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FORECASTING METHOD FOR NOISY DEMAND

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Abstract
Exponential smoothing methods are very commonly used for forecasting demand. Regarding the process of forecasting demand, the main approach towards the selection and optimisation of alternative methods relates to the minimisation of forecast error measures such as the Mean Square Error (MSE). With regard to Pegels' classification of usage of proper forecasting methods, HW methods (additive and multiplicative) are appropriate for demand with trend and seasonality which corresponds to B-2 and B-3. But HW methods are not accurate enough for demand with large noise that is often a property of real data. In this paper we present improved an HW method for demand with noise and we demonstrate that a reduction in forecast error (MSE) can be reached. From the results, we prove that the proposed method is more accurate than the existing ones and that it is the proper choice for forecasting noisy demand. Furthermore, we show that essential reduction of supply chain costs can be achieved if we use improved the HW method for joined optimization.

Keywords

Demand forecasting; Holt-Winters' method; Optimization; Inventory control

1. Introduction

Inventory related decisions are crucial for increasing efficiency and improving customer service level. Demand forecasting and stock control contribute equally towards such a decision making process.

Exponential smoothing methods are a class of methods that produce forecasts with simple formulae, taking into account the trend and seasonal effects of the data. These procedures are widely used as forecasting techniques in inventory management and sales forecasting. Some papers (Koehler *et al.,* 2001; Ord *et al.,* 1997) have stimulated renewed interest in the technique, placing exponential smoothing procedures on sound theoretical ground by identifying and examining the underlying statistical models. Moreover, while exponential smoothing methods yield reliable post-sample forecasts it would be worthwhile to develop procedures that would identify the most appropriate method (Makridakis *et al.*, 1998; Makridakis and Hibon, 2000; Ord, 2001).

Regarding Pegels' classification (Pegels, 1969) of the usage of proper forecasting methods, the HW method (Winters, 1960) is appropriate for demand with additive trend and additive seasonality (B-2) or additive trend and multiplicative seasonality (B-3). But HW methods are not accurate enough for demand with large noise, which is a property of real data. Also, HW methods are not appropriate for demand with multiplicative trend (C-1, C-2 and C-3; Makridakis *et al.,* 1998) and for intermittent demand.

The aim of the article is to expose the problem of demand forecasting when demand contains a large noise. In this paper we present an improved HW method and we show that a reduction in forecast error (MSE) can be achieved. When we minimize MSE with respect to the smoothing parameters, the new effect in the improved HW method is to smooth the seasonal factors by changing them less and consequently to overcome noisy demand. From the results obtained with simulated demand patterns and results for real data we prove that the proposed method is more efficient for noisy demand than ordinary HW methods. Furthermore, we show that an essential reduction of supply chain costs can be achieved if we use the improved HW method for joint