

ABSTRACT

Forecasting of the sales volume and planning of the production process, as well as other crucial managerial decisions are based on the knowledge of the demand for the good and service under consideration. The relationship between the price and the quantity demanded is obvious. Therefore, for the successful business decisions, it is important to understand the impact of pricing on sales by estimating the demand function for the product.

There are two main approaches to this issue: one is based on the traditional and modern theories of consumer behavior; whereas the second is a pragmatic approach to demand analysis. The latter omits the theoretical frames of the fundamental law of demand, and formulates demand functions directly on the basis of observed market data.

The traditional and modern concepts of consumer behavior are theoretically impressive and useful for the academic and in-class simulation of the demand-price relationship; however, it has no practical value for managers of the business firms in dealing with complexity of the real world. Mostly, this approach employs the linear relationship of the demand and price in outlining the fundamentals of the theories.

The pragmatic approach is based on functional forms of the demand analysis. They are useful in making managerial business decisions. However, they are difficult to estimate, requiring much computational power of the analyst as well as specific statistical software. Mostly, this approach takes into account nonlinear forms of the demand and price relationships: distributed lag models, indirect translog model, and etc.

The true total revenue maximization requires estimation of market demand curve on the entire domain. It is well known that almost in all cases the entire market demand curve is of essentially nonlinear form. The latter implies the fact, that it is impossible to estimate optimal parameters of total revenue maximization by means of local linearization. Linearization of the demand curve can be applied locally, but not to the whole domain of market demand curve (globally).

The described situation predetermines the main objective of the present research: elaborating theoretical foundations and a mathematical model of essentially non-linear demand-price relationship, which permits easy and reliable estimation of all of its parameters, and eventually, reliable estimation of optimal revenue and profit.

In the present research we suggest a new method of analysis of demand's internal structure and compound nature, dependent on the contributions of various groups of customers. New concepts of Observed Demand D , Smoothed Demand D_s , Elementary Observed Demand D_i , Smoothed Elementary Demands D_{si} , and Integrated Demand $D_{A\Sigma}$ are introduced. Direct and inverse problems of estimation of elementary and integrated market demand's parameters are defined. Integrated market demand structure is represented as a multidimensional dummy variables regression model. The theoretical results are verified by means of corresponding numerical examples.