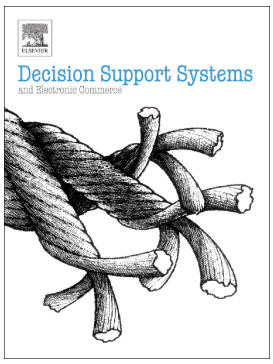

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Marco A. Villegas, Diego J. Pedregal

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Supply chain decision support systems based on a novel hierarchical forecasting approach

Marco A. Villegas, Diego J. Pedregal*

ETSI Industriales. University of Castilla-La Mancha. 13071 Ciudad Real, Spain.

Abstract

Time series forecasting plays an important role in many decision support systems, also in those related to the management of supply chains. Forecast accuracy is, therefore, essential to optimise the efficiency of any supply chain. One aspect that is often overlooked is the fact that sales of many products within an organization are assembled as complex hierarchies with different levels of aggregation. Very often forecasts are produced regardless of such structure, though forecasting accuracy may be improved by taking it into account. In this paper an approach for hierarchical time series forecasting based on State Space modelling is proposed. Previous developments provide solutions to the hierarchical forecasting problem by algebra manipulations based on forecasts produced by independent models for each time series involved in the hierarchy. The solutions produce optimal reconciled forecasts for each individual forecast horizon, but the link along time that is implied by the dynamics of the models is completely ignored. Therefore, the novel approach in this paper improves upon past research at least in two key points. Firstly, the algebra is already encoded in the State Space system and the Kalman Filter algorithm, giving an elegant and clean solution to the problem. Secondly, the State Space approach is optimal both across the hierarchy, as expected, but also along time, something missing in past developments. The approach is assessed by comparing its forecasting performance to the existing methods, through simulations and using real data of a Spanish grocery retailer.

Keywords: Forecasting, Hierarchical forecasting, Reconciliation, State Space, Decition Support System.

*Corresponding author. Tel.:+34 (9)26 295 430.

Email addresses: marco.villegas@uclm.es (Marco A. Villegas), diego.pedregal@uclm.es (Diego J. Pedregal)