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Quality signaling via strikethrough prices[☆]

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ABSTRACT

Why do firms often advertise their current price together with their past price? Although consumers expect high quality products to have high prices, such firms may optimally charge lower prices when faced with low production costs. Thus in markets in which quality is difficult to ascertain and costs often fall over time, for example technology products, high quality firms may face a challenge of signaling their quality through current price alone. In this paper we develop a price signaling model in which uninformed consumers draw inference not only from the current price but also the prior period's price (the "strikethrough price") if the firm chooses to disclose it. We find that a high quality firm benefits from using strikethrough pricing when the prior probability of high quality is relatively low while the probability of costs falling is relatively high.

1. Introduction

Why do consumers pay attention to sales prices? Standard economic theory posits that a consumer who is familiar with a product and knows his valuation for it need only consider the current price for the product and its substitutes. However, experience shows that consumers use both current and past prices when making their purchase decisions. In particular, the practice of offering discounts relative to a posted past price appears to be attractive for companies. In 2015, for example, JC Penney settled a class action lawsuit for $50 million that claimed the retailer had artificially increased past prices and posted fake "regular" prices to make discounts look enticing to consumers.[1] Notwithstanding this, 1 year later JC Penney and many of its competitors, including Kohl's, Sears and Macy's, were accused in a California lawsuit of engaging in the same practice again during the 2016 holiday season.[2] The practice of posting a sales price together with the current price is not unique to big box retailers, with online merchants a frequent user of the practice as well.[3]

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1 "J.C. Penney settles suit calling its 'discount' prices a scam." *New York Times*, by Hiroko Tabucki. November 12, 2015.
2 "JC Penney, Sears, Macy's, and Kohl's sued for 'fake' sale pricing." *NBCnews.com*, by Ben Popken. December 9, 2016.
3 "It's discounted, but is it a deal? How list prices lost their meaning." *New York Times*, by David Streitfeld. March 6, 2016. See also "Are you really getting a discount, or is it just a pricing trick?" *Harvard Business Review*, by Rafi Mohammed. March 23, 2016.

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Various explanations for the use of sales prices have been explored in the marketing literature, most of them focusing on the role of the pre-sale price as a reference price (see Grewal, Krishnan, Baker, & Borin, 1998; Kalyanaram & Winer, 1995; Mazumdar, Raj, & Sinha, 2005). According to this theory a pre-sale price becomes the "perceived" price, that is the price that a consumer expects to pay for a brand or product category. Consumers judge current prices against this standard to determine whether such prices are favorable or not. Our paper departs from this paradigm by considering the uncertainty some consumers have about product quality before making a purchase. We observe that a low current price may be a signal of low quality, but it may also arise from a high quality product whose marginal cost of production has fallen. This point is especially relevant in technology markets where production costs typically fall fast after a new product is introduced. In such markets a consumer who looks to the current price alone to draw inference about a product's quality may be unable to precisely do so since in general prices reflect many factors other than product quality, such as the costs of production and the competitive environment. We show that in this setting displaying a past price can be informative. Because a low quality firm generally enjoys a cost advantage over its high quality counterpart during a product's introductory phase, the former would typically charge a lower price than the latter during this phase. Disclosure of a high introductory price in the subsequent mature phase can therefore signal high quality at that time.

In our model a single firm has exogenous quality that is either high or low and which is fixed across two periods (the "introductory period" and "mature period"). Whereas a low quality firm always has low production costs, a high quality firm has high costs in the introductory period which may fall to low in the mature period with some probability. The firm sets a price in each period after privately observing its costs and quality. A new cohort of consumers arrives in each period, uninformed of quality but able to draw inference from prices. This includes the current period's price and, in the mature period, the past price if the firm chooses to disclose it (which we refer to as the "strikethrough price").

The possibility of posting a strikethrough price in the mature phase provides a link between the two periods: when a firm sets its price in the introductory period it knows this may affect consumers' quality inferences both in that period and in the subsequent period should it choose to disclose a strikethrough price. Since a new cohort of consumers arrives each period, absent this link the two periods would stand alone with the high quality firm independently price signaling in each period, a result already well understood given the state of the literature.[4] However, in our model when strikethrough prices are not used the high quality firm is not always able to distinguish itself from the low quality firm in the mature phase. This is because in some cases the high quality type enjoys a cost decline and so it has the same costs as the low quality type, making separation impossible within our price-signaling framework. This aspect of the model captures the insight that consumers' inferences about quality from price can be hindered by a volatile cost environment. The result is that consumers in the mature period form a Bayesian posterior that pools over the high and low quality types, thus disadvantaging the firm that is truly high quality. The lower the prior probability of high quality, the less favorable are consumers' pooled beliefs, and thus the more a truly high quality firm suffers from not being able to distinguish itself from a low quality firm.

We show that by truthfully disclosing its first period price in the mature period, a high quality firm is able to separate itself from the low quality firm since the prices that were charged in the introductory phase successfully "proved" the firm was of high quality then. However, once the two periods are linked by strikethrough prices in this manner the low quality firm has an additional incentive to mimick its high quality counterpart in the introductory period, since doing so would induce consumers to believe its quality was high in *both* periods. For this reason the high quality firm must charge a very high price in the first period to deter mimickry. The price signal is therefore frontloaded, allowing the high quality firm to charge a second period price that is not distorted. In equilibrium the low quality firm is revealed by charging its full information price in each period, and it has no incentive to use a strikethrough price.

After characterizing the strikethrough equilibrium we give the necessary and sufficient conditions for such an equilibrium to exist. It is required that the benefit from being perceived as high quality not be too high, or else it is impossible to deter the low quality type from mimicking, even with the use of strikethrough prices. After performing comparative statics on the prior probability of high quality and the probability of a cost reduction across periods, we provide a characterization of model parameters such that the high quality firm receives an expected benefit from the use of a strikethrough price. We find strikethrough prices are beneficial to high quality firms when the prior probability of high quality is relatively low and the probability of a cost decline is relatively high. This is because, absent strikethrough prices, when a high quality firm's cost declines in the mature phase it is pooled with the low quality type, and consumers' pooled inferences will be relatively pessimistic if the prior probability of high quality is low. Thus the gain from using strikethrough prices is greater in this case. In addition, the more likely a cost decline the more often the high quality firm would be pooled with the low type in the mature phase, and thus the greater the gains from separating using a strikethrough price.

1.1. Literature review

Signaling of quality through price has received considerable attention in the marketing literature (Bagwell & Riordan, 1991; Moorthy & Srinivasan, 1995; Rao & Monroe, 1989). Bagwell and Riordan (1991) have shown that in a one-period model a high price can be a signal of high quality, since a low quality firm is discouraged from mimicking a high price due to its greater profit

[4] See Linnemer (2012), for example, for a one-period model in which cost differences between quality types allow for signaling even when all consumers are uninformed.