

**De Livera, Alysha M.; Hyndman, Rob J.; Snyder, Ralph D.**

**Forecasting time series with complex seasonal patterns using exponential smoothing.** (English) [Zbl 1234.62123](#)

*J. Am. Stat. Assoc.* 106, No. 496, 1513-1527 (2011).

Summary: An innovations state space modeling framework is introduced for forecasting complex seasonal time series such as those with multiple seasonal periods, high-frequency seasonality, non-integer seasonality, and dual-calendar effects. The new framework incorporates *G.E.P. Box* and *D.R. Cox transformations* [*J. R. Stat. Soc., Ser B* 26, 211–243 (1964; [Zbl 0156.40104](#))], Fourier representations with time varying coefficients, and ARMA error correction. Likelihood evaluation and analytical expressions for point forecasts and interval predictions under the assumption of Gaussian errors are derived, leading to a simple, comprehensive approach to forecasting complex seasonal time series. A key feature of the framework is that it relies on a new method that greatly reduces the computational burden in the maximum likelihood estimation. The modeling framework is useful for a broad range of applications, its versatility being illustrated in three empirical studies. In addition, the proposed trigonometric formulation is presented as a means of decomposing complex seasonal time series, and it is shown that this decomposition leads to the identification and extraction of seasonal components which are otherwise not apparent in the time series plot itself.

**MSC:**

[62M20](#) Inference from stochastic processes and prediction

[62M10](#) Time series, auto-correlation, regression, etc. in statistics (GARCH)

[65C60](#) Computational problems in statistics (MSC2010)

Cited in **15** Documents

**Keywords:**

Fourier series; prediction intervals; seasonality; state space models; time series decomposition

**Software:**

AS 197; expsmooth; SparseM; Forecast; AS 154; forecast

**Full Text:** [DOI](#)