

Forecast Accuracy

Introduction & Principles

The forecast accuracy KPIs

Accurate and timely demand plans are a vital component of a manufacturing supply chain. Inaccurate demand forecasts typically would result in supply imbalances when it comes to meeting customer demand.

Forecast accuracy is a generic word that can encompass three different KPIs: the MAPE, the forecast bias, and the tracking signal.

- The mean absolute percentage error (MAPE) evaluates the accuracy of the prediction of **customers' demand (using quantity)**. As an input of the S&OP process, reliable forecasts constitute the major way to improve customer satisfaction via optimized planning of operations.
- The Forecast Bias describes the **tendency to either over-forecast** (forecast is more than the actual) **or under-forecast** (forecast is less than the actual), leading to a forecasting error.
- The Tracking Signal serves as a **diagnostic measure to find forecast line items with significant forecast bias**.

Aggregation levels and timeframes

Each forecast accuracy KPI can be calculated at a given aggregation level depending on the purpose it is used for. In the group, the different existing aggregations are the following (more detailed explanation can be found through this [link](#)):

- Material/ Ship-to/ DC
- Product/ Ship Dest Zone/ group of activity
- Product/ Plant
- Product Hierarchy/ Sold-to
- Sales Rep/ Product/ Ship-to KA

The timeframe (lag) can also vary and each forecast accuracy KPI can be computed with a different lag.

The lag refers to the number of months in the past at which we consider the final forecast that should be compared to the gross history. M-2 is the reference lag in the group: Taking the forecasts that were done two months before the reference month M of which we will take the gross history would correspond to a lag of M-2. Forecast accuracy KPIs can also be computed with a lag of M-1, M-3, M-4, and more.

Definition and calculation: MAPE

The Forecast Accuracy (MAPE) measures the accuracy of the forecasting figures. In Syensqo the figures are based on the Final Forecast validated in the Demand monthly Reviews vs. the Gross History. Forecast accuracy at the SKU level is critical for proper allocation of resources.

Weighted Forecast Accuracy (wMAPE) is a variant of MAPE in which errors are weighted. In the past we used to weight the values of actuals, which did not penalize the over forecasting cases. To overcome this situation, now we **weight using the Total of Actuals and Forecasted volumes** by the Aggregation Level (Material, SREP or product).

Weighted Forecast Accuracy Formula

$$WMAPE = MAPE \times Weight$$

Forecast accuracy (MAPE) = $(1 - \text{Abs}(\text{Final Forecast} - \text{Gross History}) / \text{Gross History})$ for each line by aggregation level

Weight = $(\text{Final Forecast} + \text{Gross History}) / (\text{Sum}(\text{Final Forecast} + \text{Gross History}))$ for each SREP, material or product

Definition & calculation: forecast bias

Useful Links:

[Global Supply Chain Dashboard in Tableau](#)

[Forecast Accuracy Functional Wiki](#)

Key Contacts:

[Mathieu Pourque](#)

Forecast bias is used in combination with MAPE to diagnose underforecast or overforecast. It is useful to indicate the general trend that lies behind

$$\text{Forecast Bias \%} = (\text{sum}(\text{Final Forecast}) - \text{sum}(\text{Gross History})) / \text{Sum}(\text{Gross History}) \times 100$$

Definition & calculation: tracking signal

The NFM is useful to diagnose **the forecast line items with the most significant forecast bias in proportion to the volume of gross history and final forecast.**

$$\text{Normalized Forecast Metric (NFM)} = (\text{Final Forecast} - \text{Gross History}) / (\text{Gross History} + \text{Final Forecast})$$

Impact of forecast accuracy on E2E performance and objectives

While forecasts are never perfect, understanding and predicting customer demand is key to keep an optimized inventory and effective supply chain. **Best-in-class forecast management can have impact on:**

- **Cost reduction**
 - Material
 - Freight
 - Fixed costs
- **Service & Sales growth**
 - Improving OTIF and Customer Service
 - Reducing out of stocks
 - Improving new product launch
- **Working Capital Optimization**
 - Optimize finish goods inventory
 - Optimize raw material and work in progress inventory