ForecastPRO

TRENDS

Tips, Techniques, Information and Insight for Forecasters

Welcome
Welcome to *Trends*, the e-newsletter from Business Forecast Systems. *Trends* puts more than two decades worth of forecasting knowledge, experience and expertise at your fingertips every other month. Watch this space for tips & techniques, information & insight, observations & opinions and more. Thanks for reading!

Forecasting 101: *The Anatomy of a Forecast*

When you use a statistical model to generate a 12-month forecast, you get more than just twelve numbers. You also get a great deal of information about how the forecast was generated, the model's fit to the historic data and different measures of expected forecast accuracy. This is the first in a series of articles designed to help de-mystify statistical forecasting, explaining what statistical forecasting represents and how to use it to improve your forecasting process. This month, we dissect and catalogue the different components of a statistical forecast.

Read more…

Case Study: Brooks Sports

Brooks Sports designs and develops high-performance running footwear, apparel and accessories. The company has successfully transitioned from a forecasting process based entirely on the judgment of the sales team to a collaborative process which includes statistical forecasting as well as input from all functional areas of the organization. As a result, forecast accuracy has improved dramatically.

Read more…

In Search of "Forecastability"

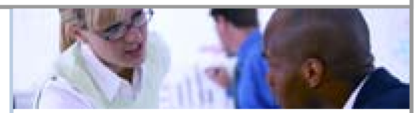
Companies often struggle to answer the question "what is an acceptable level of forecast accuracy?" The search for a realistic answer can create angst due to the myriad of benchmarking data available coupled with the lack of information regarding the data collection procedures employed and the specific formulas used to calculate the results. At the most recent Forecasting Summit conference, Professor Ken Kahn of the University of Tennessee proposed a framework which allows forecasters to assess the "forecastability" of their data and determine what level of forecast accuracy can realistically be achieved.

Read more…

Forecast Pro Tips and Tricks

When and how should you override the expert selection forecast?

Forecast Pro provides an expert selection algorithm whereby the program automatically analyzes your data, selects an appropriate forecasting technique and generates the forecasts. In most cases, expert selection works quite well. In fact, when asked in a recent survey, 43% of Forecast Pro users replied that they use expert selection "always" and 44% replied that they rely on it "most of the



March 2006

Calendar of Events

Forecast Pro Training
Product training workshops provide you with a better understanding of how to use Forecast Pro most effectively.

Forecast Pro Training (two days)
April 3-4, 2006
Boston, Massachusetts

Forecast Pro Training (two days)
June 26-27, 2006
Boston, Massachusetts

Forecast Pro Training (two days)
June 8-9, 2006
Brussels, Belgium

Post-Forecasting Summit Forecast Pro Training (one-day)
September 28, 2006
Boston, Massachusetts

Forecasting Seminar
This comprehensive course covers all aspects of business forecasting.

Forecasting Seminar
May 8-10, 2006
San Francisco, California

Forecasting Seminar
September 26-27, 2006
Boston, Massachusetts

Forecasting Summit
Forecasting Summit offers a unique combination of education, discussion,

time". In this article we will consider cases where expert selection may not be the best approach and discuss your options for generating alternative forecasts.

[Read more…]

Lighter Side

An unsophisticated forecaster uses statistics as a drunken man uses lampposts—for support rather than for illumination
- Andrew Lang

instruction and perspectives on business forecasting for practitioners.

Forecasting Summit 2006
September 25-27, 2006
Boston, Massachusetts

Forecast Pro Appearances
Look for Forecast Pro at the following events.

EPIC 2006, Exact Software NA Partner Conference
March 15-18, 2006
Phoenix, AZ

PMSA Conference
May 21-24, 2006
Hilton Head Island, SC

International Symposium on Forecasting
June 11-14, 2006
Santander, Spain

Forecasting Summit 2006
September 25-27, 2006
Boston, Massachusetts

APICS Conference
October 29-31, 2006
Orlando, Florida

Forecast Pro Partner Events
Events sponsored by Forecast Pro partners.

Innovation 2006, International Forecasting and Simulation Conference
June 19-21, 2006
Itu, SP, Brazil

Business Forecast Systems, Inc. | 68 Leonard St. | Belmont, MA 02478, USA

Forecasting 101: *The Anatomy of a Forecast*

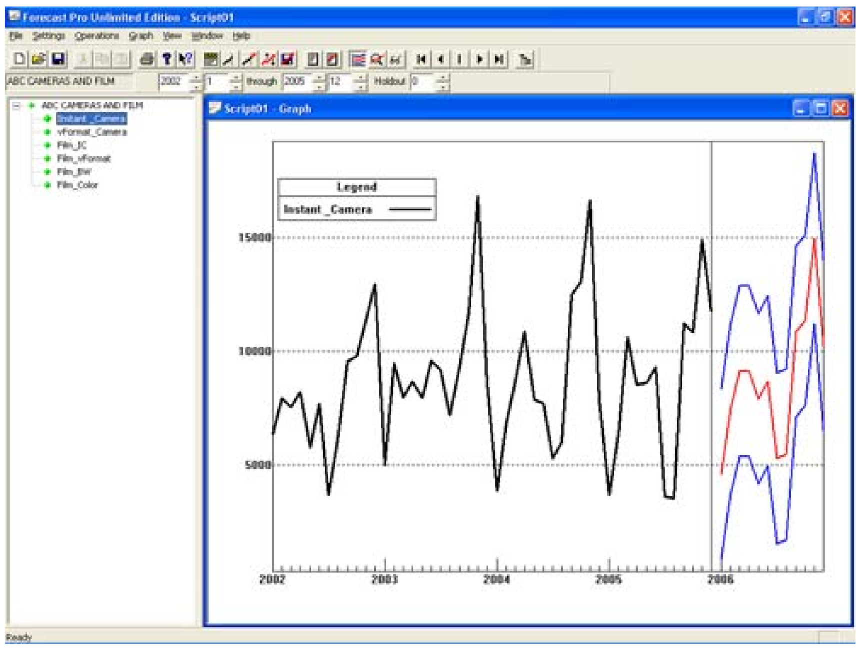


Figure 1

The graph above contains three components, the demand history, the point forecasts and the confidence limits. Let's consider each in turn.

The black line represents the historic demand for instant cameras on a monthly basis. This type of data set, consisting of equally-spaced observations in time, is referred to as a *time series*. A forecasting technique which generates a forecast based solely on an item's past demand history is referred to as a *time series method*. Typically, time series methods will capture structure such as current sales levels, trends and seasonal patterns, and extrapolate them forward.

The red line represents the *point forecasts* and the blue lines represent the associated *confidence limits*. The future is uncertain and a statistical forecasting model represents uncertainty as a *probability distribution*. The point forecast is the mean of the distribution and the confidence limits describe the spread of the distribution above and below the point forecast.

The point forecast can be thought of as the best estimate of the future. It is the point at which (according to the model) it is equally likely that the actual value will fall above or below. If we are trying to estimate expected revenue for our instant cameras, this is exactly what we want. We can take our point forecasts, and multiply by our average selling price to calculate our expected revenues.

On the other hand, suppose we want to know how many instant cameras we should stock. There are costs associated with carrying too much stock (e.g., warehousing, obsolescence, etc.) and there are costs associated with not carrying enough stock (e.g., lost sales, rush orders, etc.). This is where the confidence limits come into play. The confidence limits are calibrated to percentiles.

In the example above, the upper confidence limit is set to 97.5% and the lower confidence limit is set to 2.5%. This means that (according to the model) the probability of future sales being at or below the upper confidence limit is 97.5% and the probability of future sales being at or below the lower confidence limit is 2.5%. Thus, if our desire is to maintain a service level of 97.5% we would stock to the upper confidence limit. Of course, Forecast Pro allows you to set the percentiles for the confidence limits to whatever you desire.

Using the values of 2.5 and 97.5 for the lower and upper confidence limits is not uncommon. If you think about these settings for a minute, you will realize that the chances of the future sales falling in between these upper and lower bounds is 95%. Some people call this symmetric combination of upper and lower confidence limit settings the *95% confidence interval*.

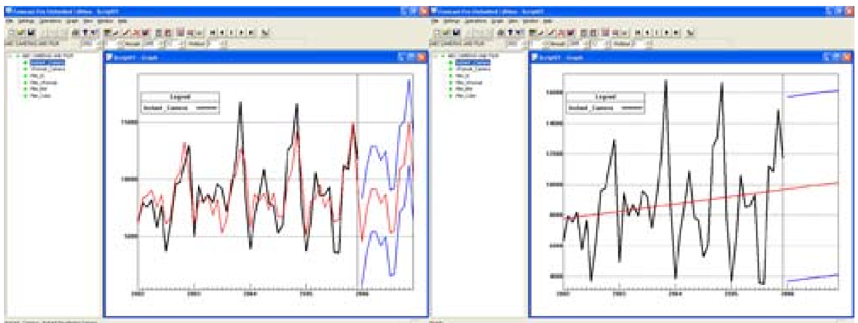


Figure 2

Consider the two graphs above. The graph on the left is the same as Figure 1 with the exception that we've added the *fitted values*. The fitted values show how the forecasting model "tracks" the history and can provide insight into how well the model captures the structure in the data.

Consider the graph on the right. Here we are using a best fit line to forecast the instant camera sales. As you may recall from your childhood schooling, the equation for a straight line is $Y = mX + b$, where m is the slope of the line, X is time and b is the intercept. Once we have selected m and b, this equation can be used not only to generate the forecasts, but also to fit the historical data. The graph on the left uses an exponential smoothing model to generate the fitted values and forecasts. Although the equations for the exponential smoothing model are more complex than for a straight line, the calculation of the fitted values and forecasts are performed in a similar fashion.

When we ask ourselves which of the two forecasting models depicted in Figure 2 is likely to forecast sales of instant cameras more accurately, the answer is clearly the exponential smoothing model. Why? Because it fits the historic data better.

In addition to examining the fitted values graphically, you can also calculate statistics to measure how closely they track the historic data. These *within-sample* statistics will be the subject of this column in the next issue of *Trends*.

Collaborative Forecasting Running Smoothly at Brooks Sports

Profile

Brooks Sports designs and develops high-performance running footwear, apparel and accessories which are sold in 80 countries worldwide. In 2001, when the company shifted from a broad product line to focus on high-performance products targeted at serious runners, it was clear that the forecasting process needed to change to support the strategic direction of the company. The existing forecasting process, based entirely on the judgment of the sales team, was limiting the company's ability to grow.

Challenges

The strategy shift created a number of forecasting challenges for Brooks including:

- *Inconsistent style growth*: the new line of products experience growth rates anywhere from 0 to 50 percent annually.
- *Long production planning horizon coupled with short product life*: production and capacity decisions are typically made 18 months before a style is launched, average lead time for a style is 6 months and the product life of Brooks' styles range from 6 to 24 months. This means that planners must sometimes set the entire demand plan for a style prior to ever receiving a customer order, underscoring the importance of accurate forecasts.
- *Increasing "at-once" orders*: "at once" orders, which are placed for immediate shipment, historically accounted for less than 20 percent of total sales. Since 2001, however, "at once" orders have increased to nearly 50 percent of total sales.
- *Evolving size curves*: with its new focus on serious runners, the standard footwear size curve would not adequately reflect distribution of sales by sizes.
- *No exposure to retail sell-through*: the high-performance products are sold primarily through independent specialty stores who don't have the capability to share sales data with vendors.

Solution

With a corporate mandate from senior management emphasizing the importance of creating accurate and timely forecasts, Brooks completely revamped its forecasting process. An independent forecasting group, reporting directly to the COO and CFO, was established to coordinate input from various groups—sales, marketing, product development and production—and to remove bias from the forecasting process.

The forecasting group established a collaborative forecasting process with three primary steps:

Step 1: Produce monthly statistical forecasts at the SKU level to capture level, trend, seasonality and the impact of events based on historical data. Brooks chose Forecast Pro to create these forecasts due to a number of features available in the software:

- Ability to create accurate forecasts
- Flexibility to choose forecast models or let software automatically select models
- Capability to model events (particularly important for predicting spikes in demand with new product launches)
- Support for multiple-level models to produce consistent forecasts at all levels of aggregation
- Powerful override facility to enable collaborative forecasting

“Forecast Pro has been a great solution for Brooks,” says Tom Ross, Financial Analyst. “Implementing Forecast Pro’s event modeling is very simple, which is an essential feature for us because of our moving product launches. We also use event models to address the challenge of forecasting events that don’t occur on a regular basis—such as races—which can have a dramatic impact on the sales of specific products. Another powerful feature of Forecast Pro is the ability to forecast a product hierarchy. This helps us to serve our multiple constituents within Brooks—we review higher-level forecasts with management and easily generate detailed forecasts at the SKU level for demand planning.”

Step 2: On a quarterly basis, get sales management and sales reps to forecast sales for a 12-month horizon, focusing on major accounts. This input is gathered via the Web and then aggregated by the forecasting group.

Step 3: Compare the statistical and judgmental forecasts, and make adjustments to create the final monthly forecast. Ninety percent of the final forecasts are the same as the statistical forecasts—changes are most commonly made to the forecasts for new styles where the sales organization has important knowledge to add. These final forecasts are then automatically fed into Brooks’ ERP system.

“Forecast Pro allows us to easily apply judgmental overrides, which is critical for us,” notes Ross. “We now can systematically track changes, giving us a better understanding of our forecasting performance.”

Results

The commitment to forecasting has paid off at Brooks. Forecast accuracy has improved on average by 40 percent, unfulfilled demand has been lowered from approximately 20 percent to less than 5 percent, and closeouts have been reduced by more than 60 percent. The improved forecasting has also helped to smooth out production, resulting in lowered costs and better margins.

Forecasting Summit 2006

September 25-27, 2006
The Seaport Hotel
Boston, Massachusetts, USA

- Home
- Conference Program
- Registration
- Pre-Conference Workshops
- FAQ's
- Visiting Boston
- Past & Future Conferences
- Get Conference Updates

In Search of "Forecastability"

Companies often struggle to answer the question "what is an acceptable level of forecast accuracy?" The search for a realistic answer can create angst due to the myriad of benchmarking data available coupled with the lack of information regarding the data collection procedures employed and the specific formulas used to calculate the results. Even if agreeable benchmarking statistics can be determined, company managers have a tendency to discount these data because they are not considered representative of business and channel characteristics within their respective industries.

In the search for appropriate benchmark statistics for forecast accuracy, it is prescribed that companies undertake an internal benchmarking effort. Such an analysis of company data can provide valuable insights for establishing an acceptable level of forecast accuracy that are not likely to be gained by using external forecast accuracy benchmarks. Moreover, it is hard to argue with internal benchmarks because they are based on actual historical company data. Analysis of company data also offers opportunities toward developing an understanding of product and customer demand patterns that can provide the basis for customer segmentation based on the value of the each segment to the firm and the apparent stability of that product/customer data.

A protocol which utilizes a decomposition approach for internal benchmarking was proposed during the February 2006 Forecasting Summit. This decomposition approach comprises the teasing out of seasonality, trend and level components, thereby leaving only noise. Assessing such noise, an approximation of stability for individual products/customers, is calculated by way of coefficient of variation (CV) and linked to an estimation of mean absolute percent error (MAPE). Data analyses would begin with examination of whether data is seasonal and/or untrended, which can be done in a spreadsheet format, following which the data would then be de-seasonalized and untrended accordingly. The remaining data stream would comprise level and noise components. Calculating the standard deviation and comparing it to the average of the level data stream provides the Coefficient of Variation (CV) and offers an approximate measure of stability; a CV approaching zero suggests a more stable data set. By employing this methodology, an analyst can categorize product/customer data in regards to stability, recognizing that those more stable data streams should be more forecastable than those less stable.

While not a panacea, this approach can help managers to better understand their data and segment it more appropriately in the course of applying forecasting techniques and planning resources to manage each data time series.

On a broader note, forecastability should be viewed as more than just forecast accuracy. Issues concerning cost and margin per product should be included alongside discussions about forecast accuracy. Forecast accuracy also should be viewed as an intermediate statistic in the course of attaining an overriding business objective. It is therefore critical to think about what the company wants to achieve as its ultimate objective for the forecasting endeavor. Goals such as customer service, customer satisfaction, and profitability are likely objectives in support of Sales and Operations Planning. And in supporting the Sales and Operations Planning process, forecasting plays a truly strategic role as a distinct process that underlies company decision-making.

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For more on this topic, you may view the presentation given by Dr. Kahn at the Forecasting Summit conference.

About the Author

Dr. Kenneth B. Kahn is an Associate Professor of Marketing in the Department of Marketing and Logistics at the University of Tennessee. His teaching and research interests include product development, product management, demand forecasting and interdepartmental integration. Dr. Kahn is co-founding Director of the University of Tennessee's Sales Forecasting Management Forum. He is the author of the upcoming book, New Product Forecasting: An Applied Approach (M. E. Sharpe, 2006). Dr. Kahn is a frequent contributor at the Forecasting Summit.

Forecast Pro Tips and Tricks

When and how should you override the Expert Selection forecast?

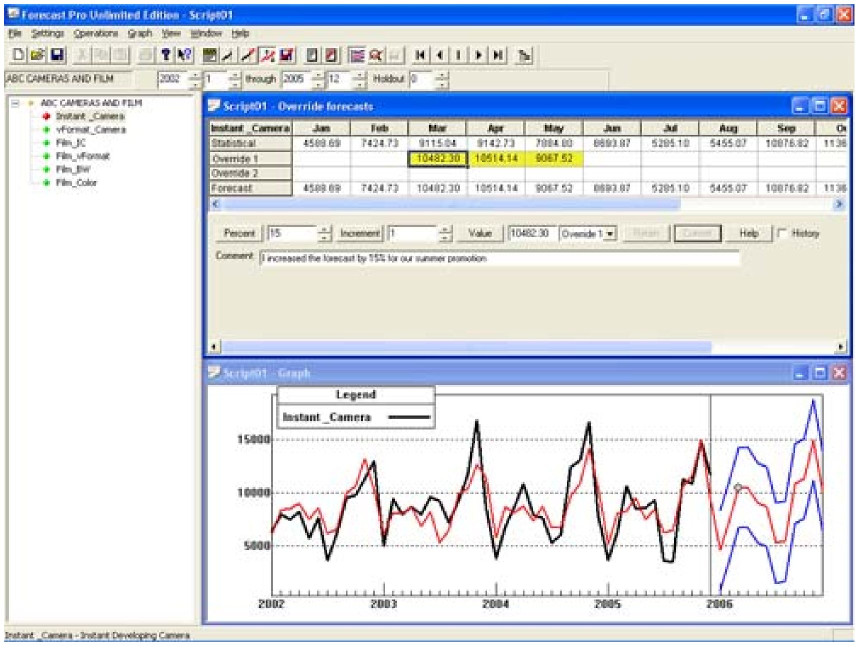
In most cases Expert Selection works quite well and a majority of Forecast Pro users rely upon it. However, you must keep in mind that Expert Selection views your data as a series of numbers and takes a purely statistical approach to generating the forecasts. At times your knowledge of your products and future events may lead you to either adjust the Expert Selection forecast judgmentally or reject it completely and use an alternative forecasting method. Let's examine several cases where overriding the Expert Selection forecast should be considered.

1. When a non-time series method is called for.

Expert selection only considers *time series methods*. A time series method is a forecasting technique which generates forecasts based solely on an item's past demand history. Time series methods considered in Expert Selection mode include different forms of exponential smoothing, Box-Jenkins models, the Croston's model, discrete data models and moving averages. Methods not considered in Expert Selection mode include event models (which provide adjustments for promotions, business interruptions or other irregular occurrences), dynamic regression models (which allow you to incorporate explanatory variables), topdown approaches (which allow you to use aggregate-level forecasts to improve lower level forecasts) and curve fitting. When one of these methods is called for, Expert Selection should not be used.

2. When you feel that Expert Selection has selected the wrong forecasting method.

There may be times when Expert Selection selects a forecasting method that you feel is inappropriate. For instance, it may elect to use a non-seasonal model to forecast data that you know are seasonal. In these cases you will want to override the Expert Selection forecasting method and use a technique you feel to be better suited. Often times electing to use a specific form of exponential smoothing to reflect the desired trend and seasonal pattern is a good solution. These cases tend to occur more frequently when working with short data sets where the ability to test the data statistically is limited--so keep a close eye on Expert Selection when forecasting short data sets.



3. When your knowledge of future events is not captured in the statistical model.

At times you may have knowledge of future events that are not captured in the forecasting model. For instance, there may be a planned promotion, a competitor entering the market or a pre-booked one-time sale. In these instances, you'll want to treat the Expert Selection forecast as a baseline and judgmentally adjust the forecast to reflect the future event. Forecast Pro provides a convenient forecast adjustment facility to allow you to accomplish this.

In the next issue of *Trends* we will be discussing how the length of the historic data impacts forecast model selection.
