

Nestlé Brazil Case: Demand Planning using SAS® Forecast Server and SAS® Enterprise Guide®

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ABSTRACT

Demand Forecasting is a critical process to drive several business decisions in industries. Marketing & Sales, Finance, Supply Chain and Factories are guided by an agreed sales forecast number. Additional to sales history, there are several factors and events that shape the demand, and robust statistic is a key competitive advantage to predict the future demand. There is a huge amount of data to be processed and hundreds of forecasting models needed. The objective of this paper is to describe how Demand Planning at Nestlé Brazil is supported by statistics using SAS® Forecast Server and SAS® Enterprise Guide®

INTRODUCTION

Nestlé is the largest nutrition, health and well-being company in the world and with industrial operations in 83 countries and world-renowned brands with sales worldwide of 91439 Million CHF in 2018. In Brazil since 1921, the company has 31 factories around the country and more than 22.000 employees with Sales of 3683 Million CHF in 2018.

There are several factors that shape the demand of a food and beverage company, such as macro-economic context, marketing activities, and special events.

Reliable demand forecasting is essential for supply chain decisions and for determining the income expectations of a company. The better the forecast, the better the sales, operational, and financial planning. It contributes to lower the inventory while keeping service level high.

In Brazil the trading environment is challenging (Nestlé Press Release) and demand forecasting is critical and complex. Nestlé Brazil and its affiliate companies are present in 99% of Brazilian households, according to a survey carried out by Kantar Worldpanel.

Volatility of demand is increasing year-to-year for most of the product categories, often related to more frequent and irregular trade activities.

Aiming to make its statistical demand forecasting process more accurate, automatic, scalable and robust, Nestlé got a master license in 2013 to implement SAS Enterprise Guide® and SAS Forecast Server® in all countries. Prior to SAS forecasting solutions available to the company took only sales history into account which is quite limited for such a dynamic and complex business.

Nestlé Brazil was the pilot in Latin America countries starting the journey in 2015 with the implementation in two business units.

A statistical forecast is now part of the sales and operational planning for 13 business units. SAS® Forecast Server output is the baseline demand to predict when to grasp opportunities, how to close gaps between forecast and business targets, and how to identify risks.

OVERVIEW FORECASTING PROCESS

The forecasting macro process can be described by four micro processes: data gathering, preparation, forecasting process and forecasting output.

SAS enables planning that combines baseline and uplifts into one single model. There is no need to clean the sales history, but to add data, other variables and events that support past demand to the statistic explanation.

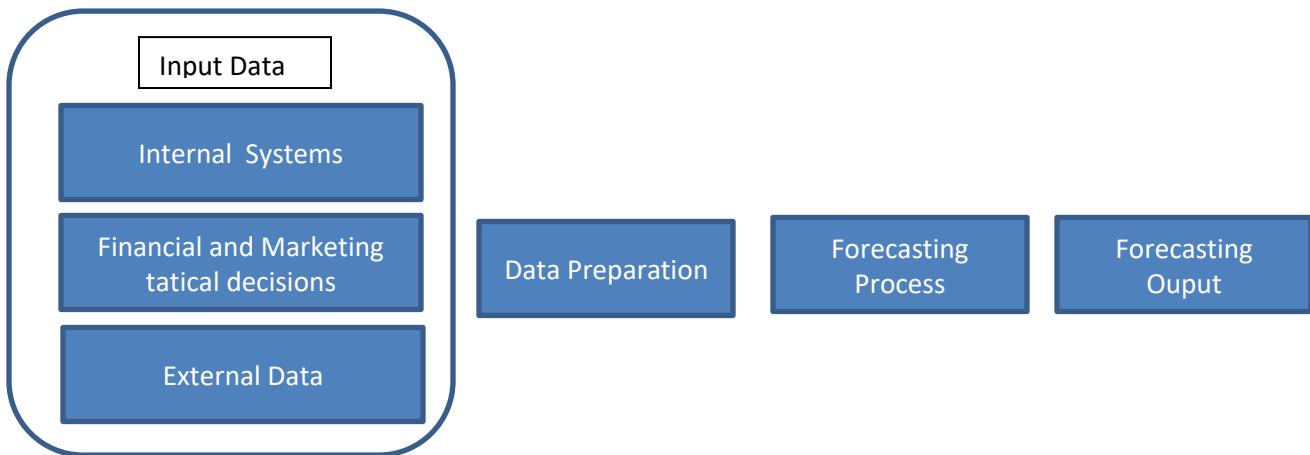


Figure 1. Caption for Sample Figure

INPUT DATA

SALES HISTORY

Sales history from past 5 years is one of the key data inputs to predict future sales. The ERP system provides the past sales in units of consumption per Stock Keeping Unit (SKU) per day. Sales history may need to be realigned between different SKUs due to resizing or promotional items. Sales history also is grouped per month as demand planning is forecasted at this level. The solution also enables us to transform sales history into different units of measures.

CAUSAL VARIABLE

In food and beverages industries there are many factors that affect the demand.

SAS Enterprise Guide is a very flexible tool that enables us to add all this data coming from different sources using CSV files. The main challenge is to have the information available, at the granularity needed, past & future. Data coming from sources that use nomenclature different from Nestlé SKU internal code needs to be transformed to Nestlé nomenclature.

Data available related to price, promotion and media are added into SAS as well as macro-economic variables such as Annual Growth Rate (GDP), inflation and exchange rate among others.

Below is an example of the data format to be uploaded into Enterprise Guide

SKU	Calendar Month	Value/KG	Value/UNIT	Discount/Total Sales	Investment/Total Sales
AAAA	01/01/2016	10,3	3,3	0,20	0,01
AAAA	01/02/2016	10,5	3,4	0,15	0,01
AAAA	01/03/2016	10,6	3,7	0,23	0,03
AAAA	01/04/2016				
.....					
AAAA	01/05/2020	11,2	3,9	0,22	0,01
BBBB	01/01/2016	5,3	4,3	0,22	0,02
BBBB	01/02/2016	5,5	4,4	0,17	0,01
BBBB	01/03/2016	5,6	4,7	0,21	0,04
BBBB	01/04/2016	5,4	4,6	0,22	0,03
.....					
BBBB	01/05/2020	6,2	4,9	0,12	0,03

• **Table 1. CSV Files: Data Types for SAS Variable Formats**

EVENTS

Demand is impacted by special events such as special holidays: Easter, Mother's Day and significant promotional events such as Black Fridays. All these events are mapped in the previous years and into the future.

Promotional events that affect the demand from regular SKUs are mapped from past and into the future.

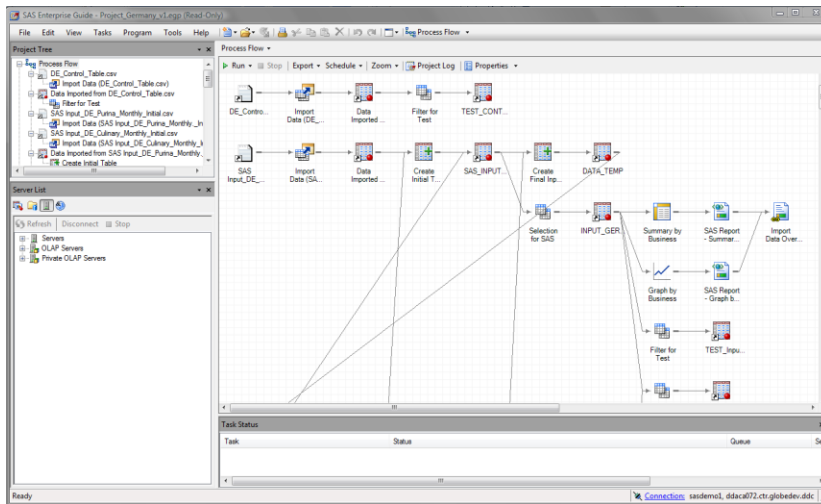
Unprecedented events such as strikes or natural disasters, are mapped to allow statistics to remove the effect from baseline.

DATA PREPARATION

Point and click is an important feature from Enterprise Guide that allows intuitive definition of the data manipulation sequence and no coding is needed. Nevertheless, coding is available for more advanced users.

The capability of SAS to work with huge amounts of data of unlimited size, enables a mass manipulation of data in a feasible processing lead time

All this data can be processed overnight and during the weekend, in background.



FORECASTING PROCESS

AUTOMATIC

SAS Forecast Studio automatically test 4 dozen model statistics

In addition to trend and seasonality are considered by SAS the following model families:

- Exponential Smoothing
- ARIMA and ARIMAX
- Unobserved components models (structural models)
- Intermittent demand models (e.g. Croston's method)
- Naïve models
- "External" models

The best performing model is automatically chosen with optimal parameter selection.

The mean absolute percentage error (MAPE) is a statistical measure of how accurate a forecast system is. It measures this accuracy as a percentage and can be calculated as the average absolute percent error for each time period minus actual values divided by actual values. Where A_t is the actual value and F_t is the forecast value, this is given by:

$$M = \frac{1}{n} \sum_{t=1}^n \left| \frac{A_t - F_t}{A_t} \right|$$

SAS selects the appropriate model to obtain better MAPE.

Large scale of automatic forecasting enables us to process a huge amount of data.

Jobs are scheduled to specific day/time or can be triggered manually per analyst.

Unlimited variables can be loaded into SAS and the solution chooses influential variables to improve the model. This functionality enables us to add any data from different departments creating an inclusive solution within any area can contribute information to the forecasting process. The test of each variable is done at SKU level. Additionally, to improve models, it gives valuable insights that are significantly relevant, reinforcing common sense and breaking paradigm.

Even if a variable is time phased to the demand, it is also considered.

SAS also support the increasing need to forecast accurately on lower levels, for example, sales branch level.

MANUAL FINE TUNING

For both entry level and advanced users, SAS can support different needs as per user profiles.

As data processing and automatic forecasting model can run on non-business hours, demand analysts can fine tune models during business hours. This feature also is important to guarantee standard calculations in the correct sequence. The total working processing time needed by the analyst is also reduced, especially in a context when there is limited time due to complex and time constrained planning cycles that requires inputs from other areas such as Finance and Business Units.

Analysts can easily identify models that need adjustments, and even though hundreds of models are being created, focus on the ones that need adjustments.

FORECASTING OUTPUT

SAS creates a forecast of what will be the monthly sales for the next 20 months per SKU. The results are grouped per category to be used at S&OP meetings and based on it, business decisions can be taken, for example, to launch a promotion or even review sales incentives.



Display 1. Former Main Interface for SAS Management Console

Confidence intervals are also available, and parameters can be changed to make them more flexible or tighter.

Reconciliation can be top down, bottom up. The journey starts by creating models at the SKU level summing up to categories. By now there is a top down to disaggregate national project to sales branch/channel/sales plant level

The output can be extracted to excel to share with other stakeholders or to use other tools.

Forecasted output is reviewed and agreed upon in the Sales & Operations Planning meetings and an agreed sales plan cascaded into the organization.

After several planning cycles with statistics being presented and performance evaluated, it was possible to achieve key business benefits such as: Improvements in demand planning accuracy, customer service level and product freshness. The financial benefit was demonstrated by less stock maintained to mitigate risk of stockouts caused by uncertainties in demand.

The demand statistical forecast proved to be systematically reliable for the majority of the product portfolio, releasing time from team to focus discussion about the demand of products with higher volatility.

Statistics also started to be a relevant input for tactical business such as agreeing and getting prepared for higher demand than originally expected and decisions about increasing production capacity.

CONCLUSION

Due to the huge size and complexity, SAS solutions fit well into Nestlé needs. Starting from processing a huge amount of data to massive creation of statistical models, SAS provides a robust platform to create a mature statistical analysis, directly impacting company's results.

Nestlé Brasil was able to create a more robust demand planning relied on statistics, delivering operations, financial and customer service benefits.

REFERENCES

NESTLÉ FINANCIAL STATEMENTS 2018

Getting started with SAS enterprise guide

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RECOMMENDED READING

- *SAS(R) Forecast Studio 4.1 User's Guide*
- *The Little SAS® Enterprise Guide® Book*
- *SAS® Enterprise Guide® - Fact Sheet*

CONTACT INFORMATION

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