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EXAMENSARBETE Explainable Demand Forecasting using Causalities and Machine Learning Models
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The Perfect Match? Demand Forecasting and Causality Analysis

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To what extent does the combination of demand forecasting algorithms together with causal models improve the forecasting accuracy? With this new proposed model, it is found that this approach could yield an increase in the forecasting accuracy given that the affecting signal is of significant impact.

Demand forecasting is a necessary discipline for businesses to try and predict all aspects of future demand for their products. This would give a business the ability to plan its production more accurately. This could e.g. help with decisions regarding the number of resources to buy for the coming period.

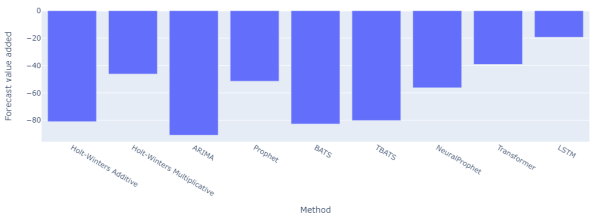
There exist several methods that are used to forecast demand sampled as time series. In this project, three of these methods are considered, with the main focus on decomposition models.

Decomposition models break the time series into a set of additive or multiplicative components. Examples of these could be a seasonal component and/or a long-term trend component.

Another topic of research is the analysis of causal relationships between different time series data. This would allow a forecaster to estimate the magnitude of influence one time series could have on another.

The proposed model is a combination of traditional demand forecasting models and causality analysis. It is also a decomposition model, where a causal component is added to a forecasting model. This is argued to, in some cases, increase the accuracy of a forecast.

Using a generated dataset where the causality signal is known, the proposed model shows a significant increase in forecasting accuracy. The figure shows a percentage decrease in the loss of the forecast over a testing period.



Percentage decreases in loss using the method

However, real-world scenarios are not as simple. The reader will also be shown demand forecasting done on real-world examples. Comparisons between the results before and after taking the causalities into account are presented, in both good and bad examples of chosen causality signals. An explanation of the performance of the neural network methods is also provided.