Modeling Coupon Values for Ready-To-Eat Breakfast Cereals

by

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While the functions of coupons have been widely studied, few researchers have attempted to model the factors that influence the face values of coupons. Reasons for this void include a lack of detailed transactions data and the fact that coupon information is proprietary. Since no study comprehensively analyzes the determinants of coupon values, the literature does not provide insight to firm managers as to what these significant factors may be. Understanding the determinants of discount levels is becoming increasingly important for firms. There is concern that discounts have risen above their optimal values, and large companies such as General Mills and Proctor & Gamble have slashed promotional budgets. Knowing what variables influence coupon values will aid managers in determining optimal discount levels and help prevent wasteful overspending on promotional programs.

The objective of this study is to fill the gap in the literature by formulating and testing a model that identifies the significant determinants of coupon values at the brand level. The theoretical framework is based on three streams in the literature: profit maximization theory, address models, and hedonic pricing studies. Furthermore, the empirical model is estimated with reliable grocery scanner data on ready-to-eat (RTE) breakfast cereal purchases.

This study should be of interest for two reasons. First, couponing is big business. Cereal manufacturers print billions of coupons annually, and almost one-third of the volume of cereal is purchased with coupons. Since the late 1980s, trade promotion expenditures by cereal manufacturers have exceeded expenditures for mass-media advertising (Connor 1999). Second, understanding how coupon values are determined is important for analyzing consumer welfare issues. Cereal manufacturers appear to have extensive unilateral market power and engage in tacit collusion to set supra-competitive prices (Cotterill 1996). Firms put forth great effort to maintain brand value and create barriers to entry through advertising, promotion, product

differentiation, product proliferation, and variation (Kahn 1996). Coupons are issued to price discriminate, extract consumer surplus, maximize profit, and get the most out of high brand prices. If consumers in this industry are to be protected, antitrust economists must understand the negative impacts of cereal coupons.

In the only study that explicitly models coupon values, Gerstner, Hess, and Holthausen (1994) derived a profit function for a price-discriminating monopolist that issues coupons to consumers who vary in their willingness to pay and level of transactions costs. The optimal brand coupon value was found by differentiating the profit function with respect to the discount, setting the first-order condition equal to zero, and solving for the coupon value. The empirical model specifies brand coupon values as a function of the markup margin, retail brand price, and a new product dummy variable. Gerstner, Hess, and Holthausen (1994) estimated the model with grocery coupons that were clipped from newspapers across the country. The variables were found to be statistically significant. The hypotheses that coupon values rise with higher retail prices and decrease with an increasing percentage retail margin are supported. In addition, the results indicate that larger face values are associated with new products.

Shaffer and Zhang (1995) investigated target couponing as a firm strategy. Using an address model, they argued that coupon issuance can be an offensive or defensive strategy. Offering discounts can increase a firm's sales by stealing away rival firms' price sensitive consumers. However, coupons may also be used to defend a firm's market share when its customers are targeted. Firms engage in more defensive couponing when the intensity of competitive targeting increases. Shafer and Zhang (1995) also noted that the discount level for a given brand is inversely related to the consumers' loyalty to that good.

Stanley and Tschirhart (1991) estimated the implicit prices of breakfast cereal

characteristics using a hedonic pricing model. Product attributes were assumed to provide one or more of the following services to consumers: taste, nutrition, and convenience. The characteristics considered in the study were vitamin, sugar, fiber, sodium, and preservative levels; texture, grain type, whether a given brand contained fruit, and if the product was natural. A linear Box-Cox model was estimated with information collected from cereal boxes. The results indicate that individuals pay more for brands that contain fruit as well as those cereals that are puffed, made from oats, and labeled as natural.

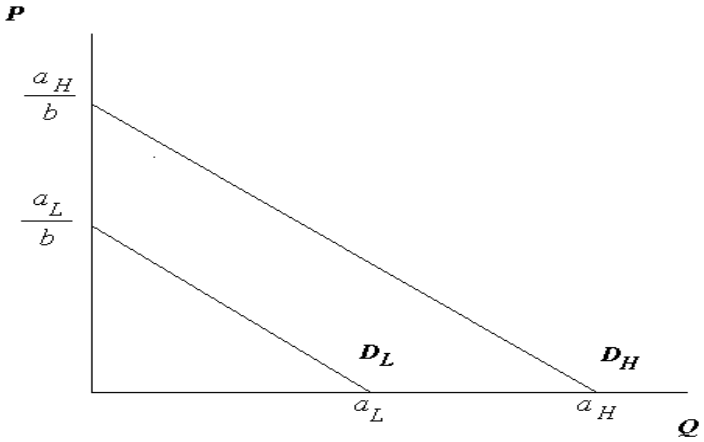
The conceptual model is an extension of the works by Gerstner, Hess, and Holthausen (1994), Shaffer and Zhang (1995), and Stanley and Tschirhart (1991). By itself, each piece only considers a subset of the factors that influence the size of discounts. Combining the spirit of each work gives a more complete understanding of the determinants of coupon values. Using Gerstner, Hess, and Holthausen (1994) as a starting point, the development of the model begins with a single, profit-maximizing firm that produces one good. The manufacturer actually has several rivals, but interfirm competition is disregarded for the time being. However, it is important to know that although the firms produce highly substitutable products, the manufacturers engage in fierce product differentiation. As a result, each firm holds a localized monopoly over its brand, and the demand curves of the individual consumers are downward-sloping and fairly elastic.

Assume that the consumers in the firm's market vary in their willingness to pay for the product. A person's willingness to pay is thought to be a function of his/her preferences. At one end of the spectrum, there are consumers who gain much pleasure when they consume the item. These individuals value the good highly and have a high reservation price for the product. These customers are called Highs, and their reservation price is denoted as P_H. Consumers with strong

preferences are considered to be brand loyal. On the other hand, there are individuals who only weakly prefer the item. As a result, they are not willing to pay as high a price as those who highly value the product. These consumers are nonloyal because they are not attached to the brand and may be enticed to buy a rival's competing good. These individuals are denoted as Lows, and they have a reservation price equal to P_L.

It is assumed that each consumer's demand curve can be represented by a linear function. All Highs have the demand curve $Q_H = a_H - bP$. Similarly, the demand curve for a Low is $Q_L = a_L - bP$. Because the two groups have different reservation prices, the Lows' demand curves are below that of the Highs ($a_L < a_H$). Each High has a reservation price equal to a_H/b, and the nonloyal consumers' reservation price is a_L/b. The slopes of the demand functions are assumed to be the same. The demand curves for individual loyal and nonloyal consumers are shown graphically in Figure I. The High and Low's demand curves are denoted as D_H and D_L, respectively.

Figure I. Demand Curves for Individual Loyal and Nonloyal Consumers



If the firm charges a retail price, P, greater than P_H (or a_H/b), the quantity purchased by any consumer is zero. Therefore, setting $P > a_H/b$ is not the optimal pricing strategy for the firm.

The manufacturer could set $P < a_L/b$, but the firm can increase its profit by setting $a_L/b < P < a_H/b$ and price discriminating against the consumers. When $P < a_H/b$, brand loyal individuals buy the product, and the quantity demanded increases as P falls (as specified by the High's demand curve). As long as $P > a_L/b$, the nonloyal consumers are excluded from the market. This is true because the retail price is greater than their willingness to pay for the brand. The crucial concept is that if $P > P_L$ and the firm wants some portion of the nonloyal segment to purchase the brand, the manufacturer must make the product affordable for the Lows by offering a coupon for the product.

Whether or not a consumer uses the coupon depends on the individual's level of transactions costs, t. Transactions costs are distributed among the loyal and nonloyal consumers with a maximum value of T. A person's brand loyalty does not imply anything about the level of transactions costs the consumer may have. In other words, both loyal and nonloyal consumers can have either high or low transactions costs. The population density functions [1] $f(t) = m + nt$ and [2] $g(t) = y + zt$ characterize the number of loyal and nonloyal consumers at each level of t, respectively.[1] To maintain generality, the slopes of the functions, n and z, may be positive, negative, or zero. The slopes may also be different in absolute terms as well as sign. The total numbers of loyal and nonloyal consumers are found by integrating the two population density functions from zero to T. The numbers of loyal and nonloyal consumers in the firm's market are $mT + \frac{1}{2}nT^2$ and $yT + \frac{1}{2}zT^2$, respectively. The total number of people in the market is the sum of the values for the two segments: $T(m+y) + \frac{1}{2}T^2(n+z)$.

The combination of brand loyalty and transactions costs breaks the consumer segments

[1] Linear population density functions are employed to facilitate the derivation of the brand's optimal coupon value from the firm's profit function below.

into four subgroups: loyal nonusers, loyal users, nonloyal users, and nonloyal nonusers. That is, there are brand loyal consumers who use the coupon as well as those who do not redeem it. In addition, the coupon gets some of the nonloyal consumers to buy the brand while others continue not purchase the product.

Because $P < a_H/b$, brand loyal consumers always purchase some quantity of the good. A brand loyal consumer does not use the coupon if his/her cost of redeeming the discount, t, is greater than the coupon's face value, C. Each loyal nonuser pays the full price of the product and purchases the quantity that is associated with P. The total quantity bought by all of the loyal nonusers, Q_{LN}, is found by multiplying the number of loyal nonusers by the amount each individual purchases.[2]

Loyal consumers redeem the coupon if $t \leq C$. In other words, these individuals use the coupon if a positive net savings can be realized. The ability of the loyal consumers to purchase the product at the discounted price results in what is called leakage. Some care must be taken when determining the price paid and quantity purchased by the loyal coupon users. With a coupon, the price paid is lowered from P to $P - C$. However, the cost of redeeming the coupon reduces the savings that is realized by the consumer. As a result, the price that the individual faces is actually $P - C + t$, and the quantity purchased is determined by this subjective price. The total amount bought by the loyal coupon users is Q_{LC}.[3]

In order to make the product affordable and get the nonloyal consumers to purchase the

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[2] $Q_{LN} = (a_H - bP)\left\{\left(mT + \frac{1}{2}nT^2\right) - \int_0^C (m + nt)\, dt\right\}$

[3] $Q_{LC} = \int_0^C \left\{\left[a_H - b(P - C + t)\right](m + nt)\right\} dt$

product, the coupon value must be large enough to offset the nonloyal individuals' transactions costs and lower the price paid to or below the nonloyal consumers' reservation price. In other words, nonloyal consumers buy some amount of the good only if $P - C + t \leq a_L/b$. The total quantity purchased by the nonloyal coupon users is Q_{NC}.[4] Some nonloyal individuals do not buy the brand because their transactions costs are so high that the net saving ($C - t$) does not lower the price paid to or below a_L/b.

Now that the quantities purchased by all of the relevant subgroups have been defined, the profit function of the firm can be stated as $\Pi = (P\text{-}W)Q_{LN} + (P\text{-}C\text{-}W)(Q_{LC} + Q_{NC})$ where W is a constant cost of production and all other variables are as defined above. The optimal coupon value for the brand is found by taking the derivative of the profit function with respect to C, setting the first order condition equal to zero, and solving for C. The brand's optimal coupon value is a function of its retail price along with the cost of production and the parameters of the demand curves and population distribution functions. There is a positive relationship between P and C because if the firm raises P, the gap between P and P_L increases. If the manufacturer wants the nonloyal consumers to remain in the market and purchase the brand, the firm must counteract the widening gap with a larger discount.

Up until this point, the competition among firms has been ignored. Shaffer and Zhang's (1995) address model is employed to show the effects of brand loyalty and interfirm competition on brand coupon values. It is assumed that the single-firm framework described above applies to several manufacturers that produce competing differentiated brands. Each individual is assumed to have at least a weak preference for one brand. That is, a consumer has a favorite brand, and

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[4] $Q_{NC} = \int_{0}^{\frac{a_L}{b} - P + C} \left\{ \left[a_L - b(P - C + t) \right] (y + zt) \right\} dt$

his/her preference toward the preferred product can range from being marginal to extremely brand loyal. This assumption implies that every individual is located within the market boundary of one of the firms. Because coupon usage depends on an individual's level of transactions costs, manufacturers have both loyal and nonloyal coupon-using consumers in their markets.

It is assumed that the firms are noncooperative with respect to product promotion and couponing. Manufacturers encourage the consumers of rival companies to switch products by offering discounts for their own brands. The size of the discounts required to entice brand switching depends on the average level of loyalty of the targeted consumers. Small (high) discounts are needed if the lower bound of the consumers' loyalty is relatively low (high). This competitive environment forces the targeted firms to react defensively and issue coupons to protect their products' market shares. The level of defensive couponing is positively related to the amount of offensive targeting done by the rivals. In addition, firms try not to discount their brands for their own loyal consumers because those individuals are willing to pay the products' full retail prices. In other words, manufacturers attempt to minimize the amount of leakage. Therefore, there is an inverse relationship between a coupon's face value and level of consumers' brand loyalty to the discounted product.

There are additional factors that influence coupon values. Connor (1998) stated that RTE cereal manufacturers issue coupons to increase brand market share. This statement implies that companies maintain their brands' large market positions with high-valued coupons. As a result, there is a positive relationship between a brand's market share and its coupon value. In addition, the size of the discounts is expected to vary by product type. Since this study focuses on RTE cereals, four categories of cereal are defined: regular/adult, presweetened, fruit/nut, and granolas. If regular cereals are considered to be the base, it is thought that presweetened cereals are

discounted less than adult cereals because parents are more willing to give in to their children's preferences. Parents need more of an incentive to purchase brands for themselves (usually regular cereals). Granolas and those cereals that contain fruit or nuts appeal to certain individuals and can be thought of as specialized brands. For these types of cereal, consumer preferences are strong and average brand loyalty is high. Therefore, in order to encourage brand switching within these product segments, manufacturers must offer larger discounts as compared with those for regular cereals. In addition, coupon values are influenced by the size of the issuing manufacturer. Large firms are expected to offer greater discounts as compared with those issued by small, private label, and generic firms. These manufacturers have large revenues and can afford to spend more on promotional campaigns. This study denotes General Mills (GM) as the reference point. Other firms identified in this study are Kellogg, Post, Ralston, Quaker, Nabisco, Malt-O-Meal, Sunshine, Kashi, McKee, Health Valley, generic, and private label firms (the last two are aggregated over all manufacturers and brands).

The model is tailored to the RTE breakfast cereal industry because this market exhibits the important characteristics of the theoretical framework. Cereal manufacturers produce highly, but not perfectly, substitutable products. Fierce horizontal product differentiation gives each firm localized monopolies over its brands. While cereal manufacturers are anticompetitive with respect to brand pricing, they remain competitive in terms of product promotion. The industry's noncooperative couponing behavior allows for the application of Shaffer and Zhang's (1995) competitive couponing framework.

The following equation is specified to characterize the determinants of brand coupon values for RTE cereals

[1] $$RBCV = \alpha_0 + \beta_1 BRP + \beta_2 BL + \beta_3 RR + \beta_4 BMS + \sum_{i=1}^{12} \delta_i F_i + \sum_{j=1}^{3} \gamma_j BT_j + \varepsilon$$

where *RBCV* is the average redeemed coupon value for a given brand in dollars. Using redeemed coupon values is more appropriate than coupon values that are offered. In order for firms to realize their price discriminatory and competitive goals, coupons must be redeemed. Discounts that are issued but never used are wasteful from the firm's perspective. *BRP* signifies the retail brand price in dollars per pound, *BL* is an index that represents the brand loyalty of coupon users and is calculated by Information Resources, Inc. (IRI), *BMS* is the percentage market share held by a brand in the entire RTE breakfast cereal market, and *RR* represents rival coupon redemptions (a proxy for the level of competitive couponing among rival firms). The variable *RR* is defined to be the total dollar value of all coupons redeemed for cereals not produced by the targeted firm. It is designed to capture the intensity of the incentive to switch from a given brand to competing cereals. The terms *F* and *BT* are 0/1 dummy variables and denote the firms and cereal types, respectively. A linear-additive functional form is chosen because the true functional form is not known.

Annual brand-level scanner data on RTE cereals are collected from the *Marketing Fact Book* (1992 to 1995 editions) which is published annually by IRI. The RTE cereals included in the *Marketing Fact Book* are those that attained at least 0.5 percent market share among the households purchasing cereals during the reporting period (January 1 to December 31). The data source does have some limitations in that it does not include sales through non-grocery outlets, products without UPC codes, and non-scannable items. The sample consists 97 brands which were consistently available during the period. Cereals that were introduced or discontinued during the time frame are not included. The exclusion of these brands is not thought to pose a

problem because the total market share of these products is small relative to that of the established brands. A fixed effects panel data model is employed because it utilizes the cross-sectional and time series aspects of the data. The model is estimated using ordinary least squares, and the results are given in Table I.

Table I. OLS Estimates Explaining Redeemed Coupon Values

Variable	*Coefficient*	*t-statistic*
Brand Retail Price	0.1354	11.66*
Brand Loyalty	-0.0008	-0.1726
Brand Market Share	0.0253	2.860*
Rival Redemptions	0.0119	6.534*
Firm: Quaker	-0.2526	-9.277*
Kellogg	-0.1669	-9.635*
Post	-0.1174	-4.690*
Nabisco	-0.1512	-4.350*
Sunshine	-0.4975	-7.683*
Generic	-0.3725	-5.407*
Health Valley	-0.6926	-10.83*
Kashi	-0.6803	-10.66*
Malt-O-Meal	-0.4032	-9.555*
McKee	-0.4085	-6.124*
Private Label	-0.5738	-7.756*
Ralston	-0.1358	-4.652*
Type: Presweetened	-0.0036	-0.2369
Fruit/Nut	0.0255	1.510†
Granola	0.1283	3.007*
Constant	-0.2841	-3.577*
$R^2 = 0.6876$	$n = 97$ observations	

* Significant at the 0.005 confidence level.
† Significant at the 0.1 confidence level.

The model does a respectable job in explaining the variation in average redeemed brand coupon values. The measure of fit, R^2, shows that approximately 68 percent of the variation in average redeemed brand coupon values is explained by the 19 independent variables. Note that all

of the coefficients are in dollars. The signs of coefficients associated with the retail price, brand market share, and target couponing variables are consistent with expectations and are statistically significant. While average redeemed coupon values fall with higher levels of brand loyalty, the coefficient is statistically insignificant. This result is contrary to a priori expectations. There are two possible reasons for why the loyalty variable is insignificant. First, high cereal prices may have eroded brand loyalty. By the time the data series started in 1992, brand loyalty may have already been low. Second, IRI is not clear as to how it calculates the brand loyalty index. Therefore, it is possible that the data are unreliable.

Each firm indicator variable denotes the difference between the respective firm's average redeemed brand coupon value and that of GM. It is clear that GM offers the highest average redeemed coupon value since all of the firm indicator coefficients are negative and, in most cases, statistically significant. The cereal type indicator variables reveal that presweetened cereals require less discounting than regular/adult cereals, but the difference is insignificant. Fruit/nut and granola brands have higher effective coupon discounts than regular cereals. Both of the coefficients are statistically significant.

This study confirms the price discriminatory function of coupons. However, cereal manufacturers are competitive with respect to couponing. Apparently, firms fight hard to get consumers to switch from competing brands. If actions are taken to make the breakfast cereal industry more price competitive, the measures should be chosen such that they do not affect the competitiveness of the industry's couponing behavior. Further study may include the use of different product categories, trying to explain the relatively large size of redeemed brand coupon values for generic cereals, and testing the robustness of the model by applying it to another industry that has less brand differentiation and/or fewer product segments.

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