Bulletin of Applied Economics, 2022, 9(2), 169-173
https://doi.org/10.47260/bae/9210

An Economic Model for Popular Event Promotions

Sheng-Yeh, Wu[1], Guan-Ru, Chen[2] and Ilia, Tetin[2]

Abstract

This study provides a theoretic framework for price promotions on seasonal events and popular events, such as anniversary, Christmas, and World Soccer Cup. Firms engage in collective price promotions seems to contradict economic wisdom because promotions are less likely to stand out among competitors in popular events. In a rational expectations model, this study shows all players' performance improve in the equilibrium. Furthermore, even less-famous goods benefit from collective price promotions in which the theoretic framework can provide a guideline to manufacturers and retailers.

JEL classification number: D21, M21.

Keywords: Event Promotions, Price-Quality Relationship, Advertising.

[1] Finance Department, I-Shou University, Taiwan.
[2] International Finance Department, I-Shou University, Taiwan.

Article Info: Received: August 11, 2022. Revised: August 24, 2022. Published online: August 30, 2022.

1 Introduction

Companies have increasingly used the promotion of their products through event marketing. However, empirical evidence on whether the events lead to higher sales is mixed. One stream of literature contends price promotions hurts brand equity in long terms. Schultz (2004) argues that over dependence on promotions can erode consumers' price-value equation. Similarly, Yoo et. al (2000), based on structural equation model, suggests that frequent price promotions, such as price deals, are related to low brand equity. People who regard price as a means of signaling his or her wealthy identity exhibit a negative attitude when a price promotion is presented (Yang et al., 2015).

Another stream of literature empirically examines whether the sales response to price promotions is stronger or weaker around events than at nonevent times. Keller et. al (2018) found that a price promotion offered around a popular event often generates a stronger sales response than the same promotion at nonevent times. Parsons (2003) indicates mall-wide sales are more effective than individual ones. Kumar and Tan (2015) provided positive spillover effects of promotions on multiple products. While such promotions are planned by the mall management, retailers usually contribute each into paying the cost of the event in addition to their tenancy fees (Karray, 2011), showing that retailers are willing to cooperate with their competitors in order to create store traffic.

In this study, we employ a mathematic model to illustrate economic incentives behind joint and event promotions. The simultaneous price promotions on multiple products reduce the downside of price promotions, thus increase the sales performance. In next section, we postulate a Cournot model to show how prices aggregate and reflect information. The relation between covariance of different products explains the risk reduction role of joint price promotions. This study investigated the combined effects of promotions, finally explains the managerial implications of the model, ending with conclusions.

2 Rational Expectations Model

Assume two products possessed by a retailer, which demand is $Z_d(A,P) = \left[z_d^1, z_d^2\right]' = \gamma Var(Q|A,P)^{-1}(E(Q|A,P) - P)$, where Q, A, P are quality, advertising and price, respectively, where $\gamma > 0$ is risk tolerance. The consumers' expectation for quality are based on advertising and price. Advertising communicates quality plus a noise $A = Q + \varepsilon$, the noise follows a normal distribution where

$\varepsilon \sim N(0,S)$, $S = \begin{bmatrix} s_{11} & s_{12} \\ s_{12} & s_{22} \end{bmatrix}$, and $Q \sim N(\bar{Q}, V)$, $V = \begin{bmatrix} v_{11} & v_{12} \\ v_{12} & v_{22} \end{bmatrix}$.

We assume there is no advertising expenditure for product 2, it is equivalent to assume $s_{22} \to \infty$, this setting enables us to investigate spillover effects of advertising.

The supply side also contains a noise, which can be expressed as $Z_s \sim N(\bar{Z}, U)$,

where $\bar{Z} = [\bar{z}_1, \bar{z}_2\ ]'$, $U = \begin{bmatrix} u_{11} & u_{12} \\ u_{12} & u_{22} \end{bmatrix}$.

The frequency of price promotions can be expressed as u_{11} and u_{22}, co-movements in two products' promotion can be expressed as u_{12}. Based on Admati (1985), let $Z_d(A,P) = Z_s$, we can solve the equilibrium price P, that is a random variable, taking expectations of P yields the following results:

$$p_1^e = \bar{q} - b_{11}z_1 - b_{12}z_2, \tag{1}$$

$$p_2^e = \bar{q} - b_{12}z_1 - b_{22}z_2, \tag{2}$$

where

$$b_{11}=\frac{v_{11}\gamma}{(v_{11}v_{22}-v_{12}^2)}\left[(\frac{\lambda\gamma}{s_{11}}+\frac{u_{22}\gamma}{s_{11}u_{22}+(\lambda\gamma)^{-2}s_{11}^2(u_{11}u_{22}-u_{12}^2)}+\frac{v_{22}\gamma}{v_{11}v_{22}-v_{12}^2})(\frac{v_{11}\gamma}{v_{11}v_{22}-v_{12}^2})-\frac{v_{12}^2\gamma^2}{v_{11}v_{22}-v_{12}^2}\right]^{-1}$$

$$b_{12}=\frac{v_{12}g}{(v_{11}v_{22}-v_{12}^2)}\left[(\frac{/g}{s_{11}}+\frac{u_{22}g}{s_{11}u_{22}+(/g)^{-2}s_{11}^2(u_{11}u_{22}-u_{12}^2)}+\frac{v_{22}g}{v_{11}v_{22}-v_{12}^2})(\frac{v_{11}g}{v_{11}v_{22}-v_{12}^2})-\frac{v_{12}^2g^2}{v_{11}v_{22}-v_{12}^2}\right]^{-1}$$

$$b_{22}=\left[\frac{v_{11}\gamma}{v_{11}v_{22}-v_{12}^2}-\frac{v_{12}^2\gamma^2}{v_{11}v_{22}-v_{12}^2}(\frac{\lambda\gamma}{s_{11}}+\frac{u_{22}\gamma}{s_{11}u_{22}+(\lambda\gamma)^{-2}s_{11}^2(u_{11}u_{22}-u_{12}^2)}+\frac{v_{22}\gamma}{v_{11}v_{22}-v_{12}^2})^{-1}\right]^{-1}$$

Equation (1) and (2) represent two products' demand function, assume the purchasing cost function of product i is $TC_i = cz_i$, the unit cost of production is $c > 0$, we can solve equilibrium quantity and profits for each product.

3 Hidden effects of joint price promotions

Based on preceding demand functions, we assume that a retailer holding two products choose quantities to maximize overall profits, the profit-maximization solution are as follows:

$$z_1^* = \frac{(\bar{q}-c)(b_{22}-b_{12}^2)}{2(b_{11}b_{22}-b_{12}^2)} \tag{3}$$

$$z_2^* = \frac{(\bar{q}-c)(b_{11}-b_{12}^2)}{2(b_{11}b_{22}-b_{12}^2)} \tag{4}$$

Then the profit for two products can be obtained by substituting preceding equations into (1) and (2).

In this model, consumers infer the quality based on advertising and prices, because prices signal the quality information as well as advertising. The noises from supply side, such as price promotions, cause price variations thus influence consumers' expectations. We use a numerical analysis to illustrate the effects of changing parameters on profits and explain the economic intuition behind event sales and promotions. In Figure 1-1, it shows higher price promotions $u11$ lead to a lower retailer's profit, because the price variations add noises to prices on which consumers infer the quality. However, the Figure 1-1 shows the negative effects can be mitigated by joint price promotions. When all product launch price promotions in the same event, consumers realize the price variations are not caused by quality.

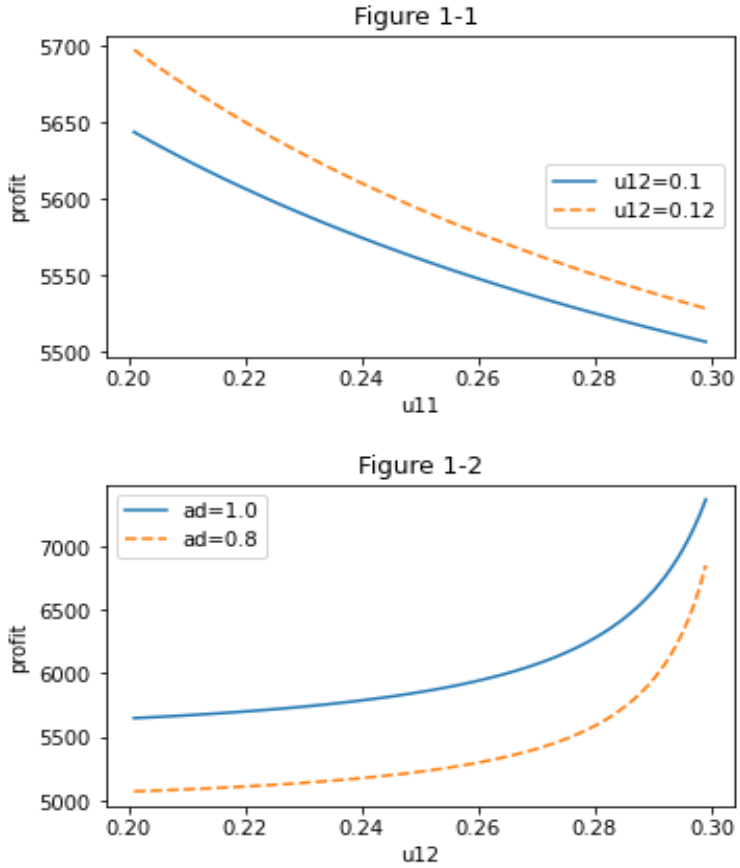

Figure 1 Joint Price Promotion and Profit

Figure 1-2 shows joint price promotions is positively with profit, the reason is the same as preceding interpretation. A higher advertising coverage is positively related to profit because advertising transmit quality information to consumers, thus reduces the uncertainty in purchasing decisions. At the same advertising efforts, event promotions deliver better results. Keller et. al (2018) found, at nonevent times, 10.79% of the price promotions are supported by advertising, whereas during events, only 8.71% are. According to their results, beneficial advertising–promotion interaction effects emerge only during popular events.

4 Conclusions

This study constructs a rational expectations model in which a retailer sells two goods. According to tradition wisdom, these two products should not launch at the same time in order to avoid prisoner's dilemma. The traditional wisdom cannot explain widespread anniversary sales and event promotions. This study shows that price promotion for one good could leave a negative effect not only on the promoted good but also on the un-promoted good. However, the rational expectations model shows that joint price promotions can serve a risk reduction role; because consumers realize that price promotions are a systematic result of events, such as anniversary sales or festivals. Although the products come from rivalry manufacturers, under the retailer's manipulation they complement each other. On the other hand, while a brand spends large resources in advertising, a part of efforts flows into other goods in the same category, causing free rider problem. However, advertised good benefits from retailer's coordinated marketing campaigns, thus justify the spillover effect.

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