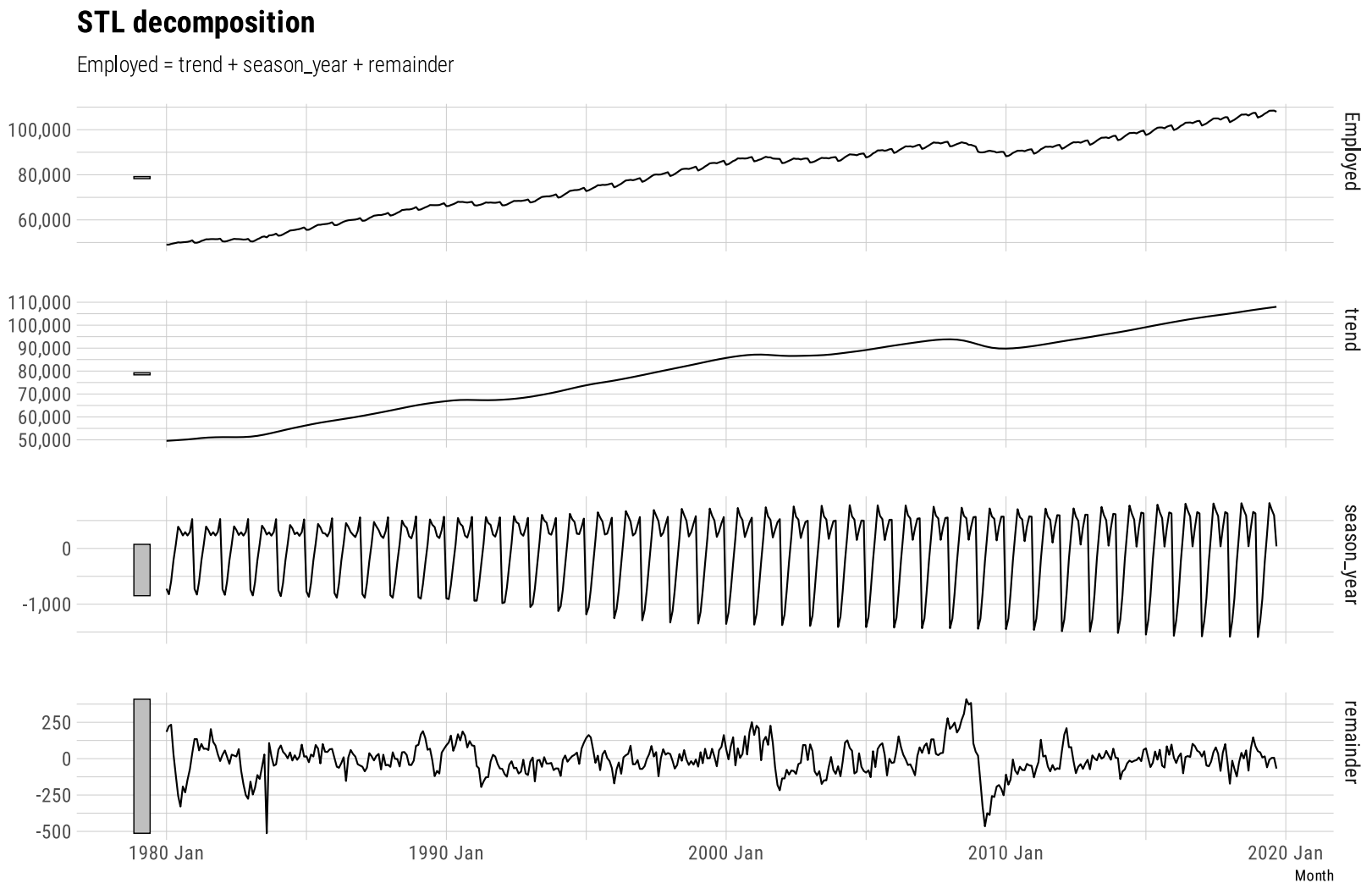
For instance,

- It allows the **seasonal** component to change over time;
- It is robust to **outliers**;
- The user may easily **control** its parameters;
- It relies on local regressions, in addition to moving averages, to estimate the **trend-cycle** component.

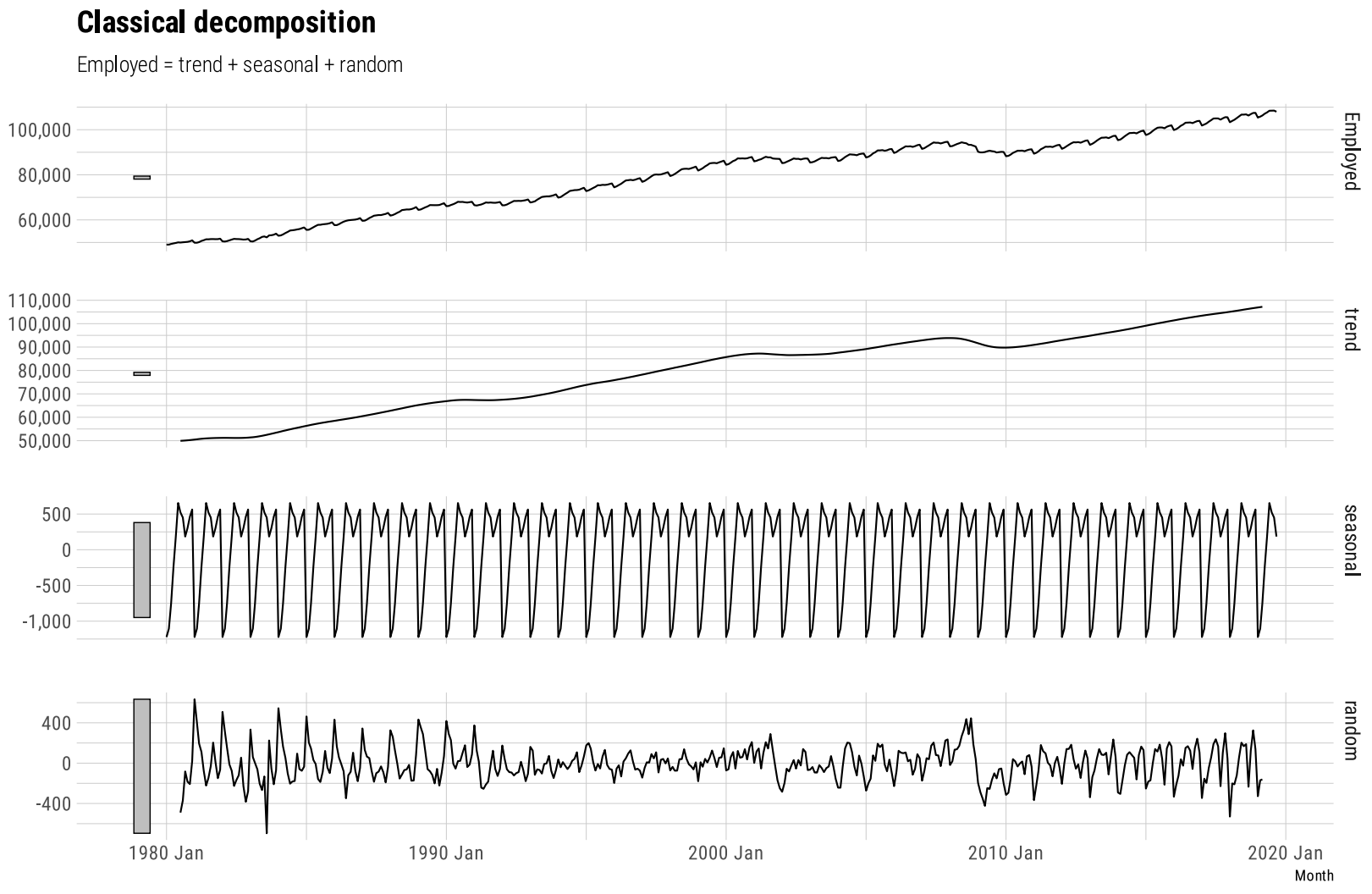
STL decomposition



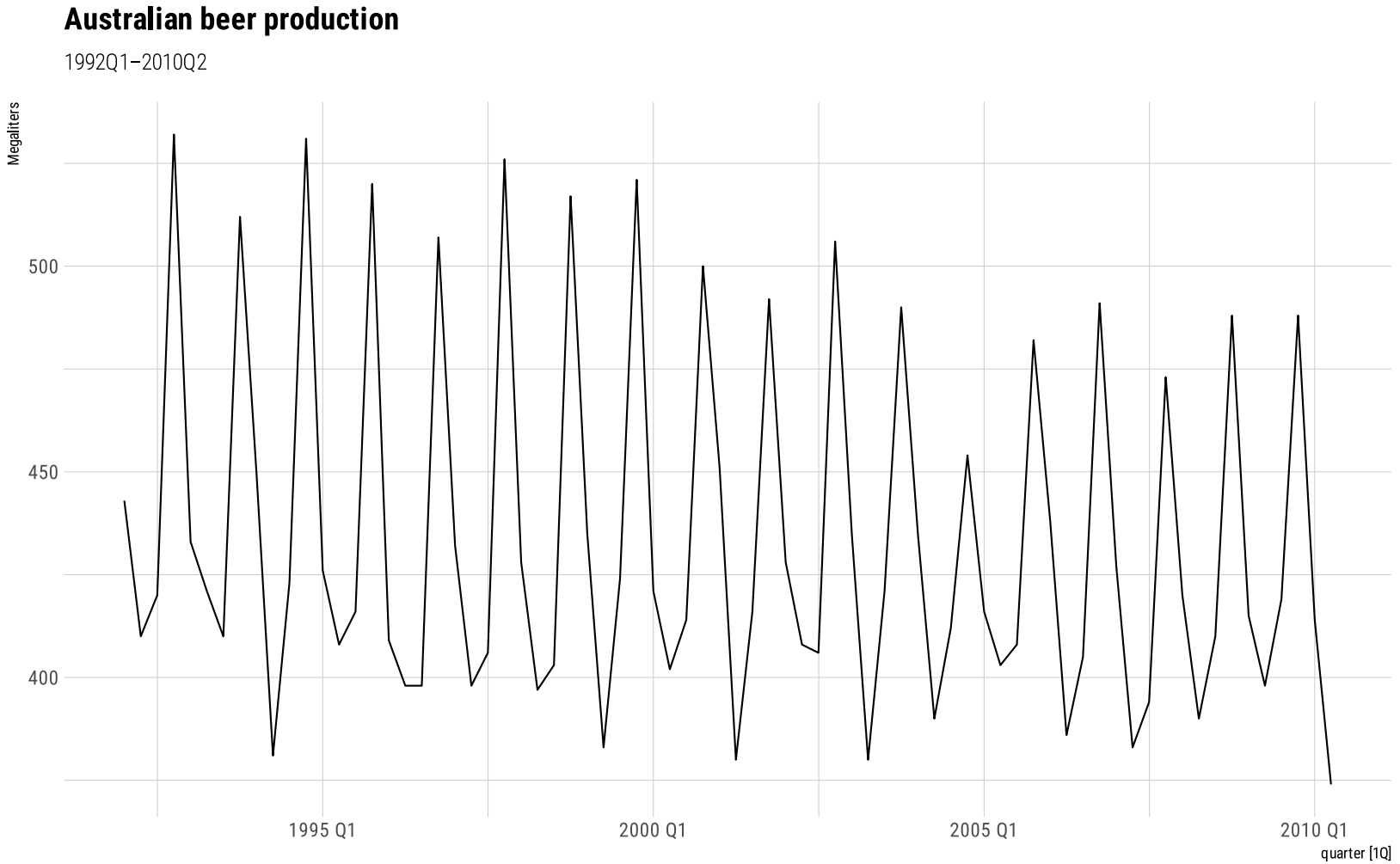
STL decomposition



STL decomposition

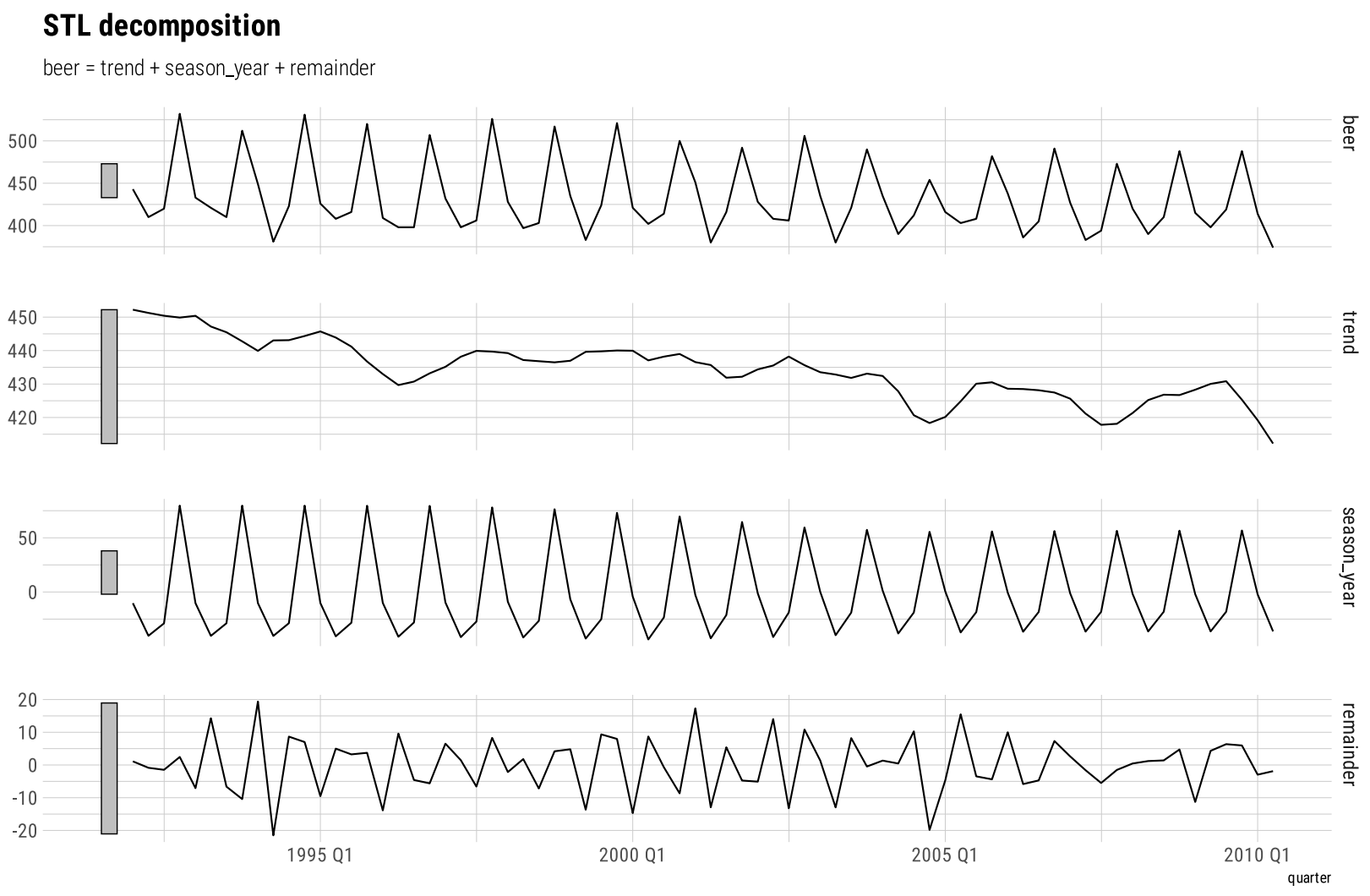


STL decomposition

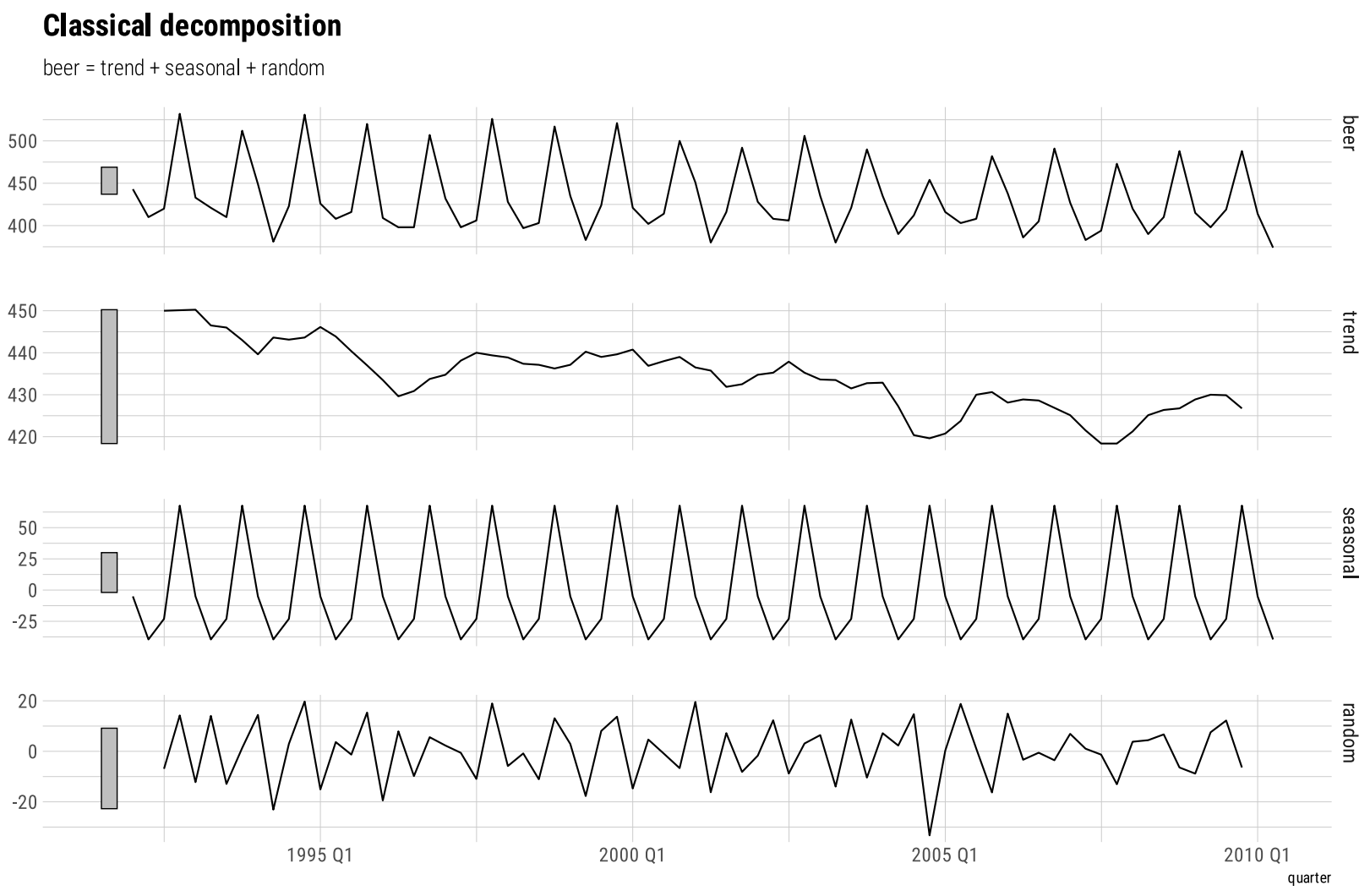


Source: Hyndman and Athanasopoulos (2021).

STL decomposition



STL decomposition



Further decomposition methods

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Time series **decomposition** methods are extensively used in statistical *offices* around the world.

Nowadays, the most common one is the `X-13-ARIMA-SEATS` method.

`U.S. Bureau of Labor Statistics website`

Next time: Time series features