

Statistical methods and models for complex data

Discussion on Rob Hyndman

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The framework

- One of the fundamental problems in time series analysis is how to handle seasonality.
- The seasonal ARIMA model and the exponential smoothing technique are classical approaches that take into account seasonality, but are not adequate for high-frequency and complex time series.
- However, many time series data from the real-world applications are affected by multiple seasonality possibly interlacing together. Also the superposition, and possibly interaction, of multiple periodic pattern contribute to the complexity of the seasonal pattern.

The framework

Other features that contribute to the complexity of seasonality are:

- periodic spikes;
- calendar effects
- seasonal period of the annual and monthly cycles neither constant nor integer;
- missing data
- outliers

The work of Rob Hyndman about seasonal-trend decomposition falls within this framework and his contributions may be well considered as the state-of-the art for this topic.

Related literature

1. Proietti T. and Pedregal D.J. (2021) Seasonality in high Frequency Time Series, CEIS Tor Vergata Research paper series, Vol. 19, Issue 2, No. 508 – March 2021, <http://ssrn.com/abstract=3802611>
2. Phumchusri, N., Ungtrakul, P. Hotel daily demand forecasting for high-frequency and complex seasonality data: a case study in Thailand. Journal of Revenue and Pricing Management, 19, 8–25
3. Xie T. and Ding J. (2020) Forecasting with Multiple Seasonality, 2020 IEEE International Conference on Big Data (Big Data), <https://ieeexplore.ieee.org/document/9378072>

Some curiosities

1. Heteroskedasticity in the remainder series
2. Is it possible to adapt these methods also to intermittent time series with a lot of zeros?
3. Forecasting