Forecast Model Development in Supply Chain Management

Executive summary
This project successfully developed statistical forecasting models for seasonal products at crop sciences. Forecasting accuracy is estimated to increase significantly, leading to inventory savings through better demand planning.

Client overview
Bayer is a global enterprise in health care, nutrition and high-tech materials, marketing over 5000 products in healthcare, crop science and material science worldwide, with over 300 companies or subsidiaries. The project was conducted with Bayer Business Services (BBS), the global competence centre of the Bayer Group for IT and business services, including consultancy for forecasting processes and methods and implementation of novel IT solutions in forecasting for procurement & logistics, human resources & management services, and finance & accounting.

Challenge overview
Planning and coordinating the supply chain in Bayer is vital to ensure timely availability of the products to consumers. Since Bayer offers research-intensive high-margin products, the supply chains of these products should ensure high availability to end customers and avoid costly stock out situations resulting in lost sales, margins or goodwill. Here, forecasting plays a key role as its accuracy drives inventory and hence supply chain efficiency and return on assets. Forecasting hundreds of products with different forms of seasonality and demand uncertainty in both quantity and time horizons require new forecast model development, which conventional approaches could not provide.

Implementation of the initiative
The Lancaster Centre for Forecasting, based at the Lancaster University Management School, has as its objective, developing new methods and approaches to forecasting focused on improved organisational practices and usage of excellent forecasting tools such as Intelligent Forecaster and SPSS. It has been particularly concerned with evaluating and improving company forecasting systems, funded by the EPSRC and a large number of companies. It has long standing relations to support Bayer group in Germany in improving the supply chain planning process. The project was conducted by a Lancaster University Masters student over a 16 week period.

The problem
The main theme in the supply chain in Bayer is responsiveness. Customers usually expect instant product availability. But the production cycle being a multi-step and complicated one, is time-consuming. So the gap between demand and supply is bridged via inventories. The nature of the demand being mostly uncertain and subject to frequent variations every year the question of how much inventory is needed is a tricky one. So the company may face potential business loss if the inventory cannot meet the demand. To cope with this demand uncertainty the production relies on a demand forecast and accordingly a safety stock is maintained. But the uncertainty in the seasonal demand pattern in terms of quantity sold and shift in demand months causes high monthly deviations between forecasted and actual values. So the project aims at overcoming the pitfalls of classical time series based approaches by considering uncertainty in quantity and timing. The outcome of the project results should be useful to improve Bayer’s current supply chain planning processes for products with seasonal demand.

Results and achievements
Results were presented to the client in the form of a detailed report. Key impacts include:

- Developing a new forecast approach that could handle uncertainties in both time and quantity simultaneously
- Assessment of 23 representative products and extension of analysis to > 250 products of different time series components.
- Recommendations for forecast accuracy key performance indicators (KPI)

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