

FEATURE STORY

Doug Stark
David Mould
Alec Schweikert



healthcare financial management association www.hfma.org

5 steps to creating a forecast

With the right process and tools, healthcare finance leaders don't need a PhD or a crystal ball to predict the future.

AT A GLANCE

By using forecasting techniques, healthcare financial managers can adjust the decisions that will help them achieve the organization's goals. The major steps that should be addressed in forecasting include:

- > Establishing the business need
- > Acquiring data
- > Building the forecasting model
- > Evaluating the results
- > Applying the forecast

A sea captain would not try to sail the Atlantic on a cloudy day without a navigational system. Likewise, a healthcare financial manager should always use a reliable forecasting system when evaluating his or her organization's performance. Simple average calculations or untested business targets that provide general direction aren't enough; financial managers need to be able to identify potential challenges, just as a navigation system would identify open-sea hazards. Yet forecasting is not an idea that should be dismissed out of fear of complex spreadsheets and mystical practices of statisticians and PhDs.

Just as ship captains today use powerful navigational systems to plot, monitor, and adjust their voyage, healthcare financial managers can leverage advanced forecasting techniques to better plan, manage, and adjust the decisions that will help them achieve their performance goals. Although an introduction to forecasting warrants a much larger discussion, this article outlines the major steps and considerations that a healthcare manager should address when embarking upon forecasting.

Step 1. Establish the Business Need

Healthcare financial managers need to clearly understand how their forecast will influence business planning and decisions within their organization. Without this important understanding, the resulting effort will very likely produce adverse results. For example, many business managers rely on monthly cash forecasts. These are used by collections managers for setting monthly cash collection goals, by finance to schedule capital expenditures for clinical equipment, and by staffing managers for their budgets.

Those are just a few examples; actually every employee walking through the halls of a hospital is a knowing or unknowing stakeholder in a forecast. Imagine if the cash forecast wasn't in synch with business expenses—the results on reserves could be disastrous. To establish the business need, these key questions should be answered:

- > What decisions will the forecast influence?
- > Who are the key stakeholders?
- > What metrics are needed and at what level of detail?

Web Exclusive!

For an example of how to apply the forecasting steps outlined in this article, read "Forecasting and Community Benefit: An Example," by Doug Stark, David Mould, and Alec Schweikert of MedeFinance. Access the document at www.hfma.org/hfm.

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- > How far forward should the forecast project in terms of years, months, weeks, or days?
- > How will accuracy be measured, and what is the acceptable level?
- > What is the impact of under- and overcasting?

The results of forecasting a metric, whether they include revenue, patient visits, or uninsured bad debt, are always needed to support many organizational decisions. To best answer the above questions, the healthcare financial manager needs to ensure that the forecasting efforts meet organizational needs.

Once these questions have been answered, it is important to identify the potential drivers of a forecast. For example, gross revenue is driven by a number of factors throughout the organization from clinical to financial to strategic. Furthermore, each driver can be grouped into internal factors and external (exogenous) factors.

Healthcare organizations can find internal factors like those shown for key hospital revenue drivers in the sidebar above quantified within their own data. As healthcare organizations adopt more sophisticated techniques for forecasting, they should advance their models to consider key market and strategic business influences like those shown in the sidebar below.

Step 2. Acquire Data

For each business driver and influencing factor, the typical forecasting effort should use at least two years, and ideally up to five years, of historical data. When forecasting efforts have short time horizons in small time periods, fewer data can be used. To collect the most accurate and robust data sets, all available data sources, such as multiple healthcare information systems (HIS), spreadsheets, small departmental databases, and/or an enterprise data warehouse, should be used. By sourcing from multiple areas, differences in organizational behavior can be balanced out to yield the best data set.

KEY REVENUE DRIVERS

- > Patient mix and growth
- > Physician mix
- > Service center mix
- > Contract reimbursement rates
- > Business office performance
- > Volume
- > Seasonal changes
- > Target markets
- > New equipment schedules
- > Utilization rates

All data should be drawn incrementally in their pure form from available data sources to build up the needed accuracy and completeness. To ensure the richest representation of historical events, the data should not be altered and quality issues should be addressed sooner in the process rather than later. A common challenge a hospital may face in forecasting is the practice of purging of aging trial balance data from an HIS after one or two years. This common practice makes accurate forecasting very difficult. Hospital financial managers need to review purging policies or acquire tools to ensure historical data are available for budgeting and planning.

Collecting exogenous data often requires involving third-party data sources. Several potential sources for external data exist in free public sources, such as census data, the Centers for Disease Control and Prevention, and the Centers for Medicare and Medicaid Services (CMS), as well as private information firms. Financial

KEY MARKET AND STRATEGIC BUSINESS INFLUENCES

- > Local competitive pricing
- > Inflation rate
- > Facility expansion plans
- > Local population growth
- > Payer market shares
- > Advertising/promotion spend
- > Natural disasters
- > Government policy shifts
- > Patient satisfaction surveys
- > Regional wellness indicators

managers need to find the optimal source that can provide reliable, high-quality data that can be incorporated into their data structures. In fact, incorporating third-party data can provide valuable benchmarks later in the analysis.

Once the data are collected, it is important to ensure they are clean. Cleaning data often requires more effort than developing the forecast. One of the most efficient ways to perform this process is to visualize the data in trend, distribution, and scatter graphs to find anomalies. This review should be conducted for each top-level metric and major subgrouping as well as all driving factors to help identify:

- > Missing values and gaps: Missing values can be caused by HIS purging policies, changes to business processes and practices, and switching patient access or billing systems. Gaps in valuable historical data can limit forecasting accuracy.
- > Outliers: These are business events that may skew a forecast, such as how Hurricane Katrina affected healthcare facilities in Louisiana and Mississippi. Rather than manually looking through all possible slices of data for outliers, it is best to identify and look for specific events that may be unique to an organization, coupled with tools that automatically search data to find outliers.

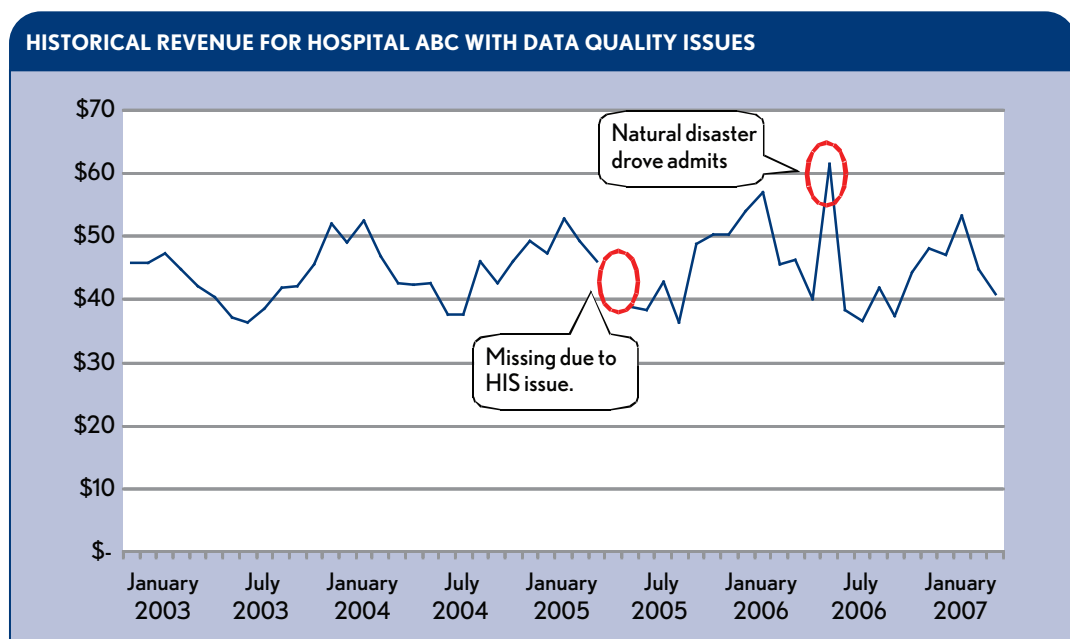
Examples of these potential issues are shown in the graph, below. Once found, there are many well-known methods for addressing missing data and outlying data points, including statistical methods such as nearest neighbor or forecasted value, or by adjusting the data manually to a known true outcome.

Step 3. Build the Model

Once the business needs, drivers, and influencing factors have been established with the associated historical data, a decision needs to be made on the type of forecasting model to use. The forecasting model is the technique or algorithm that determines the projections based on identified business drivers, influencing factors, and business constraints. There are three major categories of forecasting models: cause-and-effect, time series, and judgment.

Many more forecasting models are also available, and there is no overall best choice. In fact, forecasting models are often combined to produce the most accurate results for a given business need, and it may be necessary to consult with business and technical experts for advice when selecting the best model for a given situation.

In this example, a manager is trying to predict revenue at a single facility. First she must address missing information and a one-time event that would lower the accuracy of the forecast.



MAJOR CATEGORIES OF FORECASTING MODELS			
Model Category	Description	Usage	Examples
Cause-and-effect	Also known as causal model; assumes the factors that drive change will continue in the future. These factors are referred to as independent variables while the data to be forecast are referred to as the dependent variables. For example, changes in revenue are dependent on changes in payer mix and capacity.	Multiple factors and long-range forecasts such as revenue and patient volume	<ul style="list-style-type: none"> > Multivariate regression > Discriminant analysis > Decision trees > Factor analysis > Logarithmic regression
Time series	Assumes that variation in revenue that occurred in past time periods will continue to occur in the future. For time series models, the dependent variable is the forecasted metric, while the independent variable is time.	Short-range forecasts such as reimbursement rates	<ul style="list-style-type: none"> > Exponential smoothing > Decomposition > Box-Jenkins > Autoregressive Integrated Moving Average (ARIMA)
Judgement	Uses techniques such as surveys, focus groups, and expert opinions for their predictions	Little or no historical data available such as how a new equipment purchase will affect inpatient/outpatient volume for a DRG	<ul style="list-style-type: none"> > Delphi > Surveys > Project Evaluation and Review Technique (PERT)

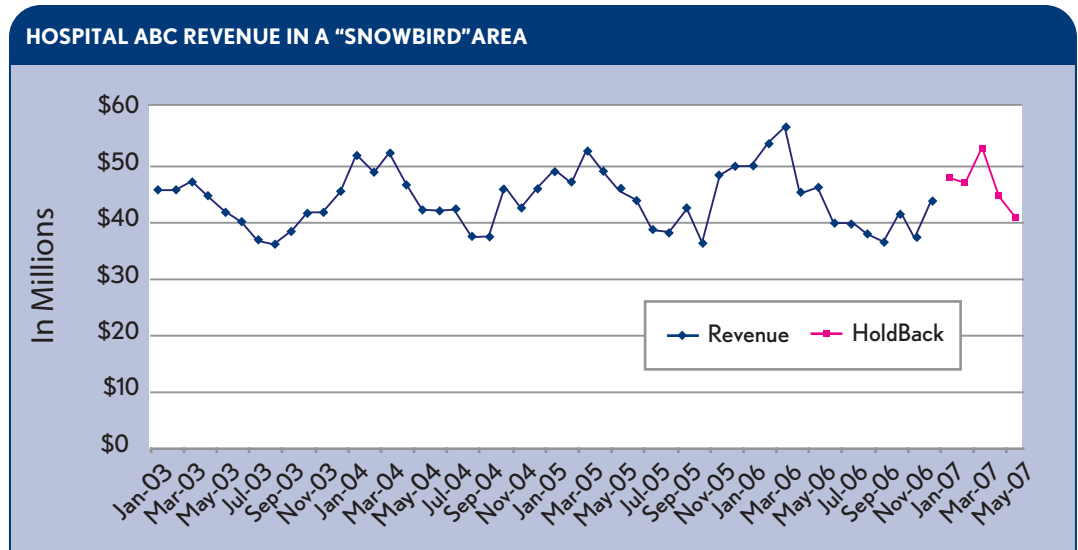
As an example, let's explore creating a hospital revenue forecast that has seasonal considerations. The graph at the top of page 104 depicts hospital revenue trending up and peaking at each year end. There are 48 months of historical data available, and the most recent five months of data have been selected to test and evaluate the model once it is built. This technique is referred to as *training and testing the model*.

An application of a cause-and-effect model that incorporates a seasonality and judgment factor is shown in the graph at the bottom of page 104. Seasonal variations can be attributable to a number of reasons, such as a hospital's being located near a ski resort during the ski season, or the "snowbird" effect, when a large population migrates south

during the winter months. Clinical factors often have seasonal factors, with the most obvious being flu season. Because the healthcare financial manager in this example knew there were seasonal trends, and ample historical data were available, the model was constructed to include these influences.

Judgment variables can also be used to account for infrequent events such as employee strikes, acquisition or construction of a new acute care center, construction of a new wing, or construction of a new hospital in the area. For example, a healthcare financial manager can use the opening of a physical therapy center at an acute care hospital in 2006 to predict the effect of opening a physical therapy center at a different facility in 2008.

This example shows the cyclical nature of revenue at a Florida hospital. The recent six months are 'held back' to test how accurate the forecast would be in predicting the winter spike and summer dip.



Step 4. Evaluate the Results

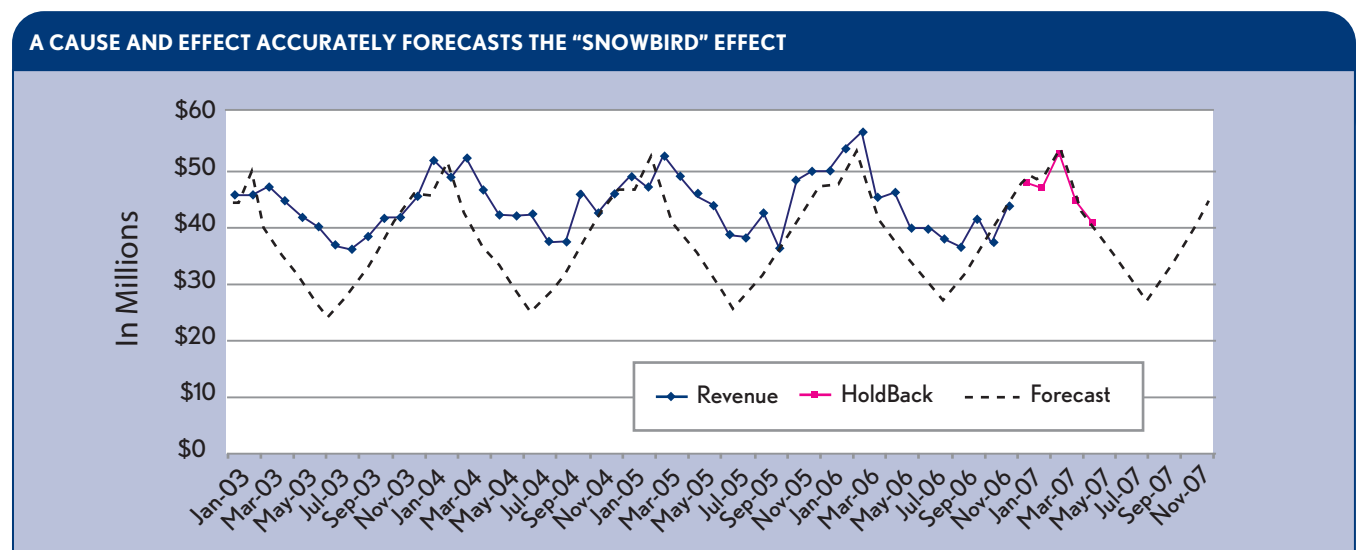
Once the model has been built and executed, the resulting forecast accuracy should be evaluated using the most recent time period. Overall model accuracy should be measured using statistical functions such as F statistic, standard error of the estimate, or R². R² is a statistical measure used for regression models describing what percentage of the changes from month to month can be explained by the forecast. By visualizing the results as shown in the graph below, a healthcare manager can easily understand a model's accuracy.

By cleaning the data and correcting for the snowbird factor, Hospital ABC has created a 95 percent accurate (by mean absolute percentage error) forecast that the organization can count on when planning and forecasting.

Model accuracy should be tracked and monitored by calculating the difference from month to

month. The accuracy rate may vary from month to month, but in any month, a forecast accuracy of more than 85 percent is considered to be very good. To compare forecast accuracy over time, the simple yet powerful mean absolute percentage error (MAPE) test should be used. If the MAPE increases over time, then not all influencing factors have been included in the model. By constantly keeping an eye on this test, a healthcare financial manager can easily understand whether the forecast model needs to be tuned.

Another powerful tool to test how a model will handle future conditions is scenario analysis. By running different scenarios, especially with known outcomes, healthcare managers can gain a



A consistent challenge healthcare organizations face is identifying a problem after it has already damaged organization performance.

comfort level of model behavior and accuracy. For example, a forecast for inpatient volume could test a base, a conservative, and an aggressive scenario for population growth rates, additions of new managed care populations and employer groups, and clinical initiatives to convert inpatients to outpatients. Under each scenario, the forecast should provide reasonable results.

Step 5. Apply the Forecast

Once all the work has been done to create a high-quality forecast, it should be deployed to the stakeholders and end users in a manner tailored to their use. The forecast should ideally be made accessible to all appropriate business areas in reports and analyses packaged to unique end-user perspectives. For example, a contract manager is most interested in revenue forecasts by payer contracts. Each healthcare financial manager should have access to a “sandbox” area to perform “what-ifs” to better understand the impact of business decisions.

An often overlooked value of a forecast model is that it allows financial managers to better evaluate how the hospital is performing when controlled for external factors. When the forecast is for an increase in revenues for a particular month, and the actual performance is below both the forecast and the previous month’s actuals, there may be a problem that needs to be resolved. For example, in the case of gross revenue, a hospital could control for the fact that it’s the holiday season and no one wants to be in the hospital, or perhaps local employment is down, or people are

moving out of the county. By letting the forecast adjust for factors beyond their control, financial managers can objectively judge how items they *can* control (such as quality of care, prices, and payer relationships) are performing.

A consistent challenge healthcare organizations face is identifying a problem after it has already damaged organization performance. To mitigate this problem, healthcare financial managers should put into place tools to check their forecasts on an ongoing basis so they will be aware of downward trends months before those trends affect the performance of the organization.

“Those Who Fail to Plan, Plan to Fail”

Today’s advanced forecasting techniques allow healthcare managers to plan, manage, and continually monitor where their organization is headed in the future. It is often said that “Those who fail to plan, plan to fail.” Through advanced forecasting, healthcare financial managers can ensure that their organizations have a successful voyage to better performance. ●

About the authors



Doug Stark

is vice president of product management, MedeFinance, Emeryville, Calif. (dstark@medefinance.com).



David Mould

is a predictive analytics scientist, MedeFinance, Emeryville, Calif.



Alec Schweikert

is senior product manager, MedeFinance, Emeryville, Calif.