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On the performance of overlapping and non-overlapping temporal demand aggregation approaches

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Abstract

Temporal demand aggregation has been shown in the academic literature to be an intuitively appealing and effective approach to deal with demand uncertainty for fast moving and intermittent moving items. There are two different types of temporal aggregation: non-overlapping and overlapping. In the former case, the time series are divided into consecutive non-overlapping buckets of time where the length of the time bucket equals the aggregation level. The latter case is similar to a moving window technique where the window's size is equal to the aggregation level. At each period, the window is moved one step ahead, so the oldest observation is dropped and the newest is included. In a stock-control context, the aggregation level is generally set to equal the lead-time. In this paper, we analytically compare the statistical performance of the two approaches. By means of numerical and empirical investigations, we show that unless the demand history is short, there is a clear advantage of using overlapping blocks instead of the non-overlapping approach. It is also found that the margin of this advantage becomes greater for longer lead-times.

Keywords: Temporal aggregation, overlapping, non-overlapping, empirical investigation.

1. Introduction

Demand forecasting is the starting point for most planning and control organisational activities. Moreover, one of the most important challenges facing modern companies is demand uncertainty (Chen and Blue, 2010; Rostami-Tabar et al., 2013). High variability in demand for both fast moving and slow or intermittent moving items (items with a high proportion of zero observations) pose considerable difficulties in terms of forecasting and stock control (Syntetos and Boylan, 2001; Teunter et al., 2010; Strijbosch et al., 2011). Stock control is particularly challenging in military, aerospace, automotive and other sectors in which there is a volatile demand across a wide variety of stock keeping units (SKUs).

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