A FRAMEWORK FOR ORGANIZING, INTEGRATING, AND TEACHING
THE TECHNIQUES OF DEMAND ESTIMATION

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ABSTRACT

This paper develops a classification scheme for organizing the demand estimation task into four different situational categories. Against this background, various demand estimation methods are presented and elaborated. The purpose of the exercise is to provide a simplific and clarified treatment of an important, and superficially complex, subject for the benefit of instructors and students of marketing.

INTRODUCTION

Estimation of demand is a basic, useful, and necessary function in the performance of marketing. Strategic decisions concerning products to produce or markets to serve cannot be made rationally without the information provided by an estimate of demand for a product, within a market. A marketer would not develop a particular product nor enter a market segment unless able to forecast a level of demand for that product/market sufficient to provide a profitable sales volume.

A variety of approaches are used in demand estimation, and are generally broached pedagogically to students of marketing at the introductory (i.e., Principles) course level. Although some prominent Principles texts give only cursory attention to the topic (Kinnear and Bernhardt 1983, pp. 208-211; Pride and Ferrell 1980, pp. 162-170; Stanton 1981, pp. 512-527), others provide somewhat detailed elaboration of demand estimation (or sales forecasting) methods (Kotler 1983, pp. 195-211; 1984, pp. 224-249; McCarthy and Perreault 1984, pp. 268-280). Yet even with the more comprehensive treatments there appears to be opportunity for supplementary organizing and synthesizing of the various techniques into a cohesive structure. Recognizing that many elementary marketing students may not appreciate the relations between certain methods (such as market build-up, the "buying power index," survey of intentions, and market testing), as well as their essential unity of purpose, it may be necessary for the course instructor to provide this clarifying and integrative perspective. The following describes a procedure by which such an effort can be made.

THE FRAMEWORK, STEP BY STEP

In introducing the subject, it may be useful to eliminate possible confusion by informing students of the general equivalence of the terms demand estimation, market measurement, market forecasting, and sales forecasting. Though most Principles texts favor the term "sales forecasting" to designate the concept and use it predominantly, some, such as Kotler (1983, 1984), employ alternate language. If "demand estimation" and "sales forecasting" must literally be regarded as near synonyms, it only requires an assumption that demand can be equated with supply for the two to be treated as equivalents. In other words, a demand estimate is a forecast of how much could be sold by a firm or industry.[1]

The Classificatory Dimensions

Market vs. company demand, the macro/micro distinction. The purpose of the classification scheme, i.e., the integrative framework referred to earlier, is to identify four situational categories of demand estimation. The first of two bases used for distinction is the difference between market and company demand--whether demand is being estimated for an industry or a single producer within an industry. This distinction is represented by the vertical axis in Figure 1. As can be seen, students are informed that market demand refers to demand for a product class, as opposed to demand for a particular firm's brand(s), and that "industry sales" volume is used as a comparable term for it.

National vs. regional demand, the geographic basis. The process of demand estimation, and the techniques applied to it, may also differ depending on whether the estimate is for a national or regional geographic level. This is the other classificatory basis shown in Figure 1 as the horizontal axis, and it represents a simplification of Kotler's "space" dimension of world, USA, region, territory, and customer (1983, p. 197; 1984, p. 225).[2] The legitimacy of such streamlining rests on these observations: (1) An estimate of world demand is likely to be an aggregation of various national estimates; (2) "region," "territory," and other similar designations (such as state or metropolitan area) are variations of sub-national geographic area; and (3) any territorial demand forecast is a composite of estimates for individual customers, either explicitly (e.g., market build-up) or implicitly/analytically (e.g., sample survey of intentions or expert opinion survey). Therefore, the two-level geographic categorization adequately captures the underlying dimension.

From the two dimensions of Figure 1, four cases of demand estimation emerge: national market, regional market, national company, and regional company.

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[1] None of this is intended to contest the fact that in some contexts, such as microeconomics, "demand estimation" involves specification of a function, rather than a point on a function which is the focus here and is likely to be the focus of the business practitioner.

[2] Since Kotler's texts are widely adopted examples of the more comprehensive textbook treatment of the topic, they will be used here as general backdrop for the discussion.

FIGURE 1
THE FRAMEWORK AND THE METHODS

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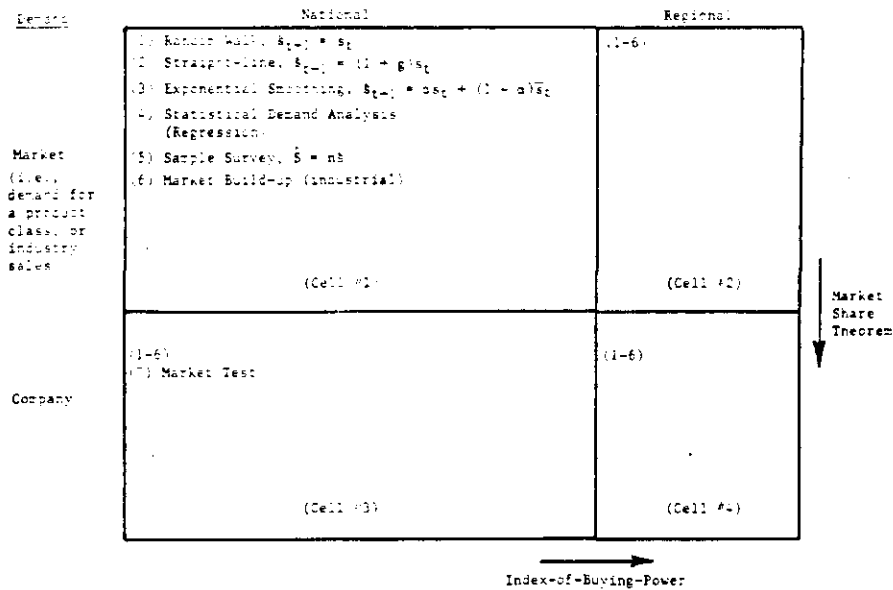
The absent temporal dimension. The framework, relative to Kotler (1983, p. 197; 1984, p. 225), contains another simplification. No distinction is made between short-, medium-, and long-range demand forecasts. The rationale for this is that the latter two types are likely to be extrapolations of shorter-term estimates and, as such, would be based on the same or similar methods. Beyond this issue, distinction is sometimes attempted between "measuring current" and "forecasting future" demand (Kotler 1983, pp. 200, 206; 1984, pp. 234, 239). This dichotomy is rejected as untenable according to the following reasoning.

First, consider what could be meant by "current" demand. Given a standard definition of the word itself, the expression would have to mean either demand at the current moment in time, or demand over a period of time in which the current moment is situated. The former option can be dismissed because demand is a flow (as opposed to a stock) variable, which occurs over a period of time. Any flow measured over an infinitely small period, i.e., a moment, is therefore zero. So the level of demand defined at the current moment would always be zero, by definition.

Concerning the second interpretation of "current demand," suppose the period in question is the current year, extending from six months prior to six months hence as shown in Figure 2. Here, any putative distinction between measurement of current and future demand would again be inadmissible. Estimation of demand for historical segment a would be moot since it already would have occurred and been recorded. Again, the only demand estimation task would be for period b, which lies in the future. The same argument applies to any location for t in a period c of any possible length. Demand estimation, therefore, always pertains to a future time period, even if it is a future segment of a period designated as "current."

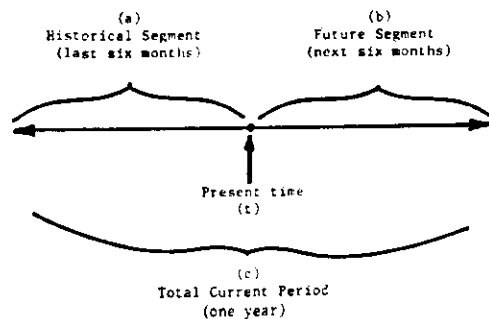For these reasons, the demand estimation framework is presented to students as applying to an up-

coming period. For simplicity, all estimation examples are assumed to relate to the immediately forthcoming one-year period, while it is made clear that longer-term forecasts are achievable by modification of the techniques or by extrapolation.

Description of the Methods

Having established the Figure 1 framework, the next step is to describe various methods of demand estimation and how they can be used to forecast demand, or sales volume, in each of the four specified cases. The basic expository procedure is to present the methods in the context of cell #1, i.e., show how they are used to estimate national market demand, then explain how the same techniques can be applied to the other cases via cell-specific data. One approach unique to cell #3, national company demand, is also presented. Finally, two devices are explicated that may be used to convert a national market estimate to one for any of the other compartments of the figure.

Random walk. The first estimation method presented is also the most basic imaginable: letting previous year's sales volume serve as an estimate

FIGURE 2
ONE INTERPRETATION OF "CURRENT" DEMAND

(a)
Historical Segment
(last six months)

(b)
Future Segment
(next six months)

Present time
(t)

(c)
Total Current Period
(one year)

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for the following year. In other words, $s_{t+1} = s_t$. Students are informed that in periods of relatively stable market demand, this "random walk" may be a reasonable approach. In times of slow or moderate growth, it is conservative. (Of course, this method requires that prior data are available. For example, it could not be used for a new industry.) Suggested data sources include the Department of Commerce and industry trade associations.

Straight-line extrapolation. Next, a method nearly as simple is demonstrated: extrapolating previous year's sales or demand level by the recent growth rate. This is represented as

$$\hat{s}_{t+1} = (1 + g)s_t \qquad (1)$$

with g = average growth rate measured over a number of recent periods (e.g., the previous five or ten years)

One reason for presentation of these simplistic methods is to show that the next technique, "exponential" smoothing, is nearly as simple.

"Exponential" smoothing. Kotler (1984, p. 245) defines this method as

$$\hat{s}_{t+1} = \alpha s_t + (1 - \alpha)\bar{s}_t \qquad (2)$$

with $\hat{s}_{t+1}$ = sales forecast for next period

α = the smoothing constant, where $0 \leq \alpha \leq 1$

s_t = current sales in period t

$\bar{s}_t$ = "smoothed" sales in period t

Although more properly referred to as "linear" smoothing, it is emphasized that the method is merely a projection based on the past data series, like the first two methods. Alternate ways of interpreting "smoothed" sales may be given, including $\bar{s}_t$ = mean over several recent periods, and $\bar{s}_t = (1 + g)s_{t-1}$.

Statistical demand analysis. The concept of regression is presented here. Students are informed that although this method ordinarily utilizes time-series data, it is a projection based on underlying factors, rather than simple extrapolation. An example would be

$$\hat{s}_{t+1} = a + bx_t \qquad (3)$$

with $\hat{s}_{t+1}$ = estimated sales of a building-related product class for the next period

x_t = housing starts for the last period

Sample survey. It is also possible to forecast sales for a coming period by surveying the intentions of potential buyers. Generally used with certain categories of consumer products, the basic form of analysis is

$$\hat{S} = n\hat{s} \qquad (4)$$

with $\hat{S}$ = aggregate market sales estimate

$\hat{s}$ = per capita projection, based on sample survey responses

n = number of customers in the population

Key points emphasized here include (a) the necessity of estimation based on a sample, rather than a census, given the large numbers in the consumer population; and (b) that the same analytical structure may be used with surveys of expert or sales-force opinion, i.e., $\hat{s}$ may represent sales-force or expert judgments, rather than consumers' own judgments.

Market build-up. Finally, students receive the industrial marketing analog of the sample survey. Highlighted are (1) the fact that a census of potential customers is taken with this method, with individual reports of expected purchase volume summed (as opposed to multiplication of per capita estimates as in the previous section), and (2) the feasibility of this approach in industrial marketing due to a comparatively small number of customers.

There is also an opportunity at this point to avert possible terminological confusion over two usages of the word "industry." Since the market build-up method, in the context of cell #1 of Figure 1, relates to industry sales of industrial products, it should be pointed out that "industry sales" refers to the sales of all producers in a market, whether the market is for consumer or industrial products. Sale of industrial (as opposed to consumer) products to industrial customers, on the other hand, constitutes industrial marketing.

Following elaboration of the above material, cell #1 of Figure 1 appears as shown. Then it is explained that the same procedures (#1-6) can be applied to the other demand estimate situations by utilizing appropriate data. In other words, if regional market, national company, or regional company data are "plugged into" the methods outlined above, estimates will be obtained for cells #2, 3, or 4 respectively. For example, if industrial customers in the region are polled as to their buying plans for the firm's products (rather than the product category), a market build-up estimate of regional company demand (cell #4) is derived. If a national sample of consumers is surveyed regarding their buying plans for the firm's brands, a national company forecast (cell #3) emerges. Or, regional sales for a product class can be related to an underlying causative factor like regional housing starts via regression analysis (cell #2).

Market test. It is also explained that test marketing is a sales projection method peculiar to the national company estimate situation (cell #3). Reasons for this are (1) the obvious, that a marketer would be testing only its own products rather than others in the product class; and (2) that the costly process of test marketing is generally affordable only by national marketers. (Exceptions might be regional brewing companies or supermarket chains.)

At this point in the presentation, the cells are composed as in Figure 1.

Derivation Techniques, or How to Work Your Way Around the Figure

Finally, two methods are explained for deriving a regional from a national estimate, and a company from a market estimate.

Index-of-Buying-Power. The buying power index published annually by Sales & Marketing Management magazine (1984) for each state, county, and metropolitan area in the United States is then revealed. Students are told that they can convert an estimate of national market (company) to one for regional market (company) by applying this value (being careful to divide the published figures by 100, since they are expressed as percents rather than percentages). It is stressed that, since national estimates are often more available than those for a given region, especially with regard to a product class, this conversion may be particularly useful.

Market share theorem. The idea of projecting a firm's market share on the basis of its share of marketing effort is the last of the demand estimation-related concepts to be communicated (Kotler 1984, pp. 231-232; Bell, Keeney, and Little 1975). The market share theorem can be presented in (over)simplified form as follows:

$$S_i = \alpha M_i / \Sigma M_i \qquad (5)$$

with S_i = company i's estimated market share

M_i = company i's marketing "effort" (actually expenditure level)

α = subjective adjustment for effectiveness; $\alpha > 1$ if spending more effective than average competitor, $\alpha < 1$ if less effective

The application and utility of this technique is to convert a national (regional) market demand estimate to a national (regional) company estimate.

With the index-of-buying-power and the market share theorem, it is possible to move from any cell in the grid to any other. A national market estimate can be converted to a regional company forecast by applying the devices sequentially. Or, one can work backwards, from company to market or regional to national, by applying the inverse of the buying power index or market share theorem. These two devices are also given in Figure 1, along the axes in a way suggestive of their functions.

SUMMARY AND CONCLUSION

The foregoing presentation has attempted to provide a basis for organizing the main demand estimation techniques which may otherwise appear to students as unrelated, and offer some simplifying tactics to prevent students from becoming confused over terms, concepts, and methods. Without such assistance, students can be intimidated by the myriad techniques they are suddenly confronted with in most texts.

The elaboration of the procedures per se offers nothing new, other than positioning in the framework and a few of one instructor's pedagogical tricks and suggestions. But if any of this material is helpful to students or readers, then the overriding purpose of the effort will have been met--that is, to contribute to better teaching and understanding of a vital set of tools for marketing research, planning, and management.

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