INSTITUTE OF PSCM

TECHNISCHE UNIVERSITÄT DARMSTADT

Bachelor's Thesis

Does statistical forecasting accuracy lead to better inventory planning? An experimental study

Background

Forecasting accuracy plays a critical role in inventory planning, particularly in lot-sizing decisions. While forecast performance is traditionally evaluated using statistical error metrics such as Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and Bias, it is important to analyse whether optimizing forecasts based on these metrics leads to better inventory decisions.

Objective

In this thesis, the task is to conduct experiments and investigate how the choice of error metric used to assess forecasting methods influences the performance of lot-sizing decisions. In the experiment, first synthetic demand time series are generated. Then, forecasting methods are applied and evaluated using different error metrics. The resulting forecasts are then fed into lot-sizing models heuristically, and then the performance is assessed in terms of total cost and service level. Through this approach, the thesis seeks to determine whether forecasts that are statistically accurate also support superior inventory decisions.

References

Goltsos, Thanos E., Syntetos, Aris A., Glock, Christoph H., Ionnaou, George. (2022). "Inventory – forecasting: Mind the gap". European Journal of Operational Research 299 (2022) 397–419, https://doi.org/10.1016/j.ejor.2021.07.040

Shumway, Robert H.; Stoffer, David S. (2017). "Time Series Analysis and Its Applications". Springer Texts in Statistics. https://doi.org/10.1007/978-3-319-52452-8 . ISBN 978-3-319-52451-1. ISSN 1431-875X

Adhikari, Ratnadip & Agarwal, R.K. (2013). "An Introductory Study on Time Series Modeling and Forecasting", https://doi.org/10.48550/arXiv.1302.6613

Ho, Chrwan-jyh & Ireland, Tim C. (2012). "Mitigating forecast errors by lot-sizing rules in ERP-controlled manufacturing systems", International Journal of Production Research, 50:11, 3080-3094, https://doi.org/10.1080/00207543.2011.592156

Silver, Edward A., Pyke, David F. & Thomas, Douglas J. (2016). "Inventory and Production Management in Supply Chains", https://doi.org/10.1201/9781315374406

Requirements: Knowledge in stochastic time series forecasting methods, Python or R, good English language level.

Language: English

Orientation: Data analysis

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