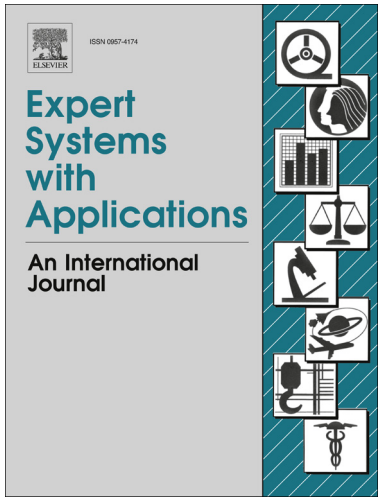

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SPC Forecasting System to Mitigate the Bullwhip Effect and Inventory Variance in Supply Chains

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Abstract

Demand signal processing contributes significantly to the bullwhip effect and inventory instability in supply chains. Most previous studies have been attempting to evaluate the impact of available traditional forecasting methods on the bullwhip effect. Recently, some researchers have employed SPC control charts for developing forecasting and inventory control systems that can regulate the reaction to short-run fluctuations in demand. This paper evaluates a SPC forecasting system denoted as SPC-FS that utilizes a control chart approach integrated with a set of simple decision rules to counteract the bullwhip effect whilst keeping a competitive inventory performance. The performance of SPC-FS is evaluated and compared with moving average and exponential smoothing in a four-echelon supply chain employs the order-up-to (OUT) inventory policy, through a simulation study. The results show that SPC-FS is superior to the other traditional forecasting methods in terms of bullwhip effect and inventory variance under different operational settings. The results confirm the previous researches that the moving average achieves a lower bullwhip effect than the exponential smoothing, and we further extend this conclusion to the inventory variance.

Keywords: Supply Chain, Forecasting, Order-Up-To, Bullwhip Effect, Inventory Variance, SPC, Control Chart, Simulation

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