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Thinking Strategically About Price Wars

In the current economic climate avoiding "price wars" is a top priority for every company, and understandably so as the climate price wars generate prove detrimental to profits, both short-term and long-term, and may threaten the long-term survival of the firms involved. Modelling pricing tactics in a simple game theoretical space sheds light on the nature of price wars. In this article, the author uses recent discussions involving pricing and game theory applications to offer new viewpoints on using these types of models with regards to price wars. Nickolas Cherrier is a consultant at Simon-Kucher & Partners. He can be reached at nickolas.cherrier@simon-kucher.com.

In the current economic climate few words echo more fear in a boardroom than "price war," and understandably so as the climate it generates proves detrimental to industry profits in the long-term and may jeopardize the very survival of firms involved in it. Modelling pricing tactics in a simple game theoretical space sheds light on the nature of price wars.

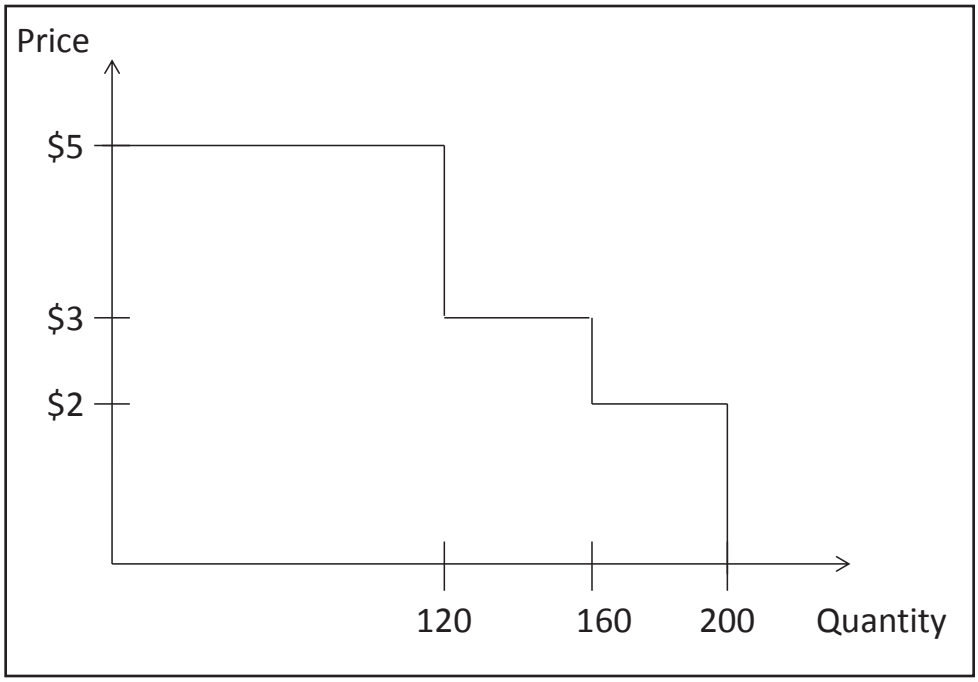
An article entitled "Avoiding Price Wars" was featured in the The Journal of Professional Pricing (Fourth Quarter 2012). Its author attempted to represent pricing tactics in a simple two-by-two prisoner dilemma in order to illustrate the importance of non-price factors such as customer loyalty. His demonstration contrasts with the Bertrand duopoly model in its acceptance of two markets, one elastic and one inelastic. Customers he argues, even in a commoditized market, are not all driven solely by price. The outcome of his model is that the Nash Equilibrium is found when one firm cuts price and the other maintains price.

The above conclusion while significant is overshadowed by flawed assumption. Indeed, while the author introduces an expanding demand as prices decrease, the portion of the market which is inelastic behaves irrationally in the model. When firm A has a lower price than firm B, it attracts 45% of the market segment. When firm A has a higher price than firm B, it attracts 80% of the same market segment. The assumption is therefore that the inelastic market segment has a negative cross-price elasticity. All else being equal, a pure price increase from a firm rarely, if ever, draws-in new customers.

The following representation offers a different approach. Our assumptions are built on two firms competing in a commoditized market. The legal framework insures the game is non-cooperative in nature. Price is the only available variable to achieve the objective: profit maximization. Other non-price constants such as market forces and brand loyalty constitute a black box which directly impacts the market demand. As market prices increase, market demand decreases. Each firm has three price points it may choose from for its good: $5, $3 and $2. Each customer contributes a marginal payoff equal to the chosen price point. 200 customers are willing-to-pay up to $2, 160 customers are willing-to-pay up to $3 and 120 customers are willing-to-pay up to $5 (Figure 1).

Customers have the choice to purchase goods from either of the two firms and, while price plays an important role, it is not the only factor. By assuming that other factors come into play, demand is treated as not fully elastic which results in a softer allocation of customer preferences. If both firms choose a similar price point, the market will be split equally. For the sake of simplicity, the outcomes are mirrored which results in three other potential scenario: ($3,$2),

Figure 1: Willingness-to-pay assumption



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($5,$3) and ($5,$2). For these, the market allocates the market demand in the following ratios respectively: 7:13, 5:11 and 1:4. Payoffs are calculated by multiplying the price point chosen by the demand allocated to each firm (Figure 2).

The outcome of this three-by-thee model is noteworthy when considering there are two Nash Equilibriums in ($3,$2) and its mirror strategy ($2,$3). Given the nature of the Nash Equilibrium, no one firm would be better off with a unilateral change in strategy. Note that the ($2,$2) strategy yields the worst result: 'price war'.

The implications are threefold:

1. The co-existence of two different dominant strategies hint to a real-life equivalent of no one-size-fits-all. In this particular model, one firm opts for a volume based strategy while the second opts for a more value based approach. The volume strategy in this outcome is the one which yields the highest payoffs and is therefore the more attractive of the two. This does not mean that a volume strategy is preferable to a value strategy in all cases, just in this particular game. Ultimately price elasticity of demand and cross-price elasticity determine the optimal strategy.

2. This model was set out as a single iteration non-cooperative game. In the business world, pricing does not happen in a vacuum. Firms use their competitive intelligence to predict and react to their competitors. If this game was sequential (but still a single iteration play), thinking strategically the first player would choose $2, forcing the second to choose $3. The existence of a first mover advantage can therefore not be ignored. Firms' actions trigger competitive reactions. Managers should therefore make sure they factor the sequential nature of business into their pricing strategy.

3. Pricing decisions should always be taken with a long term vision. If this game is not played once but repeated over a long period of time, industry payoffs ought to be considered (Figure 3). The industry as a whole would benefit from a ($5,$5) strategy, and indeed both firms would be better off. Unless the market demand is extremely price elastic, or the product is very easily substitutable, industry-wide price increases are always beneficial for all firms in the market.

The last point brings about an interesting question. **If we understand business to be a reiterative sequential non-cooperative game, how can we explain the existence of price wars?** Rejecting the irrationality argument, below are four common reasons:

1. **Market entrants may undercut competitors to establish themselves as price leaders.** This price war scenario assumes a price response from established competitors as they attempt to retain market share.

2. **Hurt yourself but hurt the other more.** Traditionally seen as a Goliath strategy for established market leaders, the aggressor believes it will run its opponents out of business or teach them an expensive lesson.

3. **Short term vision and miscalculations are causes for disaster.** When management are short sighted, the game shifts to a small number of iterations and decisions are made to maximize profits in the short term. Also, markets are not always transparent and customer responses not easily predictable. Miscalculations of payoffs may result in a volume strategy appearing more appealing that it actually is. Undercutting competitors could therefore seem appropriate and may unfortunately trigger a tit-for-tat response.

4. **Profit maximization is not always the objective.** Indeed, as a manager you may be playing an entirely different game from your competitors. In some countries and/or industries market share is held sacrosanct. Firms may be willing to sacrifice profit for share.

In all cases, consequences of price wars are long lasting and detrimental to industry profits. Managers should think strategically about pricing in order to avoid embarking on an unpleasant journey.

Figure 2: Payoff matrix

A,B	$5	$3	$2
$5	300,300	250,330	200,320
$3	330,250	240,240	210,260
$2	320,200	260,210	200,200

Figure 3: Industry payoff

A,B	$5	$3	$2
$5	600	580	520
$3	580	480	470
$2	520	470	400