

Marketing Control: Exogenous Aspects Of Price Variance

Ted Mitchell, (Email: mitchjt@scs.unr.edu), University of Nevada
Howard Olsen, (Email: olsenh@unr.edu), University of Nevada

Abstract

Marketers should compare the relative impact of changing their price and the impact of a changing market price using variance analysis. In 1977 Hulbert and Toy improved the traditional analysis of variance by expanding the quantity variance to include the variance in market share and the variance in the size of the market. They successfully argued that if managers were to understand the impact that changes in quantity were having on the differences between the planned profits and actual profits they should measure the impact that changing market size and changing market share have on revenues and contribution margins. In this paper we present a method for expanding the price variance to include the variances in the market price and the firm's choice of relative market price.

Introduction

A credible cross-section of marketing professionals, academics and practitioners, has underscored the need for more fact-based knowledge. These professionals, acting as Marketing Science Institute (MSI) trustees, have declared that “assessing marketing productivity (return on marketing) and marketing metrics” a priority for 2002-2004 (Lehman, 2002). More accountability for marketing’s activities, directions, guidelines, etc. is taking precedence. More rigor and relevance in the control system is a requirement for better decision-making (Lehman, 2002).

Although normative theories and prescriptive recipes for corporate financial health and well-being abound in academic journals (e.g., Bhattacharya and Sen 2003; Min, Song, and Keebler, 2002; John, Weiss, and Dutta, 1999) in practice it is difficult to provide verifiable proof of marketing’s contribution to corporate health. Traditional accounting tools are often eschewed because of a cost control perspective rather than a market control perspective. Variance analysis is an excellent example of a cost control tool that can be made more relevant to the control of marketing.

There are always some differences between the budgeted levels in the marketing plan and the actual results achieved. The differences between actual and planned performance are crucial in the feedback and control process. The analysis of the variances allows different variables to be measured and then compared on common bases. For example management may see a 2% difference from the planned price and a 5% difference from the budgeted sales volume. The percentages, however, do not indicate whether the change in price or the change quantity had the most impact on revenues and profits. Variance analysis solves the problem by reporting that the 2% change in price had a \$200,000 impact on revenue and the 5% change in quantity sold had a \$400,000 impact on revenue. Variance analysis allows the relative impact of different variables to be directly compared. Changes that have relatively high impacts on revenues and profits are symptoms of potential marketing problems.

Explanation

Traditional variance analysis focused on endogenous measures of performance. In their seminal article on marketing control, Hulbert and Toy (1977) expanded the traditional analysis to consider the exogenous measures of market share and market size. Theirs was the first attempt to separate the impact of uncontrollable aspects of

variances on the contribution margin. They argued that changes in quantity are more fully explained by presenting them in two parts. The first part is that changes in a firm's share of the market are treated as controllable by marketers, and the second part is that changes in the size of the total market are an uncontrollable element. Their two-part treatment of the quantity variance enhances it from being solely an endogenous performance metric to an exogenous metric as well. Increasing the exogenous components of variance analysis into the feedback and control system is consistent with current MSI's research priorities. Unfortunately, there has been insignificant follow through on the improvements proposed by Hulbert and Toy. A Social Science Citation search indicated their seminal article has been cited only five times. Today there is renewed research interest in the concepts they espoused (Lehman, 2002).

A primary exception in follow through on marketing control is by Jaworski (1988). He also expanded the analysis of variance to consider variables that are often ignored. He focused on marketing personnel's impact on business performance. He reinforced the point that understanding, analyzing, and managing marketing efforts are at the core of providing accurate and relevant knowledge for guiding decision-making.

A question arises as to the underlying reason for such a dearth of research efforts focused on providing management with tools and techniques for diagnosing early warning symptoms affecting a firm's financial well-being. Variance analysis has been used as a cost control tool for many years. The cost control perspective has never been particularly popular with marketing managers. The lack in popularity is due, at least in part, to the volume of units sold being treated as a cost driver (Horngren and Foster, 1991), and prices being viewed as an uncontrollable element. A perspective that is more useful to marketing managers is one in which variance analysis is a volume control tool which treats the four P's of marketing as expenses that drive volume. Sonke Albers (1998) worked through this perspective and has generated a very insightful theory for linking market response functions to variance analysis. The practical difficulty in using Albers's theory is in its definitional complexity and in its need for estimating response elasticities.

Marketing control, as espoused by Hulbert and Toy (1977) and Jaworski (1988), is grounded in the premise that an organization should be able to assign responsibility and give credit where it is due. However, in many instances, managers have been charged with unfavorable results due to variances beyond their control. Thus, the necessity to decompose a variance from the marketing plan into its controllable and uncontrollable impacts. With a proper perspective on the controllable aspects, the support of managers can be garnered to determine suitable solutions.

As day-to-day marketing management moves from a staff function to a line function, there is a need for more detailed reporting and control. A classic tool for control is the variance analysis. The new types of variances discussed in this paper add value to the marketing discipline in two distinct areas and respond to MSI's call for more marketing accountability (Lehman, 2002). First, it provides a more detailed level of decomposition than traditional variance analysis and more detailed measures of variance are easier to link to the performances of specific marketing strategies. Second, the framework provides insights into enhanced control of marketing strategies by decomposing the impact of variances into controllable and uncontrollable elements. This is consistent with the view that managers should be held accountable for variances from the original plan that are controllable (Jaworski, 1988).

Methodology

This paper describes an extension to the traditional variance analysis of sales revenue and is grounded in the original strategic framework for marketing control developed by Hulbert and Toy (1977). These detailed levels of variance analysis are more readily linked to and explained in terms of specific marketing strategy than conventional levels of variance analysis. Although the variances presented below can be discussed in terms of margin contribution, as done by Hulbert and Toy, or net marketing contribution (Best, 2000), for ease of exposition we focus on the variance of revenue (Kotler, 2000).

Variance in revenue is traditionally decomposed into price variance and quantity variance (Kwang and Slavin, 1962). In this paper, we have adopted the traditionally accepted two-variance presentation where the joint is

not presented separately but interpreted within the price variance. The debate between presenting two and three variances is discussed in the endnote B. The variance in sales revenue, $S_a - S_b$, is equal to the price variance, $Q_a(P_a - P_b)$, plus the quantity variance, $P_b(Q_a - Q_b)$.

The formula is:

$$S_a - S_b = Q_a(P_a - P_b) + P_b(Q_a - Q_b) \tag{Equation \#1}$$

Where:

S = Sales Revenue

P = Price,

Q = Quantity sold,

Subscript a = actual, b = budgeted.

(See End Note A for derivation of the variance formula in Equation #1)

Example from the Hospitality Industry

The figures presented are solely for demonstration purposes with substantial differences to accentuate variance considerations. Assume a hotel is charging \$100 per night but had anticipated a price of \$99 in its marketing plan. The hotel has rented 3,000 rooms in the period under consideration, falling 600 rooms short of its budgeted quantity of 3,600 rooms. A conventional analysis of the variance in the sales revenue would reveal that the increase in price had a favorable impact of \$3,000 and the failure to reach the target volume had a negative impact on revenues of \$59,400. The net result is the unfavorable variance of \$56,400 between planned and actual revenues shown in Table 1.

Table 1: Information in the Classic Analysis of Revenue

	Actual	Budgeted	Actual - Budgeted	Variance in Revenues
Price per night	$P_a = \$100$	$P_b = \$99$	\$1 1% difference	$Q_a(P_a - P_b) =$ $3,000 (100 - 99) =$ \$3000 F 5% impact
Quantity Variance in Rooms rented	$Q_a = 3000$	$Q_b = 3600$	-600 U 16% difference	$P_b(Q_a - Q_b) =$ $\$99(3,000 - 3,600) =$ -\$59,400 U 105% impact
Sales Revenue =S	$S_a = \$300,000$	$S_b = \$356,400$	-\$56,400 U	$S_a - S_b = -\$56,400 U$

The classic advantage of variance analysis is that the relative impact of the differences between actual and planned prices and actual and planned volumes (e.g., 5% and 105%) are comparable. Whereas the percentage differences in price and volume (e.g., 1% and 16%) are not. Although basic variance analysis is discussed as a control metric in some marketing textbooks (Kotler 2000, Best 2000), it is a topic that is often ignored. We speculate that the conventional treatment of variance analysis does not have the operational usefulness that marketing managers need.

Hulbert and Toy (1977) suggested that a more meaningful analysis could be drawn if the quantity variance was expanded to show the impact of controllable and uncontrollable elements in quantity sold. They developed an extension of the quantity variance that illustrates the impact that changes in total market size and a firm's market share have on revenue. Total market size is normally beyond the direct control of management, but market share is considered a controllable performance measure. Hulbert and Toy start with the assumption that quantity sold, Q, is

equal to the firm’s percentage market share $\%_m$ of the total market size, M. The extension assumes that a firm has a forecasted size of the market in the budget and marketing plan provides for a budgeted market share in terms of units sold. An example extension to the classic analysis of revenue is found in Table 2.

The traditional quantity variance $P_b(Q_a-Q_b)$ in Equation #1 was expanded by Hulbert and Toy as follows:

$$P_b(Q_a-Q_b) = M_a(\%_{ma} - \%_{mb}) + \%_{mb}(M_a-M_b) \tag{Equation \#2}$$

Where:

P = price

$\%_m$ = firm’s market share

M = market size in units sold

Subscript a = actual, b = budgeted

(The derivation of Equation #2 is found in endnote A)

The example assumes that the hotel has a budgeted market share of 1% and the total market size is forecasted to be 360,000 room rentals. For the basis of illustration, it is assumed that the actual market share is 0.6% and the actual market size is 495,000 room rentals. The crucial feature of the expansion is that impact of the market share variance plus the impact of the market size variance must equal the impact of the original unfavorable quantity variance identified in Table 1 as -\$59,400. The favorable variance in the size of the total market has a positive impact on revenues of \$80,952. The positive revenue from growth in the market is offset by the large negative impact of the hotel’s market share. Although a 0.4% is a small change in percentage, it has the relative effect of reducing revenues by \$140,382. Furthermore the relative impact of an uncontrollable variance, market size, is directly comparable to the relative impact of the controllable variable, market share.

Table 2: Expansion Into Variances of Market Share (Controllable) and Market Size (Uncontrollable)

	Actual	Budgeted	Actual - Budgeted	Variance in Revenues
Price per night	$P_a = \$100$	$P_b = \$99$	\$1	Price Variance $Q_a(P_a-P_b) =$ $3,000(100-99) =$ \$3000 F 5% impact
Quantity Variance in Rooms rented	$Q_a = 3000$	$Q_b = 3600$	-600 U	Quantity Variance $P_b(Q_a-Q_b) =$ $\$99(3,000-3,600) =$ -\$59,400 U 105% impact
Rooms rented in the market area.	$M_a = 495,000$	$M_b = 360,000$	135,000 F	Market Size Variance $P_b\%_{mb}(M_a-M_b) =$ $(\$99)0.01(495,000- 360,000)$ $=$ \$133,650 F 236% impact
Market share of rooms rented	$\%_{ma} = 0.6\%$	$\%_{mb} = 1\%$	-0.4% U	Market Share Variance $P_bM_a(\%_{ma}-\%_{mb}) =$ $(\$99)495,000(0.00606 -$ $0.01) =$ -\$193,050 U 342% impact
Sales Revenue = S	$S_a = \$300,000$	$S_b = \$356,400$	-\$56,400 U	$S_a - S_b =$ -\$56,400 U

The growth of the market from 360,000 forecasted to 495,000 actual rooms sales has a positive impact of 236%, whereas a small 0.4% drop in market share has a large negative 342% impact on the revenue variance. The obvious signal to management is to re-evaluate their market share strategies. The hotel's market share is not keeping pace with the growth of the market. A rising tide lifts all boats, but in the case of our hotel, the market is lifting a "sinking boat." The traditional quantity variance is an internal performance measure whereas the market share variance provides the external performance measure that is crucial to modern management.

Anecdotally, a situation that is depicted in Table 2 can occur when a special event is scheduled in the hotel's trade area, and the event is more successful than anticipated. Such a situation benefits the entire marketplace. That can happen with additional last minute entrants to the event or successful promotional programs attracting a larger audience than originally anticipated. Our example hotel was not sensitive to this unfolding situation.

The example in Table 2 clearly shows how the additional information in Hulbert and Toy's expansion can help management see the importance of maintaining market share. In addition, by incorporating the controllable and uncontrollable perspective, marketing managers are provided with the sense they have more influence over the variances that arise. In the following section, we shall expand the Hulbert and Toy framework to other variances that provide meaningful metrics for marketing control.

Extension to Controllable and Uncontrollable Price Components

Control is enhanced when performance metrics are clearly separated into controllable and uncontrollable variables. Secondly, traditional price variance can also be expanded to reflect controllable and uncontrollable components. An expansion of the conventional price variance in the way Hulbert and Toy did with quantity variance has not been discussed in the literature. We speculate that the lack of discussion about extensions to price variance follows from the traditional accounting perspective that firms are essentially price followers and changes in price are uncontrollable.

An alternative perspective is that prices for many companies have both a controllable and uncontrollable component. In many situations there is a clearly recognized industry price, R , and a firm with a differentiated product must adjust its own price to stay within a percentage of the industry price. If a firm has a successful marketing strategy that increases the perceived value of the product, a firm can charge a premium price. The degree to which a firm can set its price is dependent on the success of its differentiation strategies and its customer's perceptions of value. Marketing managers tend to view price as partially controllable within a range, thus a useful extension to the traditional analysis of price variance is decomposing it into the relative impact of market price changes and the relative impact of changes in the percentage of market price the firm charges.

The recognized industry price, R , or reference price is a standard price against which consumers or tourists seeking lodging evaluate the actual prices (of our specific hotel) they are considering (Rajendran and Tellis 1994). Our discussion is not concerned with how consumers set the reference price, but that it is an identifiable standard in the marketplace. From a hotel management perspective, it is an important construct in the marketing mix (Kalyanaram and Winer 1995).

Our extension to the traditional analysis of revenue variance starts with the assumption that a firm's price, P , is equal to a percentage, $\%_p$, of the industry price, R , such that $P = \%_p R$. This implies that a firm will have a budgeted forecast of the industry price, R_b , in the marketing plan as well as the percentage of the industry price, $\%_{pb}$, they intend on charging. The average industry price that is actually realized, R_a , is considered uncontrollable. The success the firm has in maintaining its own price within a budgeted percentage of the industry price is considered a decision variable. That is to say, the percentage of industry price, $\%_{pa}$, that the firm actual maintains is considered controllable. A firm may fail to maintain its target percentage because of its failure to create extra value in its offering.

Anecdotally, a hotel can obtain an industry reference price from the local convention and tourism bureau. This information is generally available on a monthly basis by category of lodging establishment, i.e., deluxe hotel, business traveler hotel, limited services hotel, or motel. In addition, on a regular basis our example hotel will have its personnel actively telephoning competitors for their room rates. Thus the marketing manager is able to develop a type of peer reference price.

The formula for the traditional variance in price, $Q_a (P_a - P_b)$, as depicted in Equation #1, is expanded as follows:

$$Q_a (P_a - P_b) = Q_a (\%_{pa} (R_a - R_b) + R_b(\%_{pa} - \%_{pb})) \tag{Equation #3}$$

Where:

Q = quantity sold

$\%_p$ = firm's percentage of the reference price

R = industry reference price

Subscript a = actual, b = budgeted

(The derivation of Equation #3 is shown in the Endnote A)

The relative impact of changes from a forecasted industry price and changes from the planned percentage of industry price on revenues can be compared. Management can determine which has had a greater impact — the controllable or the uncontrollable element – and make appropriate strategy adjustments.

The hotel example assumes that there is a recognized reference room price in a tourist area and is available from the local convention and tourism bureau. The forecasted industry price is \$90 a night and the actual industry price is \$80. The hotel in question planned to have a price equal to 110% of the industry price. The analysis in Table 3 shows the firm had a price equaling 125% of the industry price at the end of the budget period.

The classic price variance, $Q_a(P_a-P_b)$, in the example is a favorable \$3,000 and new extended variances associated with industry price and the firm's percentage of industry price sum to this amount. The industry price of \$80 did not reach the \$90 level planned for and this represents a negative impact of \$37,500 on the firm's revenues. The fact that the hotel was able to charge \$100 a night rather than the planned rate of \$99 appears small, but the impact is significant. Maintaining a price 125% higher than the industry's reference price represents a positive impact on the firm's revenues of \$40,500. The choice of management to maintain their prices when the industry prices are lower than anticipated reflects a strong belief in their product's value. A 15% difference in the planned percentage of industry price resulted in a 71.8% impact on the firm's revenue variance. The uncontrollable change in the industry price resulted in an impact of 66.5% on the firm's revenue variance. The percentages allow for a direct comparison of the relative impact from changes from the budgeted levels of controllable and uncontrollable aspects of pricing.

Anecdotally continuing the special events scenario, our example hotel has an aggressive monitoring campaign of market area room rates and occupancy factors. The front desk personnel determined, as a result of telephoning competitors, that the special event was a success with occupancy exceeding estimates of the local convention and tourism bureau. As a result, they maintained forecasted room rates instead of reducing them, as some competitors were prone to do during special events. These competitors were more concerned with obtaining a "full house" than maintaining room rates that supported the hotel's value proposition.

Table 3: Impact of Controllable and Uncontrollable Price Components

	(1) Actual	(2) Budgeted	(1)-(2)	Impact on Revenues
Price per night	$P_a = \$100$	$P_b = \$99$	\$1	Price Variance $Q_a(P_a - P_b) =$ $3,000 (\$100 - \$99) =$ $\$3000$ F 5% impact
Industry reference price per night in the area	$R_a = \$80$	$R_b = \$90$	-\$10 U	Variance in market price $Q_a(\%_{pa})(R_a - R_b) =$ $3,000(1.25)(\$80 - \$90) =$ $-\$37,500$ 66.5% impact
Our percentage of the reference price	$\%_{pa} = 125\%$	$\%_{pb} = 110\%$	15% F	Variance in targeted percentage of market price $Q_a(R_b)(\%_{pa} - \%_{pb}) =$ $3,000(\$80)(1.25 - 1.1) =$ $\$40,500$ F 71.8% impact
Quantity Variance in Rooms rented	$Q_a = 3000$	$Q_b = 3600$	-600 U	Quantity Variance $P_b(Q_a - Q_b) =$ $\$99(3,000 - 3,600) =$ $-\$59,400$ U 105% impact
Market area rooms rented	$M_a = 495,000$	$M_b = 360,000$	135,000 F	Market Size Variance $P_b\%_{mb}(M_a - M_b) =$ $(\$99)0.01(495,000 - 360,000) =$ $\$133,650$ F 236% impact
Market share of rooms rented	$\%_{ma} = 0.6\%$	$\%_{mb} = 1\%$	-0.4% U	Market Share Variance $P_b M_a(\%_{ma} - \%_{mb}) =$ $(\$99)495,000(0.00606 - 0.01) =$ $-\$193,050$ U 342% impact
Revenue In dollars =S	$S_a = \$300,000$	$S_b = \$356,400$	-\$56,400 U	-\$56,400 U

Discussion

The manner in which our expansion of the conventional price variance compliments the work of decomposing the quantity variance done by Hulbert and Toy is summarized below in Figure 1.

Variance analysis is the investigation of a difference between a planned and an actual performance. In the examples presented, differences in sales revenue are the factors under consideration and associated costs are assumed to be zero. When variable costs and fixed costs are incorporated into the equation then the impact of variances can be measured in terms of contribution margins and net profits.

Hulbert and Toy (1977) included in their discussion of the decomposed quantity variance the impact of a flexible budget or “Monday morning quarterbacking.” By introducing a flexible budget, ex post information is included to provide additional insight into any difference. We believe that a fully decomposed variance – both price and quantity – provides a more complete perspective for effective managerial decisions. Variance analysis is not a panacea for marketing control. It is a tool for clarifying symptoms and does not identify which specific marketing program or which change in the environment is the cause of a variance (Piper 1977; Shank and Churchill 1977). It is the role of management to diagnose the cause and prescribe a solution.

Figure 1
Decomposition of Revenue Variance

Revenue Variance	Traditional Decomposition	Marketing Variances
$S_a - S_b$ Where Revenue = S = PQ	Quantity Variance $P_b(Q_a - Q_b)$ Where $Q = \%_m M$	Hulbert and Toy's Share of Market Variance $P_b (M_a (\%_{ma} - \%_{mb}))$ controllable
		Hulbert and Toy's Size of Market Variance $P_b (\%_{mb} (M_a - M_b))$ uncontrollable
	Price Variance $Q_a (P_a - P_b)$ Where $P = \%_p R$	Proposed Market Price Variance $Q_a (\%_{pa}) (R_a - R_b)$ uncontrollable
		Proposed Percentage of Market Price Variance $Q_a (R_b) (\%_{pa} - \%_{pb})$ controllable
P = Price	$\%_m$ = Market Share	
Q = Quantity sold	R = Industry Reference Price	
M = Size of market	$\%_p$ = Percentage of Reference Price	

A third point addressed was the perspective of controllable and uncontrollable aspects of a variance versus performance and planning aspects as described by Hulbert and Toy (1977). It is possible that variance analysis has not been well received by marketing managers because it has been primarily used to assign blame – many times inappropriately. Managers have been tasked with both controllable and uncontrollable aspects of deviation from a marketing plan. By decomposing a variance appropriately, credit can be given where it is due and responsibility assigned where shortfalls occur. In our example, if the special event was a bust due to mismanagement by the local convention and tourism bureau, the overall market or market price may undoubtedly suffer. Attaching blame to the marketing manager for such a deviation only creates resentment – hardly a decision based in effective management principles (Horngren and Foster, 1991). On the other hand marketing managers can be held accountable for strategies that fail to support the appropriate room rate ($\%_{pa}$) or the anticipated market share ($\%_{ma}$).

Conclusion

Varadarajan and Jayachandran (1999) provided an extensive assessment of the state of marketing strategy with an opening statement that “an inherent characteristic of most industries is the variance in the profitability.” To implement and execute marketing strategy, a manager must understand well the variance in profitability or differences between planned activities and actual results as this will be a continuous challenge. Our framework provides a successful integration of managerial accounting concepts with marketing activities supplying managers with an enhanced perspective. With an enhanced perspective, they are able to more successfully address assessment requirements that are needed with the marketing discipline (Lehman 2002).

Lastly, based upon a cursory review of current marketing textbooks and our experience in the classroom, our students are failing to receive sufficient training in analysis and control techniques. It also appears that classic tools such as variance analysis need to be reviewed and revamped for the modern era of databases and Internet. The new generation of managers must be in a position to respond to MSI's call for enhanced assessment of marketing

productivity (Lehman 2002). The improvement to variance analysis we have developed can help provide future managers with a procedure to assess the impact of price performance on revenues and profits.

Endnotes

- A: The original difference between the planned sales revenue and the actual sales revenue is decomposed into the generally accepted equation which is derived as follows:

$$S_a - S_b = P_a Q_a - P_b Q_b$$
 The difference in sales revenue, S , is first recognized as a compound variable based on price, P , and quantity, Q , such that $S = PQ$. The term $P_b Q_a$ is added to both sides

$$S_a - S_b + P_b Q_a = P_a Q_a - P_b Q_b + P_b Q_a$$
 The equation is rewritten and simplified to be

$$S_a - S_b = P_a Q_a - P_b Q_b + P_b Q_a - P_b Q_a$$

$$S_a - S_b = Q_a (P_a - P_b) + P_b (Q_a - Q_b)$$
 The choice of the common term $P_b Q_a$ is somewhat arbitrary but is generally accepted because of the traditional accounting focus on actual volumes in the design of flexible budgets.
 The expansion of any compound variable follows a similar procedure to one illustrated. Hulbert and Toy saw quantity as a compound variable where quantity, Q , equals market share, $\%_m$, times market size, M , such that $Q = \%_m M$. In this paper the firm's selling price, P , is seen as a compound variable where the firm's price, P , equals market price, R , times relative percentage of the firm's price, $\%_p$, such that $P = \%_p R$. The choices of the common terms to use in the expansions are actual market size and the budgeted share of market, $M_a \%_m$, as well as the actual market price and the budgeted relative percentage, $R_a \%_p$.
- B: There has been extensive discussion in the accounting literature concerning proper presentation of the joint variance (e.g., McIntyre 1976; Piper 1977; McIntyre 1978). This discussion is focused on whether the joint variance – possible interaction between the quantity variance and price variance – should be included in the price variance (two variance presentation) or separately (three variance presentation). It is not in the interest of this paper to attempt to resolve such an issue; rather it should be recognized that it exists and managers should interpret variances accordingly.

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Notes