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# **Selling Demand-Based Pricing**

By Dr. Ronald B. Larson

1215 N 17<sup>th</sup> Street Montevideo, MN 56265 ron.larson@live.com

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#### Abstract

Applied economists have been trying to sell businesses on the value of demand-based pricing for many years. Their arguments favoring demand-based pricing have not been particularly persuasive and cost-based pricing continues to be the dominant price-setting method. This paper suggests four changes that may lead more firms to use demand principles when they set prices. Applied economists should acknowledge the benefits of cost-based pricing, shift their focus from profit-optimization to profit-improvement opportunities, develop principles and methods that better meet firm needs, and add new pricing topics to classroom discussions.

### **Selling Demand-Based Pricing**

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In their writings and in the classroom, applied economists often emphasize the importance of understanding demand and buyer willingness-to-pay when organizations make pricing decisions. Firms are described as optimizing their profits by analyzing marginal costs and marginal revenues (i.e., marginal analysis). A demand relationship is estimated, marginal cost and marginal revenue are calculated, and the profit-maximizing quantity is found by setting marginal cost equal to marginal revenue. This demand-based, profit-optimizing process is sometimes presented as a representation of what firms do or as a proscription of what firms should do. If an organization employed a different price-setting process, it probably would not maximize profits.

Economists have been trying to sell the demand-based pricing model to businesses and students for more than 100 years. Faulhaber and Baumol (1988) reported that most firms were not explicitly aware of marginal analysis as late as the 1970s. The common alternative to demand-based pricing is to use cost to set price. Oxenfeldt (1961, p. 72) wrote: "Any pricing method that is based exclusively on cost and ignores demand considerations is clearly unsatisfactory." Economists have tried to highlight the importance of demand-based pricing. Backman (1953, p. 148) argued: "The graveyard of business is filled with the skeletons of companies that attempted to base their prices solely on costs." Nagle and Hogan (2006, p. 3) emphasized how cost-based (or cost-plus) pricing can mislead firms that are segmenting the market: "Cost-plus pricing leads to overpricing in weak markets and underpricing in strong ones – exactly the opposite direction of a prudent strategy." Unfortunately, many firms have not

adopted demand-based pricing and are sacrificing profits. "For most businesses, pricing is a profit-leaking paradox." (Mohammed, 2005, p. 24). Baker (2006, p. 101) called for renewed emphasis on this issue: "Cost accountants have had a significant impact on pricing decisions in companies, and it is time to bring their tyrannical rule to an end."

Many surveys have confirmed that cost-based pricing is the most common method employed by firms. Zeithaml, Parasurman, and Berry (1985) found that U.S. service firms used cost-oriented pricing more than competition-oriented or demand-oriented pricing. During the 1980s, cost-based pricing use increased among sixty U.S. industrial firms (Coe, 1990). Noble and Gruca (1999) found that while most U.S. manufacturers employed more than one pricing technique, the most common method, cited by 56 percent of respondents, was cost-based pricing. A large survey of firms in nine Eurozone countries found that more than half fixed their price with a markup over costs (Fabiani et al., 2007). Hinterhuber (2008) reviewed nearly two-dozen surveys of firms in North America, Europe, and Asia, conducted over a 24-year period. He concluded that, on average, 44 percent used competition-oriented pricing, 37 percent used cost-based pricing, and only 17 percent used customer-valued-oriented or demand-based pricing. Raju and Zhang (2010, p. 2) wrote: "An overwhelming majority of U.S. companies use the cost-plus approach to set their prices." Smith and Nimer (2012, p. 17) agreed: "... most corporations today use some form of cost-based pricing to set prices."

This paper discusses several reasons why demand-based pricing may not have been adopted by more firms. The first section considered a hypothetical manager who is interested in improving his or her firm's pricing process. He or she may visit a library or buy books online. To learn what the manager is likely to read, a content analysis of more than 85 current or classic pricing texts was conducted. Three questions were considered: (1) How were the advantages

and disadvantages of cost-based pricing described?; (2) How was the superiority of demand-based pricing explained?; and (3) What techniques were suggested for estimating buyer willingness-to-pay and demand? Although these books are neither a random sample nor a census, they represent much of what a manager is likely to read. The second section addresses some of the gaps identified in the pricing literature by the content analysis. The third section presents a graphical approach for comparing prices that may help convince firms about the merits of considering demand when setting price. The paper concludes with four recommendations on how to sell demand-based pricing in applied economics writings and in the classroom.

#### I. Contents of Pricing Texts

To improve his or her firm's pricing process, the manager may select several books for ideas. Many texts contained special topics that could be of value to some firms. Several offered advice for firms on negotiating sales (e.g., Morris and Morris, 1990; Daly, 2002; and Holden and Burton, 2008). Dolan and Simon (1996) included a chapter on "International Pricing" with an emphasis on the economics of trade while Maxwell (2008) focused on cultural differences and pricing practices by country. The pricing of services was covered by Baker (2011). Price wars were discussed by several writers (e.g., Cram, 2006; Ruskin-Brown, 2008; and Raju and Zhang, 2010). One might think a book titled "How to Price" would be exactly what the manager was looking for, but Shy (2005) focused on the advanced mathematical derivations behind classical economic demand theory which may be difficult for the manager to apply. Winninger (2000) emphasized many options for adding value to products and for differentiating products from competitors but did not mention how to choose a price. Kennedy and Marrs (2011) concentrated on how to reduce price discounting. Calogridis (2010) discussed how firms can develop pricing

plans but offered little advice on the pricing process. Smith (2013) described how DuPont designed an organization within the firm to pilot and test different pricing options and Liozu (2015) provided advice on how to promote changes in the pricing process at companies. Many of these special topics may be particularly helpful for large firms.

Instead of highlighting the benefits of demand-based pricing or discussing the limitations of cost-based pricing, many authors chose to describe cost-based pricing with negative terms. The process was criticized for its "arbitrariness," for being a "formula for mediocrity," and for having a "fundamental flaw" (Morris and Morris, 1990; Gregson, 2008; Hill, 2013). It was referred to as "unsatisfactory," "dumb," "dead," "reckless," "foolish," "wishful thinking," a "delusion," a "fallacy," or even a "sin" (Oxenfeldt, 1961; Cram, 2006; McGroarty, 1989; Bouter, 2013; Dolan and Simon, 1996; Baker, 2006; Nagle and Hogan, 2006; Mohammed, 2005; Vohra and Krishnamurthi, 2012). Depicting the most common pricing systems with derogatory terms cannot strengthen the case favoring demand-based pricing. Only a few books discussed a case study or showed a numerical example as evidence that the cost-based approach had flaws.

Many authors attempted to demonstrate the superiority of demand-based pricing by claiming a 1 percent price improvement (i.e., a price increase with no volume decline) would produce a larger profit increase than either a 1 percent variable cost reduction or a 1 percent fixed cost reduction. These calculations do not necessarily favor demand-based pricing because cost-based prices could be changed. The relatively wide range of estimated profit gains for a typical firm from a 1 percent price improvement [7.1 percent, 11.0 percent, 8.7 percent, 10.29 percent, and 12.3 percent (Docters et al., 2004; Marn, Roegner, and Zawada, 2004; Baker, Marn, and Zawada, 2010; Raju and Zhang, 2010; Meehan et al., 2011)] may also raise some doubts about the calculations.

Demand elasticity ( $\mathscr{E}$ ) is one key component of the economist's pricing toolkit. If marginal cost is assumed constant over the range of quantities being considered and demand is elastic, the profit-maximizing price can be determined by the demand elasticity and average variable cost (AVC) (i.e., optimal price = { $\mathscr{E}$ \* AVC} / { $\mathscr{E}$ + 1}). Some authors criticized or misused the term "elasticity" or suggested that the concept had limited value (e.g., Stiving 2011; Killingbeck 2011; Holden and Burton, 2008; and Doctors et al., 2012). Many of the books did not explain how a manager can use elasticity estimates to improve pricing decisions.

A basic prerequisite for demand-based pricing is to have estimates of the demand relationship. If the manager looked in the texts for demand estimation techniques, he or she would likely be disappointed. Only a few books provided a list of methods and some used definitions that were confusing. Morris and Morris (1990) recommended qualitative and quantitative methods (manager judgement, buyer feedback, buyer surveys, and historical data analysis). Dolan and Simon (1996) added pricing experiments to the list of options. In a 1992 paper, Anderson, Jan, and Chintagunta asked firms and suppliers about the use of nine demand estimation methods and found buyer surveys on attribute importance and focus groups were employed the most. These nine estimation options were listed in several books with limited explanations. Only a few books described the challenges involved with the demand estimation methodologies (e.g., Cram, 2006; Ruskin-Brown, 2008; Biehn and Zawada, 2013; and Simon, 2015). None of the texts that recommended buyer surveys described how to address the problems of hypothetical bias or strategic-answer bias.

The review of the texts suggests that the manager will probably not find a persuasive case favoring demand-based pricing. The benefits and limitations of cost-based pricing were rarely mentioned and the important information about how to estimate demand and buyer willingness-

to-pay were not included in most books. The next section will try to address these gaps in the literature.

#### II. Gaps in the Pricing Literature

Cost-based pricing does, in fact, offer firms some benefits. It is easier to calculate and easier to administer than demand-based pricing. Noble and Gruca (1999) found that in markets where demand was more difficult to estimate, cost-based pricing was more prevalent. The process requires less data and the costs are perceived to be concrete and unambiguous. Cost-based pricing is also easier to defend to stakeholders. Employees inside the firm, salespeople, and customers can understand the pricing process. Burck (1972) claimed that cost-based pricing has a great public relations benefit. The process is probably perceived to be fairer by customers. Researchers have found that people perceived external cost increases to be fair and reasonable justifications for price increases (e.g., Urbany, Madden, and Dickson, 1989; Bolton, Warlop, and Alba, 2003; Vaidyanathan and Aggarwal, 2003; and Herrmann et al., 2007). If price increases are perceived to be unfair, a firm could face unhappy customers. Maxwell (2008, p. 91) noted: "People who feel that a price is unfair are highly motivated to punish the seller whom they hold responsible."

For the firm, cost-based pricing provides certainty of some profit and offers protection when costs rise – particularly if cost increases are unexpected. Cost-based pricing may also create a stable market if competitors also use it. It has a long history at firms and has helped them generate profits. The result may be close to optimal without all the analysis needed to do demand-based pricing. Hanson (1992, p. 150) claimed that if cost-based prices are revised regularly, based on new cost and sales information, the results could be: "... a perfectly

acceptable shortcut to excellent performance." Hanson and Kalyanam (1994) checked if cost-based pricing could help a firm learn about demand and found that little information was generated. They identified a bias or "cost-plus trap" that appeared to encourage companies who started collecting demand information to continue setting prices based on costs.

Hardly any authors described specific cost-based pricing limitations. Often the costbased price will be lower than the profit-maximizing price. Cost classification can be somewhat arbitrary, especially if the firm has a large product line and overhead is allocated across all the products. Other accounting issues involve the choice of either historical costs or replacement costs and the source of the margin that is used. Because costs are taken as given, the firm's focus may shift away from efficiency improvements. Cost-based pricing ignores important factors including demand, brand image, product positioning, and the value customers derive from the products and sacrifices potential profits. Crouch and Hunsicker (2013, p. 178) pointed out: "A purely 'cost-plus' or margin driven mentality can leave a company vulnerable to under- or over pricing, margin deterioration, or volume loss." The benefits of incremental volume are likely to be discounted because most users of cost-based pricing would tend to count overhead as a cost to generate the sales gain. A few authors recognized the circular logic in the cost-based pricing process (e.g., Nagle and Hogan, 2006). A quantity is selected, the cost to produce that quantity is calculated, and a margin is added to costs to set the price. Of course, the price selected could change the quantity, which would start the loop again.

Several authors have tried to explain why firms chose cost-based pricing (e.g., Brooks, 1975; Urbany, 2001; Johansson et al., 2012; Toytari, Rajal, and Alejandro, 2015; and Toytari, Keranen, and Rajala, 2017). Lack of data and lack of tools were often mentioned. A survey of industrial marketing managers found that about 70 percent agreed or strongly agreed that their

pricing strategy would be more effective if they had better demand elasticity measures (Morris and Joyce, 1988). This implies that strong, clear research methods are important. Clancy and Shulman (1993) surveyed managers of American companies and found only 12 percent conducted survey research on pricing. Liozu (2015) reported that only 15 percent did systematic primary pricing research. The lack of good information about methods to estimate demand may be contributing to the limited use of demand-based pricing.

Demand estimation options can be grouped into seven categories. Simon, Bilstein, and Luby (2006) suggest using techniques from several categories. Besides the surveys and focus group class, other methods that could be used include managerial judgement/expert interviews, comparisons with similar products/benchmarking, laboratory experiments/test markets, historical data analysis, estimation of the economic value to the customer/internal engineering assessments, and conjoint analysis/choice experiments. Each approach has some benefits and limitations. Three of these categories will be discussed below

Surveys and focus groups can produce misleading results because responses may be biased (e.g., hypothetical bias, strategic-answer bias etc.). Research based on survey questions such as "What would you pay?" or "Would you pay \$x?" can be affected by the hypothetical nature of the questions and by strategic responses from respondents. When price is specified in a question, a large sample size may be needed. To reduce sample size needs, some researchers add conditional questions (If they say no to \$x, ask if they would pay \$x-a, and if they say yes to \$x, ask if they would pay \$x+b). A problem with this "multi-bound" approach is that if respondents agree with the first question, they tend to disagree to the second question no matter what price is mentioned (Jeanty, Haab, and Hitzhusen, 2007).

Two "named" approaches are sometimes mentioned in the literature. In Europe, the Gabor-Granger model and the Van Westendorp Price Sensitivity Meter have gained popularity (Lipovetsky, Magnan, and Polzi, 2011). Unfortunately, both approaches suffer from response inconsistencies (Lyon, 2002). The Gabor-Granger model involves asking buyers if they would buy at a specific price. Then additional, contingent questions are asked (i.e., a multi-bound approach). The Van Westendrop method asks buyers four questions and constructs a graph with two upsloping and two downsloping lines. Points where two lines intersect are said to identify the acceptable price range and the optimal price. The value of these intersections may be unclear (e.g., the optimal price is where the percentage of subjects who doubt the product's quality because of its price is perceived to be low is equal to the percentage who think the item is too expensive). Extraneous factors and the price range in the survey can influence the elicited price results (Bakken, 2012). Since this method involves asking people about price and quality perceptions, both hypothetical bias and strategic-answer bias could occur. Ruskin-Brown (2008) suggested that respondent biases may limit the usefulness of this method to cases involving new products in new markets. Lazar (2009) predicted these two approaches will soon be replaced by discrete choice experiments.

Several types of experiments may provide useful information to firms. Vickery auctions with incentives, field testing (e.g., test markets), or virtual shopping experiments could be used by some firms. Dolan and Simon (1996), Schindler (2012), and Smith (2012) were proponents of conjoint analysis. Full-profile conjoint analysis could be employed, but experimental design issues can influence the results (e.g., number of attributes, range of attributes levels and prices shown etc.). This method may not be appropriate for "low-involvement" items or for categories with a variety of products. If many people always "buy" or "never buy" at experiment prices, the

results may be invalid (Gensler et al., 2012). Adaptive or partial-profile conjoint analysis may address some of these issues. Discrete choice experiments were recommended by several books (e.g., Dolan and Simon, 1996; Meehan et al., 2011; and Hunt and Saunders, 2013) but have limitations. These experiments are complex, can generate biased price sensitivity estimates, and may produce inaccurate results (Sichtmann, Wilken, and Diamantopoulos, 2011). Adding incentives and using hierarchical Bayesian analytical techniques may improve the approach. Although several books recommended conjoint analysis or discrete choice experiments, few books discussed the challenges involved in these techniques.

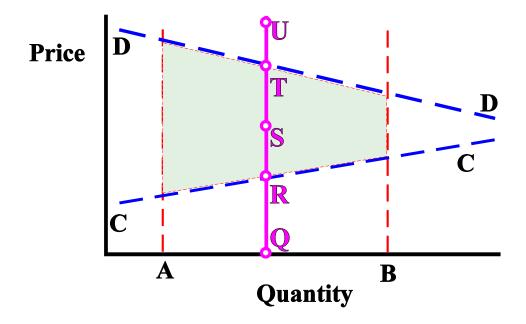
Economists might recommend historical data analysis using econometrics.

Unfortunately, there is rarely sufficient price variation in historical data for econometric analyses (Simon, 2015). The results are sensitive to assumptions about the distribution of the buyer's maximum willingness-to-pay (Bodea and Ferguson, 2014). Advanced econometric methodologies may also be required to minimize biases. Haupt and Kagerer (2012) studied weekly supermarket sales and found significant nonlinearities and heteroscedasticity in sales-response relationships. Business managers may prefer simpler pricing research methods that are easier to explain to coworkers and customers.

## III. Graphical Approach for Comparing Prices

A new approach may help teach businesses and students about cost-based and demand-based prices. Figure 1 shows a simple graphic that could be used to encourage more firms to consider demand when choosing their price. Assume a firm has a minimum quantity goal, perhaps, based on a breakeven analysis or goals of power, prestige, or survival, and a maximum capacity. These constraints can be represented by vertical lines A and B in the graphic (line A

Figure 1. Pricing Constraints and Pricing Options



could be nonlinear, but this will not change the results). The firm has average costs that are a function of quantity, represented by line CC. Many firms assume that their average costs are fixed (i.e., line CC is horizontal) for the range of quantities they are considering. Whether line CC represents average total costs or average variable costs, it will not change this analysis [i.e., although economists probably would recommend using average variable costs, most firms use average total costs in their cost-based pricing (Govindarajan and Anthony, 1983; Shim and Sudit, 1995; Altomonte, Barattieri, and Basu, 2015)]. Buyer willingness-to-pay is represented by line DD. Even if the actual demand was nonlinear, with kinks, steps, and sections with positive slopes due to pricing psychology (Larson, 2014), the lessons being illustrated would not change. This creates four constraints and a shaded area that represents a set of feasible price-quantity combinations that meet the constraints.

To set price using the cost-based pricing process, the firm would choose a quantity (labeled Q in Figure 1) and calculate the cost to produce that quantity (labeled R). To this cost,

the firm adds their margin and arrives at their price. The price chosen could be a point like S, inside the feasible area. It could be a point like T, on the demand line, or a point like U, outside the area. If the margin selected pushes price out of the feasible area, the firm's sales will be less than quantity Q. Setting a price at point T would generate the most profits when selling quantity Q. However, the likelihood of selecting a margin that would produce a price on the demand function is low. The most likely result of the cost-based pricing would be a price inside the feasible area, like point S. Classical theory would suggest a shortage would exist at point S, which would drive prices higher. However, if the firm set sales quotas consistent with point S and adjusted their marketing efforts to generate sales of Q, the unmet needs of prospective buyers may not be noticed by the firm.

From point S, it is possible to improve profitability by raising price toward the demand line (i.e., vertical change), by increasing quantity if average cost is fixed, or by raising both price and quantity. Quantity might be increased by raising sales quotas, increasing salesperson/dealer incentives, entering new markets or distribution channels, and boosting advertising (i.e., to increase buyer awareness). The key would be to stay inside the feasible area.

Instead of focusing on profit optimization, perhaps firms need heuristics to help them increase profits by raising their quantity goal and price while staying inside the feasible area. The demand-based pricing model requires excellent estimates of the demand function (i.e., location and slope). Managers seem to understand that small errors in demand forecasts could produce poor prices. Knowing the precise shape and position of demand may be less important when selecting a price-quantity combination close to, but below, the demand function. Banker and Hansen (2002) developed three decision heuristics involving costs, capacity, demand, and price. They found one with an adjustment for demand elasticity that reached the optimum 99.5 percent

of the time. Developing more decision rules that guide firms to select price-quantity combinations close to the demand function may help firms with their pricing processes. Shifting the focus from profit optimization to profit improvement may make it easier to sell demand-based pricing.

#### IV. Conclusions and Recommendations

This research suggests that how the pricing process is described in books and in classrooms may be contributing to the limited adoption of demand-based pricing. The case for demand-based pricing could be made more persuasive by acknowledging the benefits and limitations of the cost-based approach. Instead of using derogatory names to describe cost-based pricing, examples should be offered that compare the pricing processes. A simple graphic can highlight that it is unlikely for a cost-based process to select a price on the demand curve and that more profits can be earned by firms who consider demand in their pricing. Claiming that demand-based pricing can optimize profits may not be as persuasive as claiming principles from demand analysis can help improve profits. As an initial step toward greater demand-based pricing adoption, applied economists should develop techniques that produce inexpensive, rough estimates of the demand relationship that includes many pricing psychology principles (Larson, 2014). Decision rules should be developed to guide firms, particularly small and medium-sized enterprises, on their price choice. As firms experience the benefits of using demand to select their price, they will likely become interested in more demand-based pricing principles.

In the classroom, students need to learn the benefits and costs of all the methods firms employ to set price. Students should also learn about the different techniques for estimating demand. Their future employers may be interested in using techniques such as Vickery auction

experiments with incentives, virtual shopping simulations, incentive-aligned, hierarchical Bayesian discrete choice experiments, and partial-profile or adaptive conjoint analysis to better understand buyer willingness-to-pay. Besides adding these methodologies to the student's toolkit, one additional skill may be needed to increase firm interest in new pricing approaches. Liozu (2015) argued that cost-based pricing is so ingrained at firms that anyone proposing a switch to a new system needs considerable patience and change-management skills. Teaching students about change-management could be particularly useful for helping them convince firms to try principles from demand analysis.

Applied economists have been trying to convince firms to change their pricing systems for many years with little success. Four changes may help strengthen the case for demand-based pricing and reduce the dominance of cost-based pricing. The benefits of cost-based pricing need to be acknowledged in the writings by applied economists and in the classroom. Second, the focus should shift from profit-optimization to profit-improvement. Third, new decision rules and demand estimation techniques should be developed that better meet business needs. And finally, students need to learn about several price-setting processes, about different ways to estimate demand, and about change-management. Over time, these four changes may help sell more firms on the benefits of demand-based pricing.

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