Forecasting and inventory control with compound Poisson demand using periodic demand data

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Abstract

Although compound Poisson demand is a popular choice in inventory control theory, there is hardly any discussion about obtaining its demand parameters from real data. The forecasting literature focuses on predicting period or lead time demand rather than the demand parameters, and forecasting software also uses period demands as input. We show that standard forecasting methods of period demand are not suitable for fitting a compound Poisson distribution, as they ignore the difference between individual demands and periodic totals. We propose an intuitive, consistent, closed-form method of moments estimator to bridge this gap. Different from well-known and popular demand forecasting techniques, we propose a method for estimating the parameters of a compound Poisson distribution, which are essential for stock control. The method estimates the arrival rate using the fraction of periods without demand, and combines this estimate with the average of period demand to estimate the mean demand size. We compare it to Croston's method and to a standard method of moments estimator in terms of estimation accuracy and inventory control performance. The new estimator is consistent and shows better small sample performance than the standard method of moments approach. Croston-based order levels are dramatically too high and overshoot the target fill rate. The proposed method leads to inventory reductions, avoids fill rate overshoots, and thus yields cost savings without adding complexity.