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A comparison of univariate time series methods for forecasting intraday arrivals at a call center. (English) Zbl 1232.90214

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Summary: Predictions of call center arrivals are a key input to staff scheduling models. It is, therefore, surprising that simplistic forecasting methods dominate practice, and that the research literature on forecasting arrivals is so small. In this paper, we evaluate univariate time series methods for forecasting intraday arrivals for lead times from one half-hour ahead to two weeks ahead. We analyze five series of intraday arrivals for call centers operated by a retail bank in the United Kingdom. A notable feature of these series is the presence of both an intraweek and an intraday seasonal cycle. The methods considered include seasonal autoregressive integrated moving average (ARIMA) modeling; periodic autoregressive modeling; an extension of Holt-Winters exponential smoothing for the case of two seasonal cycles; robust exponential smoothing based on exponentially weighted least absolute deviations regression; and dynamic harmonic regression, which is a form of unobserved component state-space modeling. Our results indicate strong potential for the use of seasonal ARIMA modeling and the extension of Holt-Winters for predicting up to about two to three days ahead and that, for longer lead times, a simplistic historical average is difficult to beat. We find a similar ranking of methods for call center data from an Israeli bank.

MSC:

90B35	Deterministic scheduling theory in operations research
62M10	Time series, auto-correlation, regression, etc. in statistics (GARCH)
62P20	Applications of statistics to economics
90B90	Case-oriented studies in operations research

Keywords:

call center arrivals; time series; forecasting; univariate methods seasonality

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