



Forecasting Propulsion

By Ranga Katti

Introduction

Mercury Marine, a division of Brunswick Corporation, is one of the world's leading manufacturers of recreational marine propulsion systems. Recognized worldwide for its ability to foresee and fill the needs of its consumers, Mercury's product portfolio includes Mercury and Mariner outboard engines, MerCruiser sterndrives and inboard engines, Mercury Racing, MotorGuide trolling motors, Mercury and Teignbridge propellers, MotoTron electronic controls, Mercury inflatable boats, Mercury SmartCraft electronics and Mercury and Quicksilver parts and oils.

Purchase Decision

In 2006, Mercury Marine approved the purchase of Autobox 6.0 as a tool to enhance our ability to forecast. The decision to purchase was driven by my past experience as a Materials Manager at Omniquip-Extron Inc. While at Omniquip-Extron, we utilized Autobox to generate forecasts for after-market parts and were pleased with the results. Shortly after assuming my role at Mercury Marine, I made a recommendation to management that dedicated forecasting software tools be purchased and implemented to improve forecast accuracy. We purchased Autobox and now use it to forecast US demand for many different types of outboard engines in the portfolio. We are expanding the forecasting process to include sterndrives and inboard products using this software.



Program Functionality

Demand planning is an initial step in Sales Inventory and Operations Planning (SIOP). It is a collaborative process that has four key steps with the first step to derive a baseline forecast using historical demand. We have been using Autobox since June 2006. The first twelve months of results yielded a 20 percentage point improvement in cross-sectional forecast accuracy at a product group level with a three month origin. We use Autobox 6.0 in an automatic mode for hundreds of SKUs on a monthly basis. The forecast generated from Autobox 6.0 is utilized as a building block to the final demand plan. We also use it for its ability to build a market model using causal variables for strategic planning. It provides real information extracted from the data concerning which variables are driving the dynamic market.

Baseline forecasts from Autobox are consistently accurate for many different forecast origins. The tool provides a good starting point to review with sales and marketing experts for any overrides based on market knowledge. In instances where market intelligence is not available, we can rely purely on the Autobox forecast.

Our products are manufactured in many different parts of the world with varying lead-times. Long range forecasts are important for planning purposes. Autobox has delivered reasonable long term forecasts to meet our needs. We approach forecasting reconciliation using a “top-down” method where Autobox can build a National Level model for an Industry forecast based on many macroeconomic causal variables. We force “top-down” forecast to SKU forecasts based on market share.

Improved Forecasting Accuracy

The Autobox software has provided us with better forecast accuracy compared with neural networks and other techniques like exponential smoothing. Additionally, Autobox doesn't use a pre-set list of models that it tries out on the data in a “fitting process.” Rather the software builds a model for the data to meet our unique product demand



fingerprint. It also doesn't engage in other fitting approaches like withholding the last 10 observations to determine the best model (I refer to that flawed technique as "the tail wagging the dog.") In my view, who is to say that perfecting a model for those last 10 observations is a good idea? Or why not 9 or 16 observations which could generate a totally different forecast? Consequently, I am comfortable with the techniques used by Autobox to generate forecasts, as experience shows them to be reliable.

Autobox is used in a batch mode to generate hundreds of SKU level forecasts. The batch processor reads in a text file with header information on the series (i.e. series name, periodicity, number of observations, period begin date, causal variables etc.). AFS worked with us on modifications to the software so it could create the necessary input files from our Excel demand history file.

Our historical data from Excel file is converted to a text file which is then loaded into Autobox. When Autobox forecasting is complete it creates a single file with all of the forecasts. The data is then imported back into Excel to interface with our supply chain system. With five years of monthly history for about 200 SKUs, it takes about 20 minutes to generate SKU level forecasts. The installation is very simple, easy and the output is reliable.

We use many of the built-in features of the product like automatically accommodating the effect of the outliers, seasonal pulses, mean level shifts, seasonality, and local time trends. The software allows us to bring in and utilize trading days, monthly effects, accounting week aggregation schemes like 4/4/5 or other user specified events, such as promotions. As an example, we use an accounting aggregation scheme where months follow a 4/4/5 week pattern and a causal variable is generated in a text file for the historical and future values to reflect our accounting periods. Autobox will consider using the causal variable so that the model and the subsequent forecast will respond to the



quarter end spike in demand. We use the 4/4/5 week pattern to model an additional week of selling in a five week month.

Another element of the system we are beginning to utilize is the “Early Warning System” report. This report identifies which SKU’s latest observation is considered unusual so as to identify SKU’s with exceptional activity. This will allow us to manage exceptions rather than trying to manage every single forecasted item.

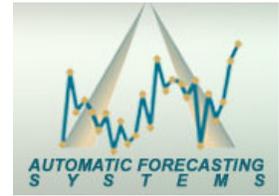
Traditional regression models do not correctly identify the lag/lead structure for our causal variables, but now with Autobox, all of the models are built for us using “transfer function” modeling with such precision it is allowing us to better understand which variables are driving our market.

Installation

The software is a PC based product but is also available on UNIX systems. It is not available through a browser. We downloaded the software from an AFS website and received an email with license files that were loaded to an IBM T42 Thinkpad running at 1.7GHz with 512 MB of RAM and a 30 GB hard drive. We use the Windows XP operating system. The Installation process was easy with no issues.

Documentation and Training

Training is not part of the software purchase, but personal one-on-one training or on-site training can be purchased. We did get a day of training as we wanted to tap into the experiences AFS has as consultants working with different companies. They reviewed our data and recommended ways for including causals to construct data and our models to match our business environment.



Documentation includes computer based tutorials. The tutorials show how to read in data and get started. It also walks you through how to have Autobox create various casual variables (i.e. holidays) for use in modeling along with interpreting the reports that are generated. It shows how to modify default conditions if you need to customize Autobox for your needs. It has an extensive discussion on time series methods which provides background on how Autobox was approaching its modeling and the understanding of the different types of models.

Overall the User's guide provides a clear description with all screens and options described in detail. There are some discussions for advanced options but having a good understanding of statistics would be beneficial. The documentation is contained in a MS Word/PDF file which is part of the installation package and is searchable.

Whenever we had questions, we found the technical support to be excellent. We experienced fast, clear and concise responses. This enabled us to receive the maximum benefit from the software in the shortest amount of time.

Ease of Use

After going through the documentation and a one day training session with the vendor it was very easy to grasp the various tools available within Autobox. AFS also offers an interactive version of Autobox to create one forecast at a time (vs. batch). The interface for the interactive version is a simple Windows based menu system which is easy to navigate and intuitive to use. The output reports are opened in a browser. We can adjust the forecasts simply by dragging and dropping a data point up or down to a desired level. Output files are automatically updated. There are many features that are intuitive and easy to utilize.



Customization

AFS was flexible and supportive of our needs. We were able to tweak many, options in Autobox which means we were able to override some of its heuristics. This feature is strength of the program but does not come without risk. We can turn on and off a variety of options, but beyond that we can leave options on and modify single attributes such as confidence limits or the number of interventions or the number of periods before a level shift is detected. It wasn't necessary for our application, but it's nice to know that if we have a dataset that is challenging Autobox, we can create an override. The inherent risk is managing which attributes are turned on or off and why it was done. It is essential to review the criteria and determine the assumptions remain valid.

Additionally, Autobox does allow us to manually build models through all standard modeling stages Identification, Estimation and Forecasting should we need to go that route in the future.

Best Features:

To sum it up in one word: *Accuracy*. We find that Autobox forecasting system provides an accurate forecast for SIOP planning time and time again. This is important in helping us to work as efficiently as possible. We also like the fact that it is relatively easy for a novice who just wants to create a forecast based on historical demand. Autobox has many built-in features to detect patterns and its ability to add casual variables (including modeling holiday impact on sales).

Shortcomings:

One shortcoming we have encountered is that if you have only one series to forecast, the modeling with causal variables is very simple and quick. However, when you have to model the same causal variables on hundreds of SKUs, it is a very time consuming process. This is one place where speed is essential. Primarily this is due to the desk top platform on which we chose to run the software. With the growing number of products



and SKU's it will take a longer time to process. To address this, we are considering moving the application to a UNIX server. As we expand the use of this software, it is essential to weigh desk top ease of use vs. the speed which can be realized on a larger UNIX server.

Summary

In the overall assessment of the features and functionality of Autobox software, we are satisfied with the results. It is simple, fast and accurate. The software has a nice reporting feature which explains how the final forecast is generated. Final results can also be compared along with fit and residuals using charts. We also like the "What-If" analysis for causal modeling. It provides the ability to create various strategy scenarios when the future values of the causal variables are changed. Autobox is an excellent fit and has helped to solve many of our forecasting issues. Because of the results we are implementing a similar demand planning process across other divisions and product lines and will leverage the same or similar forecasting technology.

Bio

Mr. Katti is the Director of Supply Chain Intelligence for Mercury Marine, a division of Brunswick Corporation. His 17 years of business experience includes 8 years in supply chain management. He holds Master of Science degree in Mechanical Engineering from the University of Oklahoma and a Master of Business degree from Marquette University.