

NEW METHODS FOR DEMAND ESTIMATION AND CORRELATION WITH SALES PLAN

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ABSTRACT

One of the most important and often difficult tasks for a manager is estimating demand for its product. Many firms, both small and large, encounter problems in methodically estimating market demand for their products and services. The issue is crucial because realistic sales demand estimation is fundamental for the sales plan. The market variables that will affect demand for the enterprise's product are grouped into those market variables the manager is likely to know with a high degree of certainty and those the manager is likely to know with less certainty, like consumer demand.

In the paper we present the frame model for determining the empirical distribution for the probability of the uncertainty of the demand estimation.

KEYWORDS: *demand estimation, forecast uncertainty, empirical distribution*

1. Market variables that influence the demand

Practical corporate experience as well as literature reviews indicates a need for an organized approach to demand estimation. Many years of consulting experience led to the conclusion that the greatest demand estimation failures in business arise from those variables that we simply neglect to consider (errors of omission) as opposed to those we factor in but fail to analyze correctly (errors of commission). The framework suggested here is intended especially to combat errors of omission through both a checklist of factors to evaluate as well as a sequence in which they should be considered.

Much of the earlier literature in the area of demand evaluation deals with the application of specific techniques (Armstrong, 1970) and predictor variables (Boyd, 1974).

The market variables can be divided in a category with a high degree of certainty as: own costs, competition, market price.

The manager will be able to estimate for example its own per unit and marginal costs of production for lens. This will allow the firm to establish a benchmark price markup over costs as part of developing a comprehensive pricing strategy.

Market research can help the manager properly define its market in terms of competitors. The manager wants to identify competitors as those who produce direct and indirect substitutes in the same geographic market. In some cases this will be relatively easy such as identifying competitors for the manager who opens a lens shop.

The market price for lens will be set by the enterprises active in the market.

These variables provide the manager with the information to construct an initial demand function based on market variables it will know with a fairly high degree of certainty.

A second group of factors contain market variables with a low degree of certainty like consumer demand, the economy and random factors.

The demand of consumers to the enterprise's product will depend on the price it charges, consumer tastes, the availability of substitute offerings like plastic lens, and the impact its marketing effort has on consumers. Consumer demand depends also on current income and expectations of future income, so changes in macroeconomic variables, as currency rate, add a degree of uncertainty to consumer demand.

The variables described as ones the enterprise is likely to know with a high degree of certainty are going to be immediately known because they define the current market environment.

Price is both an exogenous and an endogenous variable for the enterprise.

When the economy is growing with moderate price inflation and low interest rates, consumer demand grows. Such economic growth as is occurring currently, allows the enterprise a more positive estimate of demand.

Random factors such as a change in the business laws facing the enterprise can be adverse or favorable in their effect on demand.

2. Demand forecast

Generally, demand and sales do not have a determined nature, but present some given uncertainties.

The market demand for a product consists of the total volume of goods that a given group would buy, in a given geographic surrounding, in a given time frame, in a given marketing environment and in a given marketing program (Kotler 2007).

The market demand is not a fixed value, but one that varies according to the existing conditions. For this reason, it can be named the function of the market demand.

It is important to remember that the function of the market demand is not an image of the evolution of the given market demand. The demand curve indicates current alternative forecasts of the market demand, associated with possible alternative levels of sales effort in the given sales area in the current time frame.

The market forecast indicates the expected level of the market demand, not the maximum level of the demand. For that we need to imagine the level of demand resulted at a "very high level" of the sales promotion spending, where any new increase of the promoting effort will have almost no stimulating effect on the demand. The market potential is the limit towards which the market demand leans, when the promotion expenses lean towards infinite in a given vending environment. (Kotler, 2006, 194)

The condition "for a given vending environment" is of crucial importance. Let us think about the market potential of lenses in times of recession and in times of prosperity. Companies interested in the market potential have a special interest in the penetration rate of the product that shows what percentage of the total population owns or uses a certain product or service. Companies consider that, the lower the penetration rate of a product, the bigger the market potential is, although this thesis is based on the idea that in the end everybody will make it on the demand market for every product.

To obtain a good estimate for future demands and sales one needs to determine the rate of uncertainty that comes with it.

The uncertainty of the outcome is very important for all decisions that are to be made, taking into account the future demand, as well as the production plans or even the provision plans.

The uncertainty of the outcome is the track between the real demand and the foreseen one.

In practice, the uncertainty of the outcome is important, because through the understanding of the errors that might occur in their determination, it allows one to analyze the precision of the previous forecasts. For a better estimate of the uncertainty of the forecast, it is necessary to analyze the history of the uncertainties and the usage of a reliable method for the determination of these uncertainties.

For the bonding of the demand and sales with the sales plan in conditions of uncertainty one has to have a series of characteristic aspects for this situation in mind.

The growth of the uncertainty regarding demand requires a great deal of attention on behalf of the company.

3. Determining the uncertainty of the demand forecast

The technical literature presents a variety of different methods for determining the uncertainty of the demand forecast. In this paper we use a quantitative method that consists in defining the distribution for the probability of the uncertainty of the forecast according to the history of the demand. According to the picture in figure 1 the calculation of the difference between forecast and real demand for all previous periods, allows us to determine the distribution for the probability of the uncertainty of the forecast. These differences can be determined in absolute values or relative values, depending on the models of uncertainty of the forecast.

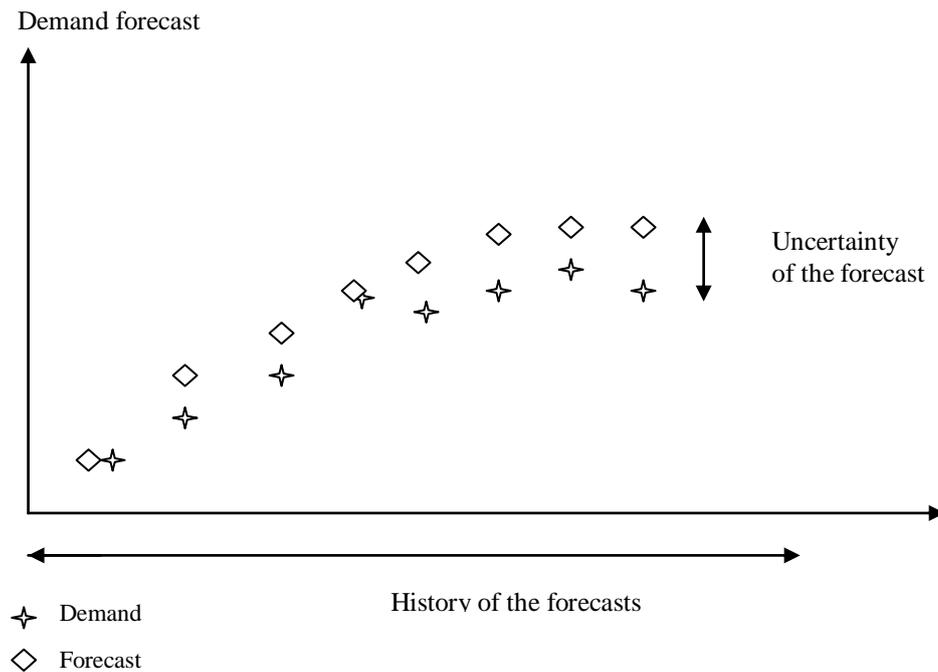


Figure 1 Forecast and the uncertainty of the forecast

In the technical literature we distinguish three basic models for the uncertainty of the forecast: absolute model, relative model and mixed model. (Galasso F., 2007)

The absolute model defines the uncertainty of the forecast as the difference between the demand and the forecast. At a given time s the uncertainty of the forecast PI_s is the function of the forecast P_s and the demand C_s :

$$PI_s = C_s - P_s$$

According to this model the demand is:

$$C_s = P_s + PI_s$$

The relative model defines the uncertainty of the forecast as the difference between demand and forecast related to the value of the forecast. For a period s the uncertainty of the forecast PI_s is a function of the forecast P_s and demand C_s :

$$PI_s = (C_s - P_s) / P_s$$

According to this model the demand can be determined through the following formula:

$$C_s = P_s (1 + PI_s)$$

The mixed model defines the uncertainty of the forecast through a relative component and an absolute one. For a period s the demand can be defined through the formula:

$$C_s = (P_s + PI_s^A) + (P_s * PI_s^M),$$

Where PI_s^A is the added part of the uncertainty of the forecast and PI_s^M is the multipliable part of the uncertainty of the forecast.

Thus, the absolute model and the relative model represent the particular cases of the mixed model, for which $PI_s^A = 0$ and $PI_s^M = 0$.

In the case of the mixed model it is difficult to determine the distribution of the probability of the absolute component and the relative component. In this paper we shall analyze the absolute and relative models of the uncertainty of the forecast. The models of uncertainty have a significant impact on the parameters of the distribution and sales policies. In practice there are two methods to determine the uncertainty of the forecast: the empirical method, which consists in determining the empirical distribution of the probability with the help of the statistics of the uncertainty of the forecast (for a given period or cumulated for a time frame) and a method that consist of choosing a law for the distribution of the probability of the uncertainty of the individual forecast.

In this paper we analyze the empirical approach, according to which, if the forecast P_s and demand C_s can be determined for the period s , according to its history, than the value of the uncertainty of the individual forecast for a period s is:

$$\begin{aligned} PI_s &= C_s - P_s, & \text{for the absolute model} \\ &= (C_s - P_s) / P_s, & \text{for the relative model} \end{aligned} \quad (1)$$

We can determine the empirical distribution for the probability of the uncertainty of the individual forecast according to the value of the uncertainty of the forecast for all historical periods. We denominate the random variable of the uncertainty of the individual forecast as PI and with Φ_{PI} its empirical distribution.

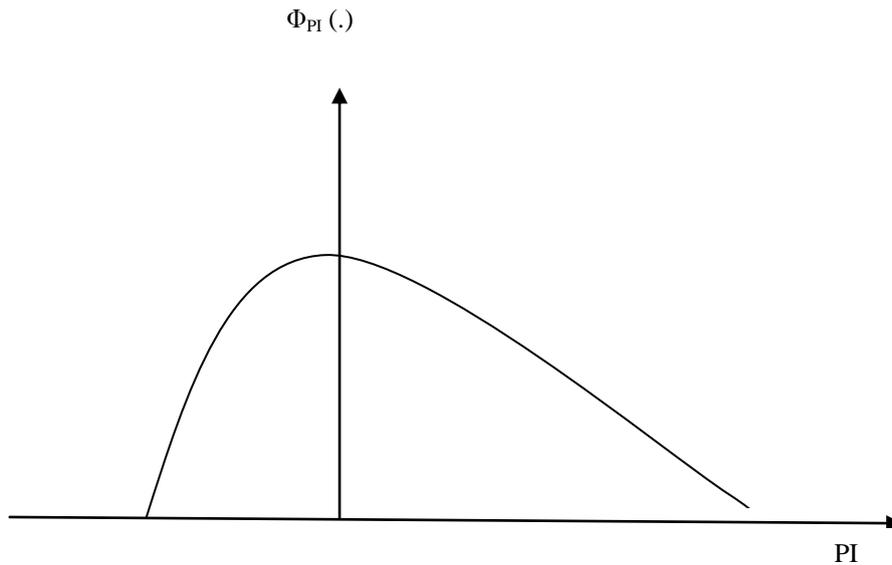


Figure 2 The empirical distribution for the probability of the uncertainty of the individual forecast

To determine the accumulated empirical distribution of the uncertainty of the forecast for more than one period we calculate the accumulated forecast PC_s^N and accumulated demand CC_s^N for N periods.

$$PC_s^N = \sum_{i=s, s+N-1} P_i \quad (2)$$

$$CC_s^N = \sum_{i=s, s+N-1} C_i \quad (3)$$

The value of the uncertainty of the accumulated forecast for a time frame R with N periods PIC_s^N can be determined through the following formula:

$$PIC_s^N = CC_s^N - PC_s^N, \text{ for the absolute model} \quad (4)$$

$$= (CC_s^N - PC_s^N) / PC_s^N, \text{ for the relative model}$$

According to the values PIC_s^N of the uncertainty of the cumulated forecast for a time frame R with N periods, we can determine the direct empirical distribution for the uncertainty of the forecast for the time frame R. For the relative model of the uncertainty of the forecast we express the obtained distribution in percentages.

4. Conclusion

The model developed in this paper suggests applications for further research. First, industries might be categorized into types with specific demand conditions analyzed for each one. This would allow the model to be applied with more detail and specificity to each industry. The model could be used to develop pricing strategies based on each industry and the type of demand structure relevant to each. Pricing strategy follows naturally from a discussion of estimating demand. Finally, the model could be applied empirically. Industry

statistics are readily available that would allow for actual estimation of demand for a specific industry based on the variables specified in the model.

Furthermore, in this paper we have analyzed certain concepts referring to the forecast of demand and sales that can also be used in practice. The analysis also contained two models of the uncertainty of the forecast, that is the absolute model and the relative model. These models help in determining the empirical distribution for the probability of the accumulated uncertainty of the forecast.

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