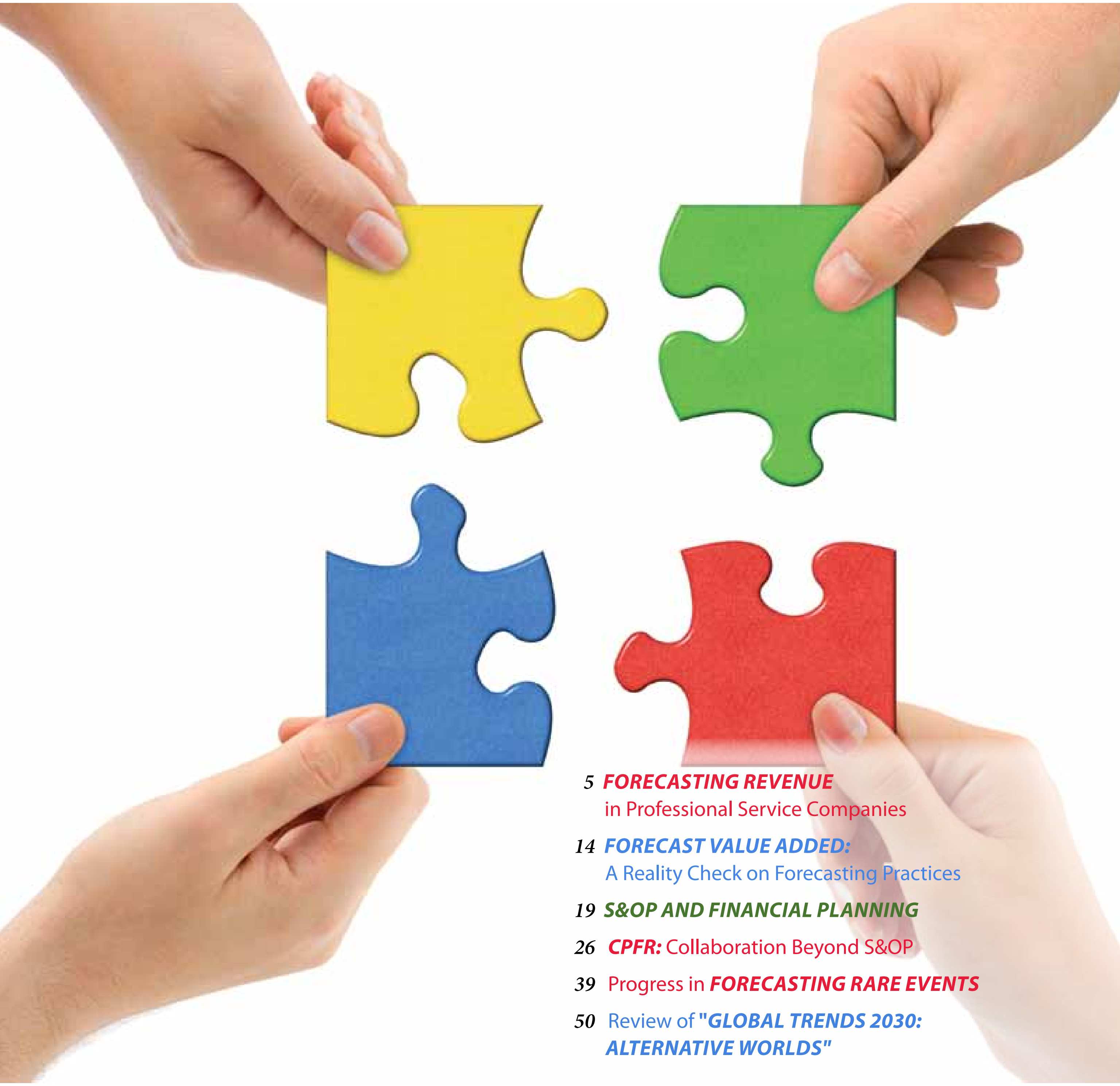
Spring 2013

Issue 29

FORESIGHT

THE INTERNATIONAL JOURNAL OF APPLIED FORECASTING



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FVA: A Reality Check on Forecasting Practices

Mike Gilliland

PREVIEW *Mike Gilliland has long advocated the use of a* forecast value added *(FVA) metric to assess the effectiveness of managerial adjustments to statistical forecasts as well as other individual phases of the forecasting process. FVA has caught on in many companies as an aid in eliminating unnecessary or even harmful actions – something for all businesses to think about.*

INTRODUCTION

We all want our business practices to be effective, efficient, and certainly as waste-free as possible. No conscientious executive willingly squanders company resources on activities that have no benefit to customers or to the business's own bottom line. So when it comes to the practice of business forecasting, how do we know whether we are performing up to these standards?

A traditional forecasting performance metric, such as the MAPE, tells us the magnitude of our forecast error but little else. Knowing the MAPE of our forecasts does not tell us how efficient we were at achieving this level of error or how low an error would be reasonable to achieve. Nor does it tell us how our methods and processes perform compared to simpler alternatives. This is where *Forecast Value Added* (FVA) steps in.

FVA analysis turns attention away from the end result (forecast accuracy) to focus on the overall effectiveness of the forecasting process. As the FDA will test a new drug for its safety and efficacy, FVA evaluates each step of the forecasting process to determine its net contribution. If the process step (such as a sophisticated statistical model or an analyst override) makes the forecast better, then it is "adding value" and FVA is positive. But if the effect of the step is inconclusive (we can't discern whether it is improving the forecast) or if it is making the forecast worse, then we can rightly question whether this step should even exist.

This article presents the basic data requirements and calculations for FVA analysis, along with sample report formats. It also examines some implementations by industry practitioners.

CALCULATING FORECAST VALUE ADDED

Suppose we have this simple forecasting process:

Sales History

↓

Forecasting Model

↓

Statistical Forecast

↓

Management Override

↓

Final Forecast

In this common situation, historical sales information is read into forecasting software, where the history is modeled and the statistical forecast is generated. At that point, the forecast is reviewed and potentially adjusted, resulting in the "final forecast" that will be published and sent to downstream planning systems.

FVA is a measure of past performance. For each item being forecast, and for each time period in our history, we would need to gather:

- the Statistical Forecast
- the Final Forecast
- the Actual Value (e.g. actual sales)

If we have 100 items and have been forecasting them for the past 52 weeks, we would have 5,200 records in our data file, with the variables:

<ITEM WEEK STAT_FCST FINAL_FCST ACTUAL>

FVA is defined as:

The change in a forecasting performance metric that can be attributed to a particular step or participant in the forecasting process.

In this simple example there are two process steps: the software's generation of the statistical forecast and the management's override resulting in the final forecast. A more elaborate process may have additional steps, such as a consensus or collaboration, and an executive approval.

In FVA analysis there is also an implied initial step: generation of a naïve forecast. It is normal to use the random walk ("no change" model) to generate the naïve forecast. This is easy to reconstruct from the historical data and can be added to our data file as a new variable:

< ITEM WEEK NAÏVE_FCST STAT_FCST FINAL_FCST ACTUAL>

We compute FVA by comparing the performance of sequential steps in the forecasting process. Here, we would compute performance of the naïve, statistical, and final forecasts, and determine whether there was "value added" by these successive steps.

Key Points

- **FVA is the change in a forecasting performance metric that can be attributed to a particular step or participant in the forecasting process. The concept turns attention away from the end result (our forecast accuracy) to focus on the *overall effectiveness* of the forecasting process.**
- **We compute FVA by comparing the performance of sequential steps in the forecasting process. Positive FVA means the step was "adding value" by making the forecast better. Negative FVA means the step just made the forecast worse.**
- **FVA is being used by companies to identify process *waste*, those activities that are failing to improve the forecast. Resources performing those non-value-adding activities can be redirected to more productive activities or eliminated.**
- **In one company, salespeople were challenged to "beat the nerd in the corner" by adding value to the computer-generated forecasts. This reduced frivolous forecast adjustments that were being made simply because of the requirement to make changes.**

FVA doesn't care which traditional metric you are using to evaluate performance (although some flavor of MAPE is most common in industry). Results can be reported in the "stairstep" format shown below. Rows represent sequential process steps, the second column shows the MAPE (or whatever performance metric is being used) for each step, and the right columns show pairwise comparisons between steps:

Figure 1. Forecast Value Added "Stairstep" Report

Process Step	MAPE	FVA vs Naïve Fcst	FVA vs STAT Fcst
Naïve Forecast	50%		
Statistical Forecast	40%	10%	
Final Forecast	42%	8%	-2%

Note that a more elaborate process would have additional rows for the additional process steps and additional columns for the pairwise comparisons.

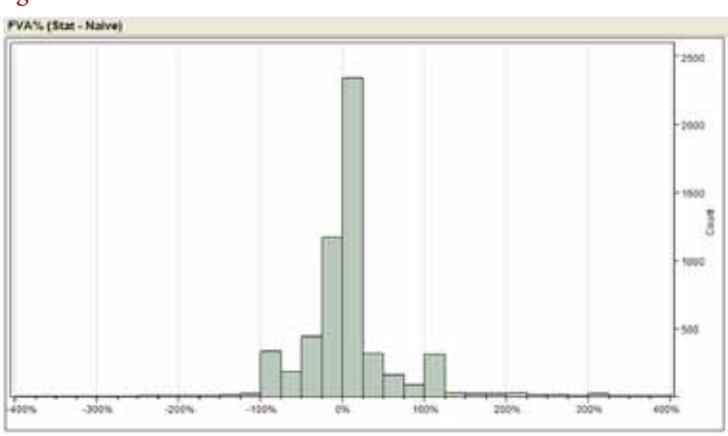
The stairstep report can be generated for each item being forecast, for item groupings, and for all items combined. Groupings are of interest when they have different demand patterns, use different forecasting processes, or are overseen by different forecast analysts. For example, a retailer might separate products with Everyday Low Pricing from those with High-Low (promotional) pricing to compare demand volatility, forecast accuracy, and FVA between the two groups.

Of course, over the thousands of items that may be forecast by a large organization, some of the observed FVA differences may be too small to be meaningful, or the observed difference may just be due to chance. One must be cautious in interpreting such a report and not jump to unwarranted conclusions or make rash process changes. Additional analysis can confirm that the observed difference is indeed "real" and not likely to be random.

HOW ORGANIZATIONS ARE USING FVA

Our objective is to generate forecasts that are as accurate and unbiased as we can reasonably expect (given the nature of what we are trying to forecast), and also to do this as efficiently as possible. We can't *completely* control the level of accuracy achieved (since accuracy is ultimately limited by the forecastability of the behavior being forecast), but we can control the processes used and the resources we invest into forecasting.

Figure 2. Statistical Forecast Value Added



Sales and Operations Planning thought leader Tom Wallace has called FVA "the lean-manufacturing approach applied to sales forecasting" (Wallace, 2011), and some organizations are using FVA in just this way: to identify process "waste." Activities that are failing to improve the forecast can be considered wasteful and resources committed to performing them can be redirected to more productive activities.

Practitioners have extended the FVA concept with new ways of analysis and reporting or have otherwise used FVA results to modify the way they do forecasting.

Newell Rubbermaid

Schubert and Rickard (2011) reported an analysis that found a positive 5% FVA in going from the naïve to the statistical forecast but a negative 2% FVA for judgmental overrides of the statistical forecasts. Realizing a limitation of the basic stairstep report – that important information may be buried in the "average FVA" reported for a group of items – they utilized histograms as in Figure 2 to show the distribution of FVA values across a product group.

Even though the statistical forecast was (on average) five percentage points more accurate than the naïve, for many items the statistical forecast did considerably worse, and these merited further attention. Likewise, the (not uncommon) finding that, on average, management overrides made the forecast worse provided opportunity for additional investigation and process tuning.

Tempur-Pedic

Eric Wilson (2010) oversaw a collaborative forecasting process wherein a baseline statistical forecast was manually updated with market intelligence, resulting in the final forecast. He used FVA analysis for visibility into the process and to identify areas for improvement.

With FVA, Wilson realized the best way to leverage the knowledge of salespeople was to appeal to their competitive nature. Instead of forcing them to adjust all statistical forecasts, he instead challenged them to "beat the nerd in the corner" by adding value to the nerd's computer-generated forecasts. This reduced frivolous forecast adjustments that were being made simply because of the requirement to make changes.

Amway

Mark Hahn (2011) used FVA in conjunction with analysis of forecastability to better understand and communicate what "good" performance is and what is realistic to achieve. He utilized monthly product-level reporting to determine the value added by analyst inputs and also identified instances where the statistical forecast was underperforming the naïve model.

Cisco

Fisher and Sanver (2011) reported on Cisco's use of FVA for accountability of the forecasting process and the people executing it. FVA was considered a simple and important metric for judging performance and appeared on the dashboards of Cisco's senior management. It showed the team where to put resources and where a naïve forecast suffices.

WHICH NAÏVE MODEL TO USE?

In forecasting literature, the classic naïve model is the random walk or "no change" model – our forecast for next period (and all future periods) is what we observed last period. In FVA analysis, the random walk can be the point of comparison for our forecasting process, the placebo against which we measure our process effectiveness.

The spirit of a naïve model is that it be something easily computed, with the minimal amount of effort and data manipulation, thus generating a forecast at virtually no cost, without requiring expensive computers or software or staffing. If our system and process cannot forecast any better than the naïve model on average, then why bother? Why not just stop doing what we are doing and use the naïve forecast?

The random walk may not be a suitable "default" model to use in situations where the existing forecasting process is not adding value. Suppose that forecasts are changing radically with each new period of actual values, producing instability in an organization's planning processes. For example, while a year ends with a strong week of 1,000 units sold, the naïve model would forecast 1,000 units per week through the next year, and the supply chain would have to gear up. However, if we only sell 100 units in week one of the new year, we would change our forecast to 100 units per week for the rest of the year, and gear the supply chain back down. This up and down could occur with each period of new actuals.

Supply-chain planners could not operate in an environment of such volatile forecasts and would end up tempering their actions around some "average" value they expect for the year. So rather than defaulting to a random walk when the forecasting process is not adding value, it may be better to default to another simple model which mitigates such up-and-down volatility (such as a moving average, seasonal random walk, or simple exponential smoothing). Just make sure this default model is performing better than the existing process and, hopefully, better than the random walk!

As a practical consideration, the default model should be included in the FVA stairstep report, so its performance can be monitored. In the unlikely event that it performs worse than a random walk, as long as it doesn't perform substantially worse, it has the advantage of providing stability to the downstream planning processes.

A REALITY CHECK ON FORECASTING PRACTICES

"Forecasting is a huge waste of management time."

We've heard this before – especially from management – but it doesn't mean that forecasting is pointless and irrelevant. It doesn't mean that forecasting isn't useful or necessary to run our organizations. And it doesn't mean that executives should neither care about their forecasting issues nor seek ways to improve them. It simply means that the amount of time, money, and human effort spent on forecasting is not commensurate with the amount of benefit achieved (the improvement in accuracy).

We spend far too much in organizational resources creating our forecasts, while almost invariably failing to achieve the level of accuracy desired. Instead of employing costly and heroic efforts to extract every last bit of accuracy possible, FVA analysis seeks to achieve a level of accuracy that is *as good as we can reasonably expect*, and to do so *as efficiently as possible*. FVA allows an organization to reduce the resources spent on forecasting and potentially achieve better forecasts – by eliminating process activities that are just making the forecast worse.

Mike Gilliland, author of *The Business Forecasting Deal* (2010), is a longtime business forecasting practitioner and currently Product Marketing Manager for SAS Forecasting software. He initiated the "BFD" blog (blogs.sas.com/content/forecasting) to help expose the seamy underbelly of the forecasting practice and to provide practical solutions to its most vexing problems. See *Foresight*'s review of his book in the Fall 2010 issue.

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Remember: FVA analysis may not make you the best forecaster you can be – but it *will* help you to avoid becoming the worst forecaster you might be!

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