Shuba Srinivasan, Koen Pauwels, Jorge Silva-Risso, & Dominique M. Hanssens

Product Innovations, Advertising, and Stock Returns

Under increased scrutiny from top management and shareholders, marketing managers feel the need to measure and communicate the impact of their actions on shareholder returns. In particular, how do customer value creation (through product innovation) and customer value communication (through marketing investments) affect stock returns? This article examines, conceptually and empirically, how product innovations and marketing investments for such product innovations lift stock returns by improving the outlook on future cash flows. The authors address these questions with a large-scale econometric analysis of product innovation and associated marketing mix in the automobile industry. They find that adding such marketing actions to the established finance benchmark model greatly improves the explained variance in stock returns. In particular, investors react favorably to companies that launch pioneering innovations, that have higher perceived quality, that are backed by substantial advertising support, and that are in large and growing categories. Finally, the authors quantify and compare the stock return benefits of several managerial control variables. The results highlight the stock market benefits of pioneering innovations. Compared with minor updates, pioneering innovations have an impact on stock returns that is seven times greater, and their advertising support is nine times more effective as well. Perceived quality of the new car introduction improves the firm's stock returns, but customer liking does not have a statistically significant effect. Promotional incentives have a negative effect on stock returns, indicating that price promotions may be interpreted as a signal of demand weakness. Managers can combine these return estimates with internal data on project costs to help decide the appropriate mix of product innovation and marketing investment.

Keywords: marketing investments, advertising, financial performance, product innovations, stock returns, marketing and firm value, stock return response models

Marketing managers are under increasing pressure to measure and communicate the value created by their marketing actions to top management and shareholders (Lehmann 2004; Marketing Science Institute 2004). These demands create a need to translate marketing resource allocations and their performance consequences into financial and firm value effects (Rust et al. 2004). In particular, how do customer value creation (through product innovation) and customer value communication (through marketing investments) affect stock returns? Several studies have identified innovation success as a key contributor to both long-term firm sales and financial and stock market performance (Pauwels et al. 2004). In the same vein, Drucker (1973) cites innovation and marketing as the two factors crucial to long-term corporate health. However, new product failure rate is high (ranging from 33% to more than 60%) and has not improved over the past decades (Boulding, Morgan, and Staelin 1997; Sivadas and Dwyer 2000). Hauser, Tellis, and Griffin (2006) note that for each new product success, the process begins with six to ten concepts that are evaluated as they move from opportunity identification to launch. The high costs and risks involved with new products are the main culprit for the decline in both new-to-the-world (–44%) and new-to-the-company (–30%) innovations between 1990 and 2004 (Cooper 2005). The stock market's reaction to new products is not guaranteed to be warm either. For example, Boeing's stock price surged 7% when it scrapped development plans for the 747X in January 1997, and it declined 1.7% when the company revived the idea two years later—at a cost of $4 billion—to compete with the Airbus 380 (Dresdner Kleinwort Benson Research 2000; *The Wall Street Journal* 1997). Similarly, there is pressure on marketing managers to demonstrate the contribution of advertising to financial performance. This is not surprising given weak evidence for the profit contribution of advertising spending (Hanssens, Parsons, and Schultz 2001).

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Although the consumer response effects of marketing are well researched, a better understanding is needed of marketing's impact on investor response, which is typically measured by stock returns. Investors are motivated by cash flow expectations—in particular, the prospect of enhancing and accelerating future cash flows and of reducing associated risks (Srivastava, Shervani, and Fahey 1998). Moreover, many marketing actions are costly, and investors consider both their (expected) benefits and their downsides. Furthermore, the stock return impact of marketing actions needs to be assessed in the presence of other important drivers, as identified in the accounting and finance literature (Fama and French 1992; Kothari 2001). Thus, our central research question is, To what extent do marketing actions improve stock returns beyond the typical finance and accounting benchmark measures?

Our empirical research focuses on one industry, automobiles, to enhance its internal validity. Moreover, we believe that findings in this industry will be generalizable to other settings because a meta-analysis (Capon, Farley, and Hoenig 1996, p. 214) indicates few industry-specific effects of innovation performance, and though high returns need not be sustainable in any particular market, the process of generating high returns can be sustainable.

The automobile industry is of substantial economic importance, representing more than 3% of the U.S. gross domestic product (J.D. Power and Associates 2002). In addition, the industry relies heavily on new products, promotional incentives, and advertising. The main thrust of competition is in product development, with each company competing in multiple market segments "with a plethora of niche models designed to attract a particular group of consumers, and to renew them rapidly enough to keep interest fresh" (*The Economist* 2004, p. 14). However, the costs of such design changes can be substantial, and their success is far from certain. Therefore, large automobile firms face substantial innovation investment decisions across distinct product categories (called "segments" in industry parlance) that differ in category attractiveness and competitive conditions. Furthermore, automobile manufacturers invest billions of dollars every year in various forms of advertising to influence customers and prospects to buy their products and services. General Motors alone spent more than $2.8 billion in 2004 to advertise its lines of automobiles (TNS Media Intelligence 2005). However, concerns persist about the financial impact and wisdom of such substantial communications spending.

We organize the remainder of this article as follows: First, we develop the research framework and specify a comprehensive stock return response model to quantify the relationships. Second, we discuss the marketing and financial data sources and estimate the models. Third, we formulate conclusions, cross-validate the empirical results, and discuss their implications for marketing strategies.

Research Framework

We begin with the established financial benchmark—that is, Fama and French's (1992, 1993) three-factor model—and then augment it with Carhart's (1997) proposed momentum factor to obtain the four-factor model. This model produces a better estimate of expected stock returns than the capital asset pricing model. The four-factor model posits that the expected rate of return of a stock portfolio is a function of risk factors that reflect the market, size, book-to-market, and momentum factors. In addition, previous literature in accounting and finance has demonstrated that stock returns react to changes in firm financial measures, including firm results such as revenues and earnings (e.g., Kothari 2001). Controlling for these factors, we develop a conceptual framework to capture the effects of marketing activity on stock returns. We argue that such impact on firm valuation may occur through one or more of four routes: (1) enhancing cash flows, (2) accelerating cash flows, (3) reducing vulnerability in cash flows, and (4) increasing the residual value of the firm.

First, marketing investments, which can involve substantial costs in the short run, can increase shareholder value by enhancing the level of cash flows (i.e., more cash), namely by increasing revenues and lowering costs. For example, automobile innovations that are responsive to unmet customer needs in specific segments, including the Ford Mustang for young drivers and the Chrysler minivan for families with children, have resulted in substantial revenue increases for these companies. Second, marketing investments can enhance shareholder value by accelerating the receipt of cash flows (i.e., faster cash). This is especially important in high-fixed-cost industries that depend on fast turnovers to finance their operations. For example, aggressive advertising helps develop instant awareness of new products that may accelerate the diffusion process. Third, marketing investments can increase shareholder value by lowering the vulnerability and volatility of these cash flows (i.e., safer cash), which results in a lower cost of capital or discount rate (Srivastava, Shervani, and Fahey 1998).[1] Thus, all else being equal, cash flows that are predictable and stable have a higher net present value and thus create more shareholder wealth. For example, advertising may help smooth out the variability in highly seasonal demand patterns or, alternatively, may accentuate them (e.g., Fischer, Shin, and Hanssens 2007). Fourth, marketing investments may increase the residual value of the firm. Building brands and keeping them relevant and distinctive (e.g., by pioneering innovations) increase the equity of the brands owned by the firm and, thus, its residual value.

Marketing actions can influence the outlook for investors on enhancing, accelerating, and stabilizing the firm's cash flows and increasing its residual value. We for-

[1]A good example of these intertemporal effects in the car industry is a "lease pull ahead" program. Analysts at car manufacturers keep track of the patterns of lease expirations. When they spot a month in the future with an unusually large volume of lease returns, they offer some lessees the option to return the car ahead of time, coinciding with a period of lower expected lease returns, or offer a promotional extension of the lease term. Furthermore, it is a common practice to target lease programs to terms coinciding with an expected "valley" in lease returns. By seeking a stable flow of lease returns, manufacturers aim to generate a stable flow of new leases.

mulate the hypotheses in this section in terms of which brand-level marketing actions influence the stock returns, modeled through the main effect and the interaction effect with new product introductions. Figure 1 and Table 1 present a summary of these drivers and their hypothesized effects.

Marketing Actions and Stock Returns

Innovativeness. The innovativeness, or relative advantage of new products, is a consistently important determinant of accelerated consumer adoption rate (Holak and Lehmann 1990) and new product success (Montoya-Weiss and Calantone 1994). On the basis of venture portfolio theory (Booz Allen Hamilton 1982), we can classify the extent of innovation in new products on two dimensions: (1) new to the company and (2) new to the market.[2] The first dimension measures the extent to which the new product introduction is innovative compared with the firm's existing products. The second dimension measures the extent to which the firm's new product is a new introduction to the market. An example of a new-to-the-company innovation within the automobile industry context is the Porsche Cayenne, which was the first sport-utility vehicle (SUV) developed by the company (and thus scores high on the first dimension, offering Porsche loyals the opportunity to drive

[2]Specifically, we are interested in the extent to which a new automobile model introduced is different from current offerings of the firm and those in the market. We do not consider specific innovations in processes or components.

FIGURE 1
Conceptual Framework

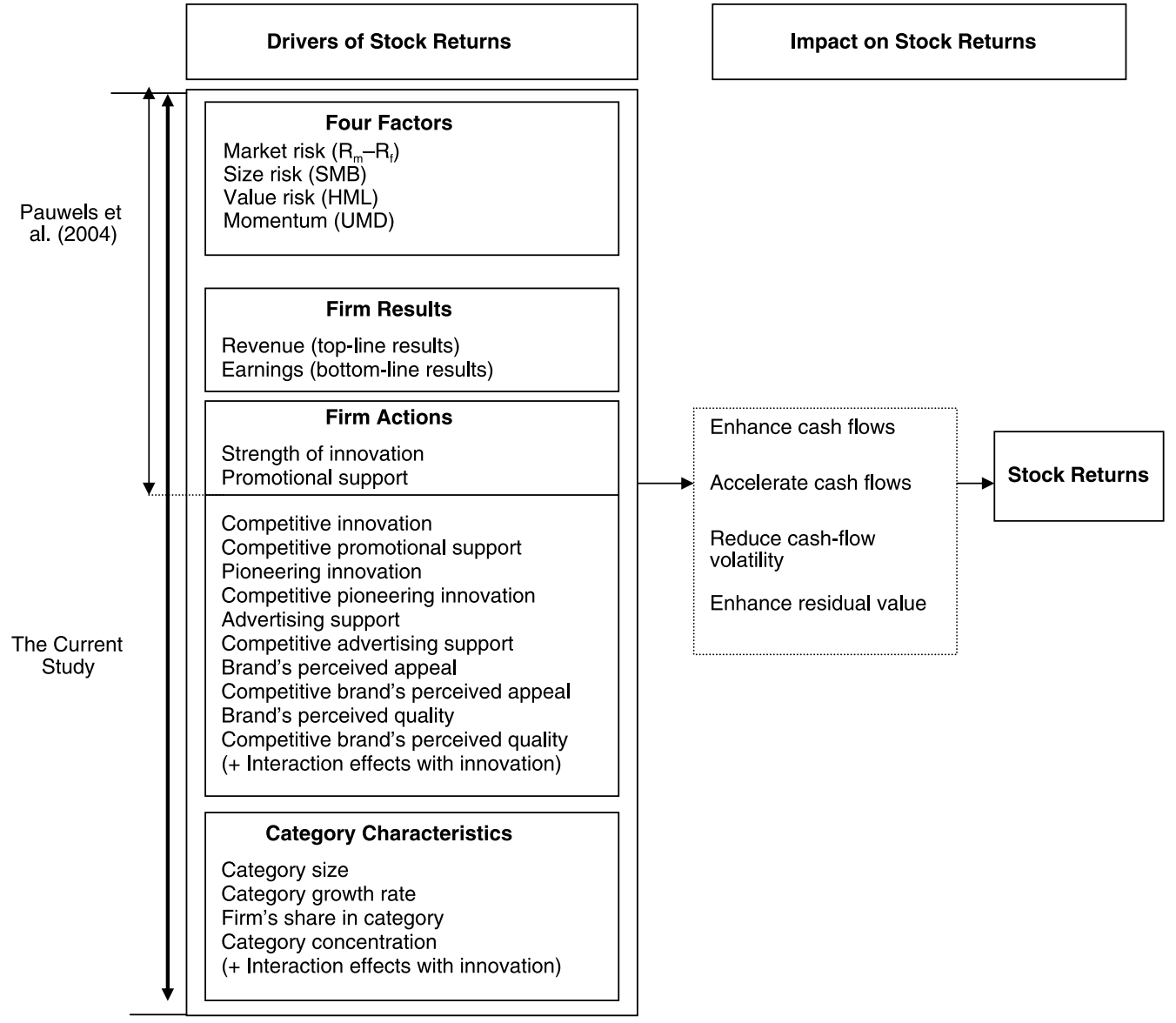


TABLE 1
Marketing Drivers of Stock Returns

Hypotheses and Drivers	Enhancing Cash Flows	Accelerating Cash Flows	Reducing Volatility of Cash Flows	Residual Value	Net Effect on Unexpected Stock Returns
H_1: Innovation level	+	?	+	+	++
H_2: Pioneering innovation	+	?	?	+	++
H_3: Advertising support	+	+	?	+	++
H_4: Promotional support	+/–	+	?	–	–
H_5: Customer liking	+	?	+	+	++
H_6: Perceived quality	+	?	+	+	++

Notes: + denotes that the driver has a positive effect, – denotes that the driver has a negative effect, +/– denotes that the driver could have either a negative or a positive effect, ? denotes no a priori hypothesis on the driver's effect, and ++ denotes that the driver has a net positive effect.

an SUV) but which entered a market already full of SUVs, including the sports car–based BMW X5 (and thus scores low on the second dimension). An example of a new-to-the-market innovation is the Toyota Prius hybrid. We discuss the impact of these innovation dimensions in turn.

New-to-the-company innovations. Renewing products is widely regarded as necessary for long-term survival and as an engine of growth, thus enhancing cash flows and future profitability (Chaney, Devinney, and Winer 1991; Sorescu, Shankar, and Kushwaha 2007). Recent evidence on new product introductions in the context of the personal computer market suggests that enhancement in cash flows occurs as a result of reduced selling and general administrative expenses (Bayus, Erickson, and Jacobson 2003). On average, the greater the new product's improvement over previous versions, the better is its long-term financial performance, and the greater is its firm value impact (Pauwels et al. 2004). In line with the J.D. Power and Associates expert rating scale, we consider the range from mere trimming and styling changes (Levels 1 and 2) to design and new benefit innovations (Levels 3 and 4) to brand entry in a new category (Level 5) in the empirical analysis (Pauwels et al. 2004).

Developing new products faster and moving them into production can accelerate cash flows from product innovation (Srivastava, Shervani, and Fahey 1999). In contrast, many products have failed to realize their potential because of insufficient attention to speeding up the market acceptance cycle for these products (Robertson 1993). Large companies, especially, have been criticized for delaying the renewal and upgrade of their product offerings in the face of changing consumer preferences (Ghemawat 1991). Furthermore, the success of innovations depends on consumers' timely adoption of the innovation, with both consumer and market factors being important drivers of the trial probability (e.g., Gielens and Steenkamp 2003).

Companies can reduce the vulnerability of their cash flows by completing their product portfolio with new-to-the-company products that enable them to address new consumer segments. For example, Toyota reduces cash flow volatility by offering a full line of products and managing the migration of customers from its economy models to its luxury cars—for example, from Yaris to Corolla or from Camry to Lexus ES. Furthermore, synergies between and within product lines, including sharing components and design elements across such different products, can reduce production costs and inventory risk (Fisher, Ramdas, and Ulrich 1999). In addition, a higher innovation level may also increase the residual value of the company. In the face of shifting demand and fickle consumer preferences for the newest products, brands with more improvements from one model to the next are more likely to remain fresh and, thus, relevant to today's and tomorrow's consumers.

Finally, recent empirical evidence has suggested a nonlinear effect of the innovation level on new product success. On the demand side, Gielens and Steenkamp (2003) find a U shaped effect of product novelty on product trial probability. Within a range of (nonradical) innovations, such as those in their and our study, consumers prefer either low complexity (minor update) or high relative advantage (new market entry). Moderate innovations typically do not offer (much) more advantage over minor innovations (Kleinschmidt and Cooper 1991) and thus appear stuck in the middle. On the supply side (Sherman and Hoffer 1971), design and new benefit innovations (Levels 3 and 4 on our scale) are much costlier than mere trimming and styling changes (Levels 1 and 2). For example, Cadillac's Escalade SUV innovation cost General Motors approximately $4 billion (White 2001). Thus, combined with the U-shaped demand impact, financial performance shows a U-shaped impact of innovation level (Pauwels et al. 2004). Between minor updates and new market entries, the latter are better news for the firm's future value because "products high on newness provide an especially strong platform for growth" (Gielens and Steenkamp 2007, p. 104). Although minor innovations are necessary to maintain the stable stream of cash flows from "bread-and-butter" products (e.g., Toyota's frequent minor updates to Camry), major product updates are better able than minor product updates to enhance cash flows (Kleinschmidt and Cooper 1991) and, thus, stock returns. In summary, we expect that the stock return benefits have a U-shaped relationship to each innovation level in this scale, with a preference for new market entries over minor updates.

H_1: (a) New-to-the-company innovations increase stock market returns, and (b) stock returns are U shaped in the level of new-to-the-company innovation.

New-to-the-market (pioneering) innovations. Although new product introductions benefit stock returns on average, new-to-the-market products have a greater impact (Chaney, Devinney, and Winer 1991). Indeed, the new product literature has consistently related innovation success to a product's ability to provide benefits and features not offered by alternative products (Henard and Szymanski 2001; Holak and Lehmann 1990). Pioneering innovations have a greater potential to unlock previously unmet customer needs and, thus, ultimately to surpass "me-too" innovations in terms of enhancing cash flows (Kleinschmidt and Cooper 1991; Moorman and Miner 1997).

It is not clear a priori whether pioneering innovations accelerate cash flows compared with other innovations. On the one hand, relative advantage is a consistently important determinant of accelerated adoption rate (Holak and Lehmann 1990). On the other hand, consumers may also consider pioneering innovations riskier, which delays adoption (Gatignon and Robertson 1985).

Finally, pioneering innovations also stand out as reducing cash flow vulnerability and raising residual value. Indeed, although the short-term risk may appear to be higher, pioneering products also have option value; that is, they offer "the possibility of greater long-term financial gain given the possibility of their revolutionizing a product category" (Moorman and Miner 1997, p. 94). Indeed, firms can reduce the vulnerability of their cash flows by staying ahead of competition in product innovation and introducing difficult-to-copy new products. Moreover, investors may view such pioneering innovations both as platforms for future product introductions and as signals that the firm is successful in the innovation process itself. Therefore, their view of the residual value of the firm is likely enhanced. Finally, pioneering innovations offer new strategic choices for the firm by providing the opportunity to leverage these innovations to future products. For example, DuPont has leveraged its invention of nylon and Teflon in a series of successful new product introductions in a variety of categories. At the same time, radical pioneering innovations are likely to increase the volatility of cash flows in the short run but can eventually lead to stable cash flows. A notable example of a radical pioneering innovation is the Toyota Prius hybrid, which is tracking to commercial success as a result of radical but visionary strategy. Overall, we postulate the following:

H_2: Pioneering (new-to-the-market) innovations have a greater stock return impact than no-pioneering innovations.

Advertising support. Research over the past decade has shown that marketing activity, such as advertising, can lead to more differentiated products characterized by lower own–price elasticity (Boulding, Lee, and Staelin 1994). In turn, this enables companies to charge higher prices, attain greater market share and sales (Boulding, Lee, and Staelin 1994), command consumer loyalty (Kamakura and Russell 1994), and thus ward off competitive initiatives. Empirical evidence from the automobile market suggests that advertising expenditures generate greater cash flows for pioneers than for later entrants (Bowman and Gatignon 1996). Therefore, advertising support for innovations, especially pioneering innovations, can enhance cash flows for the company.

In addition, advertising builds awareness, which is an essential component of new product success. For example, Bly (1993, p. 125) notes that the "new-product innovator will spend more than twice as much on advertising and promotion as a business with fewer new products." Recent evidence suggests that firms that invest more in marketing resources can better sustain the innovation and thus accelerate the adoption rate of their new products (Chandy and Tellis 2000). These benefits can lead to cash flow acceleration.

Finally, investments in the brand through advertising can reduce consumers' perceived risk, particularly for radical innovations (Dowling and Staelin 1994). As such, differentiation of a brand through advertising may lead to monopolistic power, which can be leveraged to extract superior product-market performance, thus leading to more stable (i.e., less vulnerable to competition) earnings in the future (Srivastava, Shervani, and Fahey 1998). Conversely, advertising spending can exacerbate or smooth seasonal demand patterns, leading to either an increase or a decrease in volatility, respectively.

Likewise, the increased brand differentiation through advertising should increase the residual value of the firm. Moreover, investors may perceive enhanced residual value through advertising exposure beyond its impact on firm financial performance (Joshi and Hanssens 2007). Therefore, we hypothesize the following:

H_{3a}: Advertising support for new-to-the-company innovations increases the stock market returns of these innovations.

H_{3b}: Advertising support for pioneering innovations increases the stock market returns of these innovations.

Although we expect that advertising works for both new-to-the-company and new-to-the-market innovations, the latter should benefit most. Indeed, advertising works best when the firm has something new to offer the consumer (Lodish et al. 1995). When the product innovation is so pioneering that it (temporarily) dominates the competition, firms may even reap permanent benefits from their advertising campaigns (Hanssens and Ouyang 2002). Therefore, we expect the following:

H_{3c}: Advertising support benefits the stock market returns more for pioneering innovations than for new-to-the-company innovations.

Promotional support. The power of sales promotions to enhance future cash flows has been investigated extensively in empirical research. On the one hand, sales promotions are effective demand boosters because they often have substantial immediate effects on sales volume and profits (Dekimpe and Hanssens 1999). In terms of the conceptual framework, the main power of price promotions is to accelerate cash flows, which is why managers often use them to reach sales quotas on time (e.g., Lee, Padmanabhan, and Whang 1997). On the other hand, promotions also signal a weakness in the customer value of the product relative to competition, particularly in the context of new product introductions (Pauwels et al. 2004).

To the extent that sales promotions have positive short-term effects on top-line and bottom-line performance (Nijs et al. 2001; Srinivasan et al. 2004), the use of sales promotions would accelerate cash flows. However, because promotion effects on sales are typically short lived, any positive cash flow response will dissipate quickly.

In addition, for durable products (and particularly for automobiles), manufacturers need to build and commit capacity before the product is launched. Promotions and price discounts could signal that the new product is performing below expectation in terms of sales, which in turn would lead to either low-capacity utilization or a chronic dependence on price discounts. Thus, price discounts could be interpreted as signaling profit compression in the future. Especially important for automobiles, price promotions on new vehicles may reduce the secondhand and trade-in market for used vehicles, which in turn affects the residual value of the firm's portfolio of leased cars. Therefore, we postulate the following:

H_4: Promotional support for new-to-the-company innovations decreases the stock market returns of these innovations.

Customer perceptions of brand defects and brand perceived quality. In general, marketing theory predicts greater success for firms that serve the needs of their customers better, especially by providing products that are superior to the competition in the customers' eyes (Griffin and Hauser 1993). Within the automobile industry, management can significantly improve a company's fortunes by introducing new products with superior features and minimal deficiencies (e.g., General Motors' recent push for more pleasing new cars with fewer defects). Customer-focused measures of these improvements include customer liking, quality, and satisfaction. In markets for pioneering innovations, prior evidence suggests that the initial growth in customer base and revenue is largely due to perceived quality improvements by incumbents as well as new entrants (Agarwal and Bayus 2002). In other words, innovations that create and deliver added consumer value contribute significantly to the success of brands (Kashani, Miller, and Clayton 2000).

Apparently, investors view the quality signal as providing useful information about the future-term prospects of the firm: Changes in perceived quality are associated with changes in stock returns (Aaker and Jacobson 1994; Tellis and Johnson 2007). Favorable perceptions of product quality and value by customers lead to differentiation and higher brand loyalty, which in turn lead to higher buyer switching costs that can be exploited to enhance current profitability and cash flows or to increase the residual value of the firm.

A priori, it is unclear whether customer liking and perceived quality will also accelerate cash flows. Regarding cash flow stability, brands with favorable perceptions of product quality likely enjoy a greater degree of "monopolistic competition" power. In other words, high customer quality perceptions represent competitive barriers that reduce price elasticity and generate more stable (i.e., less vulnerable to competition) earnings in the future. In summary, we postulate the following:

H_5: Customer liking of new product introductions increases stock returns.

H_6: Perceived quality of new product introductions increases stock returns.

Category Characteristics

We consider four category characteristics the control variables—category size, category growth rate, a firm's share of the category, and category concentration—on the basis of previous literature (e.g., Capon, Farley, and Hoenig 1996). Although previous marketing literature enabled us to formulate hypotheses on the impact of marketing actions on stock returns (H_1–H_6), our empirical analysis is exploratory, given the need for studies that examine the impact of category characteristics on stock returns. As such, we formulate expectations about the direction of the effects rather than formal hypotheses at this juncture.

Category size.[3] The strength of category demand is an important factor in brand success, and firms neglect market size assessment at their own peril (Cooper and Kleinschmidt 1993; Henard and Szymanski 2001). On the one hand, large categories enable firms to spread their fixed research-and-development and launch costs over a greater number of potential customers. On the other hand, large categories are also attractive to competitors and thus will draw more competitive innovation and attention. Going after larger categories may also reduce the vulnerability of a firm's cash flows. If the new product introduction misses its intended mark, other consumers in the large category may have an interest. For example, when Cadillac launched a redesigned Escalade SUV in 2002, it became highly successful with an unintended market segment—professional athletes, rappers, and celebrities. In turn, Cadillac has begun to pursue these trendsetters by giving them previews of the next-generation Escalade, by offering them limited-edition versions, and so forth (Eldridge 2004). Moreover, large categories may provide a better cushion against damage by competitive marketing actions or exogenous changes (Aaker and Jacobson 1990).

Category growth rate. Firms that target high-growth categories achieve higher sales and better financial performance, leading to enhanced cash flows (Capon, Farley, and Hoenig 1996). Moreover, competitive reactions to new product introductions are likely to be less aggressive when the incumbent sales continue to grow at a satisfactory rate, which would be the case when the product innovation increases primary demand (Frey 1988). Likewise, advertising reactions to new product introductions are less likely in growing versus static categories (Cubbin and Domberger 1988). In turn, this lower competitive intensity leads to enhanced cash flows. Moreover, investments are preferentially directed toward high-growth categories and away from established businesses in slower-growth categories

[3]Within the context of the automobile industry, there are six categories based on the accepted industry classifications: SUVs, minivans, midsize sedans, compact cars, compact pickups, and full-size pickups.

(Wensley 1981) because the expected payoff is better in high-growth categories. Similarly, when the category demand is growing, it is easier for all competitors to acquire customers rapidly, leading to acceleration in cash flows (Cooper 1999; Scherer 1980).

Finally, commitment of marketing resources in emerging-growth categories reduces risk in the future. Indeed, investors are likely to reward share gains in growing categories because the returns are expected to grow as the category grows.

Firm's share of category. The firm's current market share in a category may affect its long-term performance in several ways. A firm's high market share typically results from a strong relative advantage in the served segment (Phillips, Chang, and Buzzell 1983), which in turn enhances cash flows. At the same time, dominant firms have more to lose from cannibalization (Chandy and Tellis 2000), which could jeopardize the price premiums on their established products. This has an opposite impact on cash flows. In addition, it is unclear a priori to what extent the firm's share of the category affects the acceleration of cash flows from new product introductions. Finally, the volatility of cash flows is reduced when the firm has a dominant market share and therefore is more likely to retain a large proportion of customers on an ongoing basis (Srivastava, Shervani, and Fahey 1998). However, firms with a large share of a category may become complacent in that category as their managerial priorities shift to other, higher-growth opportunities (Kashani 2003), leading to increased vulnerability in cash flows. Given these opposing forces, we explore the effect of firm category share.

Category concentration. A brand's success critically depends on competitive category conditions, including category concentration (Capon, Farley, and Hoenig 1996; Cooper and Kleinschmidt 1993). Economic theory suggests that in concentrated categories, profit margins are higher. Moreover, companies in concentrated categories are less motivated to engage in price wars because they dissipate the attractive margins. Thus, increases in category concentration are more likely to increase cash flows and, thus, stock returns. Finally, faced with only a few competitors, a firm is less likely to be surprised by disruptive innovations that affect the stability of its income streams. Therefore, category concentration will likely reduce the vulnerability of cash flows.

Research Methodology

We use stock return response modeling to assess the degree to which marketing actions and category conditions improve the outlook on a firm's cash flows and thus lift its stock price. In essence, stock return response modeling establishes whether the information contained in a measure is associated with changes in expectations of future cash flows and, thus, stock price and returns (for a review, see Mizik and Jacobson 2004). We present a "unified" estimation of firm stock returns by specifying a model that enables us to assess the proposed hypotheses directly.

Stock Return Response Modeling

It is well known that the economic return to a marketing activity, such as a new product introduction, is obtained over the long run (e.g., Pauwels et al. 2004). Therefore, we may consider a firm's marketing activity an intangible asset that influences future cash flows. As such, "the value of a marketing strategy to the firm can be depicted as a discounted present value of the future cash flows generated through the use of this marketing strategy" (Mizik and Jacobson 2003, p. 67).

The stock market valuation of a firm depicts the market expectations of these discounted future cash flows. The efficient market hypothesis implies that stock prices follow random walks; the current price reflects all known information about the firm's future earnings prospects (Fama and French 1992). For example, investors may expect the firm to maintain its usual level of advertising and price promotions. Developments that positively affect future cash flows result in increases in stock price, whereas those that negatively affect cash flows result in decreases. Whereas changes to typical marketing time series, such as consumer sales, are mostly temporary (Dekimpe and Hanssens 2000; Ehrenberg 1988), changes to stock prices are predominantly permanent (Fama and French 1992; Malkiel 1973). By taking the first differences of the logarithm of stock prices, a stationary time series of stock returns is obtained as a dependent variable. In the context of this article, regressing stock returns against changes in the marketing mix provides insights into the stock market's expectations of the associated long-term changes in cash flows.

Assessing the Impact of Marketing Actions on Stock Returns

The framework for assessing the information content of a measure enjoys a long tradition in both finance (e.g., Ball and Brown 1968) and marketing (see, e.g., Jacobson and Aaker 1993; Madden, Fehle, and Fournier 2006). The latter research stream has attempted to assess the stock market reactions to nonfinancial information, including firms' customer-based brand equity (Aaker and Jacobson 2001; Barth et al. 1998), brand extension announcements (Lane and Jacobson 1995), online channel addition (Geyskens, Gielens, and Dekimpe 2002), and a shift in strategic emphasis from value creation to value appropriation (Mizik and Jacobson 2003). In the tradition of stock return response modeling, these studies test for incremental information content—that is, the degree to which a series explains stock price movements beyond the impact of current accounting measures, such as revenue and earnings.

We begin with a well-established benchmark in the finance literature—that is, the four-factor explanatory model, which estimates the expected returns ($Eret_{it}$) as a function of risk factors that reflect the general stock market, size, the relative importance of intangibles (book-to-market ratio), and momentum (Fama and French 1992, 1993). Riskier stocks are characterized by higher returns, so smaller firms are expected to outperform larger firms, stocks with higher book-to-market ratios are expected to outperform stocks with lower book-to-market ratios, and

stocks with higher momentum (i.e., high past return) are expected to outperform stocks with lower momentum. The typical financial benchmark model for stock returns is estimated as follows:

$$(1)\quad R_{it} - R_{rf,t} = \alpha_i + \beta_i(R_{mt} - R_{rf,t}) + s_i SMB_t + h_i HML_t + u_i UMD_t + \varepsilon_{it},$$

where R_{it} is the stock return for firm i at time t, $R_{rf,t}$ is the risk-free rate of return in period t, R_{mt} is the average market rate of return in period t, SMB_t is the return on a value-weighted portfolio of small stocks less the return of big stocks, HML_t is the return on a value-weighted portfolio of high book-to-market stocks less the return on a value-weighted portfolio of low book-to-market stocks, and UMD_t is the average return on the two high prior return portfolios less the average return on the two low prior return portfolios (i.e., momentum). Moreover, ε_{it} is the error term; α_i is the model intercept; and β_i, s_i, h_i, and u_i are parameter estimates of the four factors used in the model. The SMB and HML factors are constructed using portfolios formed on size and book to market, and the UMD factor is constructed using portfolios formed on prior 2- to 12-month returns.[4] If the stock's performance is "normal," the four-factor model captures the variation in R_{it}, and α_i is zero.

Next, we augment the financial benchmark model (Equation 1) with marketing variables to test hypotheses on their impact on future cash flows. As argued previously, we express the marketing variables in unanticipated changes—that is, deviations from prior behaviors that are already incorporated in investor expectations. We define the model at the brand level and the category level as follows:

$$\begin{aligned}(2)\quad R_{it} - R_{ft} = {} & Eret_{it} + \beta_1 U\Delta INC_{it} + \beta_2 U\Delta REV_{it} \\ & + \sum_{l=1}^{5} \beta_3 U\Delta INND_{ijkt,l} + \beta_4 U\Delta CINN_{ijkt} \\ & + \beta_5 PION_{ijkt} + \beta_6 CPION_{ijkt} \\ & + \sum_{own=1}^{4} \beta_{7,own} U\Delta OMKT_{ijkt,own} \\ & + \sum_{cross=1}^{4} \beta_{8,cross} U\Delta CMKT_{ijkt,cross} \\ & + \sum_{n=1}^{4} \beta_{9,n} U\Delta CAT_{kt,n} + \gamma_1 U\Delta INC_{it} \times U\Delta INN_{ijkt} \\ & + \gamma_2 U\Delta REV_{it} \times U\Delta INN_{ijkt} \\ & + \sum_{own=1}^{4} \gamma_{3,own} \times (U\Delta OMKT_{ijkt,own} \times U\Delta INN_{ijkt}) \\ & + \sum_{own=1}^{4} \gamma_{4,own} \times (U\Delta OMKT_{ijkt,own} \times PION_{ijkt}) \\ & + \sum_{cross=1}^{4} \gamma_{5,cross} \times (U\Delta CMKT_{ijkt,cross} \times U\Delta INN_{ijkt}) \\ & + \sum_{n=1}^{4} \gamma_{6,n} \times (U\Delta CAT_{kt,n} \times U\Delta INN_{ijkt}) + \varepsilon,\end{aligned}$$

where R_{it} is the stock return for firm i at time t, $Eret_{it}$ is the expected return from the Fama–French benchmark model in Equation 1, and the subscripts j and k denote the brand and category and *l* denotes the innovation level. The inclusion of brand and category subscripts is relevant for two reasons: First, since the stock return impact is likely to be different across brands and categories because of cross-sectional heterogeneity, it is important to account for such heterogeneity from an econometric perspective. Second, managers want to pinpoint which brands (e.g., those with more versus less advertising support, innovation level, and quality) and/or targeted categories contribute more or less to the firm's stock return. The subscripts "own" and "cross" denote own and competitive marketing variables (advertising, promotional incentives, liking, and quality). The subscript n denotes the category variables (size, growth rate, concentration, and the market share of the firm in the category). The unexpected components of stock returns are of two kinds: results and actions or signals. Results include unanticipated accounting earnings (UΔINC) and revenues (UΔREV). Specific marketing actions or signals are the unanticipated changes to brand innovation (UΔINND); to pioneering innovations (PION); and to advertising, promotions, customer liking, and perceived product quality to the brand (UΔOMKT). Competitive actions or signals in the model are the unanticipated changes to competitive brand innovation (UΔCINN); to competitive pioneering (CPION); and to competitive advertising, promotions, customer liking, and perceived quality (UΔCMKT). Finally, category variables (UΔCAT) include category size, category growth rate, category concentration, and the firm's market share in the category (to capture cannibalization effects), and ε_{it} is the error term. Note that we include the possibility for interactions of each marketing variable with both the innovation level (UΔINN) and the pioneering nature of the product innovation (PION). The unanticipated components are modeled with either survey data of analysts' expectations or time-series extrapolations (Cheng and Chen 1997). This study follows the latter approach, using the residuals from a time-series model as the estimates of the unanticipated components.

In stock return response models, such as the one we described previously, a test of "value relevance" of unexpected changes to firm results and actions is a test for significance of the β and γ coefficients; significant values imply that these variables provide incremental information in explaining stock returns.[5] Empirically, we estimate using

[4]More details on the four factors and related data are available on Kenneth French's Web site (see http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

[5]It would be ideal to run the regression $RET^{BRAND} = bX + \mu$, where RET^{BRAND} is the return associated exclusively with the par-

a fixed-effects cross-sectional time-series panel model to control for unobserved brand and firm characteristics. We test for pooling versus estimating a fixed-effects cross-sectional time-series panel model to evaluate the significance of the cross-section effects using the sums-of-squares F-test and the likelihood function using EViews 6.0 (2007, p. 568). Because we have multiple observations by firm (i.e., multiple brands of the same firm in up to six categories, as we describe in the "Data and Variable Operationalization" section), we use seemingly unrelated regression estimation to account for the contemporaneous correlations.

Data and Variable Operationalization

We focus on the 1996–2002 automobile industry's "big six"—Chrysler, Ford, General Motors, Honda, Nissan, and Toyota—which represent approximately 86% of the U.S. car market. Sales transaction data from J.D. Power and Associates are available for a sizable sample of dealerships in the major metropolitan areas in the United States. For the sales promotions, we use data from California dealerships, which contain every new car sales transaction in a sample of 1100 dealerships from October 1996 to June 2002.[6] Each observation in the J.D. Power and Associates database contains the transaction date, manufacturer, model year, make, model, trim and other car information, transaction price, and sales promotions (operationalized as the monetary equivalent of all promotional incentives per vehicle).[7] The vehicle information is aggregated to the brand, representing a brand's presence in each category (e.g., Chevrolet SUV). Table 2 clarifies the variables, their definitions, specific data sources, and the temporal and cross-sectional aggregation of each variable. Importantly, note that a certain brand can experience an innovation at several weeks during a year because its (sub)models introduce their new versions at different times. We consider 53 brands in six major product categories: SUVs, minivans, midsize sedans, compact cars, compact pickups, and full-size pickups (see Table 3).[8]

Another source of J.D. Power and Associates data is expert opinions on the innovation level of each vehicle redesign or introduction. We obtained these data from the work of Pauwels and colleagues (2004), which provides an extensive discussion of those data.

For the "pioneering" innovation variable, in line with the J.D. Power and Associates (1998) guidelines, experts rate innovativeness as pioneering or not. An example of Level 1 for the premium car category is the 2001 Toyota Prius, the first gasoline–electric hybrid that could function as a versatile family car. For the SUV category, an example of a pioneering innovation is the 1999 Lexus RX 300, the first car-based SUV designed to compete in the luxury SUV segment. Table 4 provides specific illustrations of pioneering innovations.

Another important set of J.D. Power and Associates data is the annual surveys of the Automotive Performance, Execution and Layout (APEAL) Study and of the Initial Quality of cars, based on feedback from more than 60,000 customers on the experience of the first months of ownership. The former is a customer-driven metric of "things gone right," which measures customers' perceptions on the design, content, layout, and performance of their new vehicles during the first three to seven months of ownership. We use this measure to operationalize customer liking. The latter, which is our measure of perceived quality, is based on feedback from more than 60,000 customers on the experience of the first 90 days of ownership and measures the number of problems by each brand; essentially, this is a measure of "things gone wrong" (see Table 2).[9] A final source of data is advertising data from TNS Media Intelligence on monthly advertising expenditures by make and model in each of the six categories.

We obtain stock returns from the Center for Research in Security Prices. The data source for the four factors is Kenneth French's Web site at Dartmouth (see n. 4). For firm-specific and quarterly accounting information, such as book value, revenues, and net income, we use Standard & Poor's COMPUSTAT database. The COMPUSTAT data set also provides monthly indexes of the Consumer Price Index, which is used to deflate the monetary variables. To obtain weekly Consumer Price Index data, we linearly interpolated the monthly numbers (see Franses 2002). Table 5 provides the descriptive statistics for the measures that form the basis of our analysis. We choose the week as the time interval of

ticular brand information X. However, given the corporate nature of stock returns, the regression we estimate is $RET = \beta X + \varepsilon$, where RET is the total corporate stock return, which is composed of RET^{BRAND} and $RET^{NOT\text{-}BRAND}$ (i.e., the stock return that is not associated with the brand). Because $RET = (RET^{BRAND} + RET^{NOT\text{-}BRAND})$, it can be shown that the least squares estimate of $E[\beta] = E[(X'X)^{-1}X'(RET^{BRAND} + RET^{NOT\text{-}BRAND})] = b$ (Geyskens, Gielens, and Dekimpe 2002; Lane and Jacobson 1995), leading to an unbiased estimate under the reasonable assumption that $RET^{NOT\text{-}BRAND}$ and X are uncorrelated. As a further test of this assumption, we estimate an expanded model that includes cannibalization effects of other brands owned by the same firm and find that our substantive results are robust to this issue (for details, see n. 12).

[6]With the exception of price promotions, all the other variables come from national sources. In the auto industry, it is typical for promotions to be planned and executed at the national level, and they are advertised nationally through television networks. As such, the price promotions data from California are representative of the price promotions of other U.S. regions.

[7]Moreover, this data set is at the detailed "vehicle" level, defined as every combination of model year, make, and model (e.g., 1999 Honda Accord, 2000 Toyota Camry); body type (e.g., convertible, coupe, hatchback); doors (e.g., two-door, four-door, four-door extended cabin); trim level (e.g., for Honda Accord, DX, EX, LX); drive train type (e.g., two-wheel drive, four-wheel drive); transmission type (e.g., automatic, manual); cylinders (e.g., four cylinder, six cylinder); and displacement (e.g., 3.0 liters, 3.3 liters).

[8]For reasons of parsimony, we restrict our attention to brands that together account for at least 80% of the share of the category under consideration.

[9]The customer liking and perceived quality variables are aggregated to the brand level as the market share–weighted average of the respective ratings of the models for brand j. This enables us to incorporate the effects of changes in the vehicle model mix on firm valuation. For example, if market conditions cause a drop in sales of full-size SUVs relative to midsize SUVs, the product lines of General Motors and Ford become less attractive than those of Toyota and Nissan.

TABLE 2
Data: Variable Definitions

Variable	Definition	Source
Dependent Variable		
Stock returns (R_{it})	$(Price_t + Dividend_t - Price_{t-1})/(Price_{t-1})$	Center for Research in Security Prices
Four Factors		
Market risk (Rm-Rf)	Rm is the average market rate of return, and Rf is the risk-free rate of return.	Kenneth French's Web site (see n. 4)
Size risk (SMB)	Difference of returns on a value-weighted portfolio of small stocks and the return on large stocks.	
Value risk (HML)	Difference of returns on a value-weighted portfolio of high and low book-to-market stocks.	
Momentum (UMD)	Difference of the average return on the two high-prior-return portfolios and on two low-prior-return portfolios.	
Firm Actions		
Firm income	Firm income, scaled by dividing by firm assets, is the earnings of firm i in week t.	COMPUSTAT
Firm revenue	Firm revenue, scaled by dividing by firm assets, is the revenue of firm i in week t.	COMPUSTAT
Seasonal and holiday variables	It is set to 1 for one week before the event, during the week of the event, and one week following the event and to 0 otherwise, around the following holidays: Labor Day weekend, Memorial Day weekend, and the end of each quarter.	
Product innovation	Brand innovation variable for brand j in category k for firm i at time t is defined as the maximum of the innovation variable for all vehicle model transactions in that week, as in Pauwels and colleagues (2004). This variable is used to create the innovation variables that measure each innovation level from 1 to 5.	J.D. Power and Associates expert opinions; J.D. Power and Associates weekly transactions data
Competitive product innovation	Market share–weighted average of the product innovation of all the other brands (other than the focal brand) in the category.	J.D. Power and Associates expert opinions; J.D. Power and Associates weekly transactions data
Pioneering innovation	A dummy variable indicates whether the J.D. Power and Associates experts rate innovations as pioneering (1) or not. This variable is set to 1 in the week of introduction of the pioneering innovation and to 0 otherwise.	J.D. Power and Associates expert opinions
Competitive pioneering innovation	This variable is set to 1 in the week of introduction of the pioneering innovation of the other brands (other than the focal brand in the category) and to 0 otherwise.	J.D. Power and Associates expert opinions
Advertising support	Advertising expenditure in millions of dollars for brand j in category k for firm i at time t, scaled by firm assets.	TNS Media Intelligence
Competitive advertising support	Market share–weighted average of the advertising support of all the other brands (other than the focal brand) in the category.	TNS Media Intelligence
Promotional support	The monetary equivalent of promotional incentives for brand j in category k for firm i at time t; the brand-level calculated by the market share–weighted average of the incentives for all models of brand j in category k, scaled by firm assets.	J.D. Power and Associates weekly transactions data

TABLE 2
Continued

Variable	Definition	Source
Competitive promotional support	Market share–weighted average of the promotional support of all the other brands (other than the focal brand) in the category.	J.D. Power and Associates weekly transactions data
Brand's customer liking	The brand-level measure is calculated as the market share–weighted average of the perceived APEAL rating of the models for brand j in category k at time t. This is a customer-driven measure of "things gone right," which measures customer perceptions on the design, content, layout, and performance of their new vehicles during the first three to seven months of ownership.	J.D. Power and Associates survey data for the APEAL measure; J.D. Power and Associates weekly transactions data
Competitive customer liking	Market share–weighted average of the perceived APEAL of all the other brands (other than the focal brand) in the category.	J.D. Power and Associates survey data for the APEAL measure; J.D. Power and Associates weekly transactions data
Brand's perceived quality	The brand-level measure is calculated as the market share–weighted average of the perceived quality of the models for brand j in category k at time t. This survey, which is based on feedback from more than 60,000 customers on the experience of the first 90 days of ownership, measures the number of problems by each brand and is a measure of "things gone wrong." Thus, the latter Initial Quality Survey measure is negatively signed to obtain the perceived quality metric.	J.D. Power and Associates Initial Quality Survey for the APEAL measure; J.D. Power and Associates weekly transactions data
Competitive perceived quality	Market share–weighted average of the perceived quality of all the other brands (other than the focal brand) in the category.	J.D. Power and Associates Initial Quality Survey for the APEAL measure; J.D. Power and Associates weekly transactions data
Category Control Variables		
Category size	Category size is the total sales in week t for category k.	J.D. Power and Associates weekly transactions data
Category growth rate	The metric of interest is the ratio of category growth rate of category k to total growth rate for all auto sales, which yields a measure of relative attractiveness of a category.	J.D. Power and Associates weekly transactions data
Market share	Market share of the firm i in category k in week t.	J.D. Power and Associates weekly transactions data
Category concentration	Category concentration is the sum of the market share of the top three brands within category k in week t.	J.D. Power and Associates weekly transactions data

analysis because (1) previous stock return modeling studies have demonstrated that a few days suffice for studying product innovation (e.g., Chaney, Devinney, and Winer 1991), (2) weekly return data guard against noisy day-to-day (or even hour-to-hour) day-trading patterns, and (3) the product innovation variable is available at the weekly level.

Because the stock market reacts only to unexpected information, explanatory factors should only reflect unanticipated changes. To obtain a measure of unanticipated changes, we estimate a time-series model and use the residuals as the estimates of unanticipated components. As an illustration, a first-order autoregressive model has been widely used to depict the time-series properties of firm performance, such as earnings (Y_{it}):

$$Y_{it} = \theta_0 + \theta_1 Y_{it-1} + \eta_{it}, \quad (3)$$

where the coefficient θ_1 is the first-order autoregressive coefficient depicting the persistence of the series and η_{it} provides a measure of unanticipated portion of Y_{it} and is used as the explanatory variable in the estimation of the stock return response model in Equation 2. (In other words, the residuals in Equation 3 provide an estimate of $U\Delta Y_{it}$).

Empirical Results

Table 6 shows the correlations among the variables. The variance inflation factors range from 1.18 to 1.72, which is

TABLE 3
Brands of the Six Leading Car Manufacturers

Category	Brands	Chrysler	Ford	General Motors	Honda	Nissan	Toyota
SUVs	15	Dodge, Jeep	Ford Lincoln	Chevrolet Cadillac GMC Oldsmobile Buick	Honda Acura	Nissan Infiniti	Toyota Lexus
Minivans	9	Dodge, Chrysler	Ford Mercury	Chevrolet Oldsmobile	Honda	Nissan	Toyota
Premium midsize cars	9	Chrysler	Ford Mercury	Chevrolet Oldsmobile Buick	Honda	Nissan	Toyota
Premium compact cars	8	Chrysler	Ford	Chevrolet Pontiac Saturn	Honda	Nissan	Toyota
Compact pickups	6	Dodge	Ford	Chevrolet GMC		Nissan	Toyota
Full-size pickups	7	Dodge	Ford Lincoln	Chevrolet GMC Cadillac			Toyota

TABLE 4
Examples of Pioneering Innovations

Category	Pioneering Innovation	Description
Compact car	2001 Toyota Prius	First gasoline hybrid
Truck	2002 Chevrolet Avalanche	Unique convertible cab system to transform from a five-passenger SUV into a standard cab pickup
Truck	2002 Lincoln Blackwood	Introduced as a cross between a luxury SUV and a pickup truck
SUV	1999 Lexus RX 300	First car-based SUV in the luxury segment
Minivan	1999 Honda Odyssey	First introduced the hideaway or "magic seat"

acceptable and suggests that multicollinearity among the variables is not a concern.

We first estimate the benchmark four-factor financial model in Equation 1, followed by the focal model in Equation 2.[10] The stock return models are statistically significant at $p < .05$ for both the benchmark four-factor financial model and the focal model, including firm results and firm actions. We discuss our main results on the benchmark four-factor financial model, Pauwels and colleagues' (2004) model, and the focal model, as well as the robustness of the implied causality from marketing mix to stock market returns.

Results of the Benchmark Models

The benchmark four-factor model. Are stock returns affected by the four risk factors of size (SMB), the importance of intangibles (HML), risk class (Rm-Rf), and momentum (UMD)? As Columns 3 and 4 of Table 7 show, the benchmark four-factor financial model is statistically significant at $p < .05$ with the adjusted R-square of .154. The market-risk coefficient is positive and significant (.308, $p < .01$) and different from 1.00, suggesting that the big-six automobile firms have below-average market risk. Indeed, consistent with the capital asset pricing model and the four-factor financial model, the coefficient for market risk dominates all other explanatory variables in our models in terms of t-values. The coefficient for size risk, SMB, is positive and significant (.041, $p < .05$), and the coefficient for value risk is also positive and significant (.302, $p < .01$). Thus, these results confirm well-established findings that (1) small caps and (2) stocks with a high book-to-market ratio tend to do better than the market as a whole. Notably, the only variable that does not significantly explain stock returns in our data, momentum, represents a later addition to the four-factor model.

Pauwels and colleagues' (2004) variables. In Columns 5 and 6 of Table 7, we report the results of the stock return response model, adding Pauwels and colleagues' (2004) marketing variables. As for the Fama–French factors, SMB,

[10]Unit root tests reveal evolution in income and revenue but stationarity in stock returns, the marketing variables, and the category-specific variables. A cointegration test for the existence of a long-term equilibrium among these evolving variables produced a negative result.

TABLE 5
Characteristics of the Six Leading Car Manufacturers 1996–2002

Characteristic	Ford	General Motors	Chrysler	Honda	Nissan	Toyota
U.S. market share	21%	28%	15%	8%	4%	10%
Market capitalization (in billions of dollars)	48.6	36.7	44.3	34.1	18.5	112.2
Quarterly firm earnings (in millions of dollars)	1,570	1,040	845	530	750	1,015
Quarterly firm revenue (in millions of dollars	37,025	40,600	29,080	12,090	10,765	25,220
Stock market returns (%)	–.077%	.086%	.199%	–.063%	.102%	.165%
Brand advertising (yearly, in millions of dollars)	720	1430	660	250	290	400
Number of new product introductions (Levels 1–5)	113	93	67	42	24	56
Sales promotions per vehicle ($)	390	640	640	25	200	120
Customer liking score	603	588	644	601	626	613
Perceived quality score	203	248	187	232	230	226

Notes: The values reported are the sample mean of the time series. The exception is new product introductions, for which we report the total number.

HML, and Rm-Rf remain significant. Moreover, the marketing actions regarding innovation and promotion and their firm results regarding revenue and income significantly affect stock returns beyond the four factors. Indeed, the "marketing + finance" model explains twice as much variance in stock returns as the nested "finance-only" model. Still, our richer focal model outperforms Pauwels and colleagues' (2004) nested benchmark. Therefore, we focus on discussing the results of the focal model and return to Pauwels and colleagues' benchmark results in the "Managerial Implications" section for comparison purposes.

Focal Model Results

The focal model reported in Columns 7 and 8 of Table 7 is statistically significant (F-value at $p < .05$). The sums-of-squares F-test and the likelihood function test statistics for pooling versus fixed effects reject the null that the fixed effects are redundant ($p < .05$).[11] Notably, the estimated effect of size (SMB) becomes statistically insignificant, indicating that the size effect is likely captured by the firm-specific marketing actions and the results included in the focal modal. We tested for autoregressive conditional heteroskedasticity (ARCH) in the residuals using Engle's Lagrange-multiplier ARCH test (Engle 1982; Van Dijk, Franses, and Lucas 1999) and fail to reject the null hypotheses of no ARCH ($p < .01$).

Do Firm Results Drive Stock Returns?

A key question on the firm results side is, Do firm revenue surprises and firm earnings surprises affect stock returns? As Columns 7 and 8 in Table 7 show, the impact of unexpected changes to revenue, or top-line performance, on stock returns is positive and significant (.544, $p < .05$). Similarly, the impact of unanticipated changes to income, or bottom-line performance, on stock returns is positive and significant (2.511, $p < .01$). The size of the estimate is similar to that reported previously—for example, Kormendi and Lipe (1987), who report a coefficient of 3.38. These two effects are consistent with the extensive accounting and finance literature (e.g., Kothari 2001) that has documented the information content of revenues and earnings measures. When an unanticipated change in firm results (e.g., earnings) occurs, investors view it as containing information not only about changes in current-term results but about future-term prospects as well. This information induces stock market participants to update their expectations about the firm's discounted future cash flows and revise stock price accordingly.

Do Firm Actions Drive Stock Returns?

The key question on the firm actions side is, Do firm action surprises affect stock returns?

New-to-the-company innovations. In confirmation of H_{1a}, in general, new-to-the-company innovations have a positive and significant impact (.546, $p < .01$). This effect is U shaped (see Figure 2) in the level of innovation, with a strong preference for new market entries/Level 5 innovations (.981, $p < .01$) over minor updates/Level 1 innovations (.546, $p < .01$), lending support to H_{1b}. As for competitive new-to-the-company innovations, the main effect of such innovations on stock returns is not significant. Thus, it appears that competitive innovations have no incremental information content to investors regarding the focal firm, unless they are new to the market.

New-to-the-market innovations. Pioneering innovations have a positive and significant impact on stock returns (3.304, $p < .01$), consistent with H_2. Importantly, the advent of pioneering innovations dominates all other explanatory variables in the models. As such, pioneering innovations reflect information that affects financial markets' expectations about the firm's future financial performance. Likewise, pioneering innovations of competitors have a significant and negative impact on stock returns (–.882, $p < .05$).

Advertising support. As noted previously, we test both the main and the interaction effects of marketing support. Advertising has positive and significant effects on stock returns (.045, $p < .05$). Advertising support for new-to-the-company innovations and pioneering innovations increases the stock market returns of these innovations (.055, $p < .05$,

[11]An argument in favor of a random coefficients model could also be constructed using tests to detect such departure from the constant parameter assumption. As such, we tested for this using the variation of the Lagrange-multiplier test (Hsiao 2003, pp. 147–49). A chi-square test (using a significance level of $p < .05$) did not reveal departure from the assumption of fixed coefficients.

TABLE 6
Intercorrelations Among the Variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Stock return	1.00																		
2. UΔRevenue	.04	1.00																	
3. UΔEarnings	.04	.01	1.00																
4. UΔInnovation	.02	−.01	.00	1.00															
5. UΔCompetitive innovation	.10	.04	−.01	.00	1.00														
6. Pioneering	.03	.00	.00	.00	−.02	1.00													
7. Competitive pioneering	−.05	.00	.01	.01	−.05	.00	1.00												
8. UΔAdvertising	.07	.11	.00	.01	.11	.00	−.01	1.00											
9. UΔCompetitive advertising	.06	.08	.00	.01	.13	.00	.06	.25	1.00										
10. UΔPromotions	−.05	−.03	.00	−.02	−.02	−.01	−.02	.00	.01	1.00									
11. UΔCompetitive promotions	.01	−.09	.03	−.02	−.03	−.01	.03	−.07	−.06	.01	1.00								
12. UΔCustomer liking	.01	−.01	−.01	.00	.01	.01	−.01	−.05	−.02	.01	.02	1.00							
13. UΔCompetitive liking	−.07	.03	−.07	.01	.06	.00	−.01	.04	.08	.00	−.01	.00	1.00						
14. UΔPerceived quality	.02	−.01	−.01	.02	−.01	.00	−.01	−.01	−.03	.01	.01	.46	.00	1.00					
15. UΔCompetitive quality	.02	.00	−.01	.00	.15	.03	−.02	.00	−.02	.00	.03	−.06	.03	−.03	1.00				
16. UΔCategory size	.00	−.03	−.01	−.03	.03	−.03	−.04	−.10	−.03	.00	.10	.01	.01	−.01	.01	1.00			
17. UΔCategory growth	.00	−.03	.00	−.02	.03	−.03	−.04	−.10	−.02	−.01	.10	−.01	.01	−.03	−.03	.92	1.00		
18. UΔFirm's share	−.03	−.01	.09	−.02	.01	−.08	−.03	−.04	.00	−.01	−.02	.03	−.02	.03	.00	.04	.03	1.00	
19. UΔConcentration	.02	.02	.05	.02	.00	−.01	−.03	.03	.00	.01	.00	.01	−.07	−.03	.00	.03	.07	.03	1.00

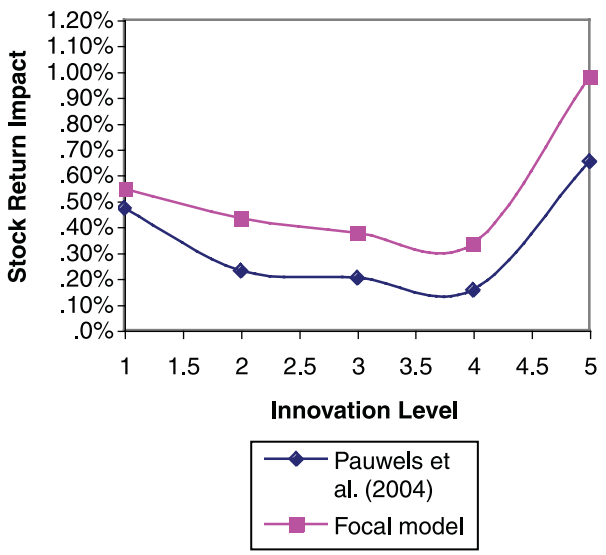
Notes: Correlations are presented as Pearson correlation coefficients and are modest.

TABLE 7
Drivers of Stock Returns

Variables	Hypothesis	Four-Factor Model 1		Pauwels et al. (2004) Variables Model 2: Partial		Focal Model 2: Full	
		Estimate	SE	Estimate	SE	Estimate	SE
Four Factors							
Constant		−.010	.035	−.077	.086	.232	.427
R_m–R_f		.308*	.017	.323*	.085	.350*	.020
SMB		.041**	.019	.048**	.024	.059	.039
HML		.302*	.026	.323*	.030	.373*	.034
UMD		.051	.036	.038	.038	.046	.041
Firm Results							
UΔRevenue				.468**	.224	.544**	.261
UΔEarnings				2.406*	.811	2.511*	.802
UΔRevenue × UΔInnovation				1.115	.678	.118	.077
UΔEarnings × UΔInnovation				2.596**	1.133	1.468*	.519
Firm Actions							
UΔInnovation: Level 1	H_1			.473*	.140	.546*	.146
UΔInnovation: Level 2	H_1			.231**	.113	.432*	.137
UΔInnovation: Level 3	H_1			.202	.125	.375	.272
UΔInnovation: Level 4	H_1			.157**	.078	.335*	.103
UΔInnovation: Level 5	H_1			.654*	.223	.981*	.420
UΔCompetitive innovation						.003	.047
Pioneering	H_2					3.304*	1.022
Competitive pioneering						−.882**	.425
UΔAdvertising						.045**	.022
UΔCompetitive advertising						−.127	.128
UΔAdvertising × UΔInnovation	H_{3a}					.055**	.023
UΔCompetitive advertising × UΔInnovation						.182	.170
UΔAdvertising × Pioneering	H_{3b}, H_{3c}					.812*	.329
UΔPrice promotions				−.002*	.000	−.005	.003
UΔCompetitive promotions						−.004	.004
UΔPrice promotions × UΔInnovation	H_4			−.002*	.000	−.002**	.000
UΔCompetitive promotions × UΔInnovation						.017	.111
UΔPromotions × Pioneering						−.018	.080
UΔLiking						.001	.001
UΔCompetitive liking						.019	.016
UΔLiking × UΔInnovation	H_5					.029	.019
UΔCompetitive liking × UΔInnovation						−.017	.017
UΔLiking × Pioneering						.191	.190
UΔQuality						.011	.009
UΔCompetitive quality						−.014*	.004
UΔQuality × UΔInnovation	H_6					.021*	.002
UΔCompetitive quality × UΔInnovation						−.257	.251
UΔQuality × Pioneering						.158	.111
Category Characteristics							
UΔSize						.018	.212
UΔSize × UΔInnovation						.220*	.052
UΔGrowth rate						.365	1.181
UΔGrowth rate × UΔInnovation						.618*	.234
UΔShare of category						−.141	.128
UΔShare × UΔInnovation						.079	.962
UΔConcentration						−.432	.420
UΔConcentration × UΔ Innovation						.129	.121
Durbin–Watson statistic for serial correlation		2.072		2.080		2.103	
Adjusted R-square		.154		.334		.472	

*p = .01 (two-sided).
**p = .05 (two-sided).
Notes: The model also includes the seasonal dummies and the brand- and firm-specific fixed coefficients, which are not displayed in the interest of space. There are 54 brands × 299 weeks in the cross-sectional time-series panel. We obtained the Durbin–Watson test statistic using EViews 6 (see Johnston and DiNardo 1997, Chap. 6.6.1).

FIGURE 2
Stock Returns and New-to-the-Company Innovations



and .812, $p < .01$), in support of H_{3a} and H_{3b}. In other words, advertising support for new products (through the interaction effect) has a positive stock return impact beyond general-purpose advertising (i.e., the main advertising effect). Because advertising and innovation are at the brand (or vehicle model) level, advertising support will draw consumer attention to the brand's innovation to subsequently drive customer traffic and new product sales to the dealer. From a practical perspective, most brand advertising at the time of a new product launch in the auto industry tends to focus on the innovation itself (e.g., the 1999 Honda Odyssey's fold-flat rear seat, the Lexus RX's smooth drive). Overall, our results suggest that the innovation effects are enhanced by advertising support because investors look beyond the advertising expense (which reduces immediate profits) and reward the signal of product support that the brand provides by advertising. Advertising support for pioneering innovations appears to be especially effective, in line with H_{3c}. Marketing communication works best when managers have something truly new to offer to and communicate with consumers.

Price promotions. For price promotions, we find that the main effect of these incentives on stock returns is not significant. Thus, although promotions are known to be revenue and profit enhancing in the short run, investors do not reward them. More important, we find a significant, negative interaction effect (–.002, $p < .05$) for promotions with innovations, in support of H_4. Thus, although advertising support is interpreted as a sign of strength, price promotions may be viewed as a signal that an innovation is weak by investors judging the innovation's impact on future cash flows.

Customer liking and perceived quality. With respect to the brand's customer liking and perceived quality, main effects are not significant. This is not surprising, because when there is no new product or change in the existing product, we would not expect any change in the brand's liking and quality and, thus, in stock market returns. The effect of new product introductions that enjoy more positive scores on customer liking is in the expected direction (H_5); however, it does not reach traditional significance levels. New product introductions that enjoy more positive consumer perceptions of quality have systematically higher stock returns (.021, $p < .01$), in support of H_6. Our results suggest that improvements in consumer appraisal in terms of perceived quality, particularly for new products, translate into better investor appraisal of firm performance.

Do Category Characteristics Drive Stock Returns?

Category size and category growth rate have significant interaction effects with product innovations. First, new product introductions have a larger stock return impact in large than small categories (.220, $p < .01$). Second, the category growth rate has a significant, positive influence (.618, $p < .01$) on stock returns from new product introductions. This finding is consistent with the forward-looking nature of investment behavior; that is, investors reward firms that target high-growth-rate categories with new product introductions because they offer the potential of higher sales and financial performance. Moreover, the returns from innovating grow as the category grows, and such growth tends to be rewarded all the more by investors.[12]

Robustness Test of Endogeneity

Our central hypothesis is that marketing-mix activity, such as product innovation and advertising, improves the outlook on cash flows and thus improves stock returns beyond the known impact of other important variables, such as the firm's net operating income. However, an argument could also be constructed in favor of the reverse effect; for example, firms' innovations and advertising levels are based, in part, on their observed stock returns. Specifically, marketers might want to incorporate investor behavior in their actions because there may be a "reverse causality" between marketing and stock returns (Markovitch, Steckel, and Yeung 2005).

Under the reverse-causation scenario, firm actions (e.g., innovations, advertising levels) are endogenously determined. Therefore, we tested for the presence of endogeneity using the Hausman–Wu test (Davidson and MacKinnon 1993; Gielens and Dekimpe 2001). The procedure is implemented as follows for each potentially endogenous variable:

[12]We also examined the robustness of our results with an expanded model that incorporates the effects of other brands owned by the same firm. Thus, this model includes two types of competitive variables. First, we control for competition from brands of the same firm within the same category to account for cannibalization. Second, we consider competition from brands of competing firms in the same category to account for cross-effects. We observe no substantial differences in the results between the expanded model and the focal model, indicating that our statistical inference is robust to this issue.

In the test equation, we include both the variable and its instruments, which are derived as the forecasts from an auxiliary regression linking the variable to the other control variables. A chi-square test on the significance of these instruments then constitutes the exogeneity test. None of these tests revealed any violation of the assumed exogeneity of the right-hand-side variables (using a significance level of $p < .05$), indicating that the model specification is robust to this issue.

Managerial Implications

To better appreciate the managerial meaning of these results, we juxtapose the consequences of the variables largely under managerial control: new product introductions, the pioneering status of the new product introduction, advertising support, promotion support for new product introductions, and improvements in customer liking and perceived quality of new product introductions. The first two variables are related to innovation characteristics (i.e., value creation), the next two involve marketing support (i.e., value communication), and the last two involve both value creation and value communication. Therefore, a comparison of these effects may provide valuable input for resource allocation decisions in the new product process. Specifically, we calculate the stock return impact of (1) introducing a new product by itself, (2) introducing a pioneering innovation, (3) increasing advertising support for a new product introduction or for a pioneering innovation by $1 million, (4) increasing promotional incentives for a new product introduction by $1,000, (5) increasing customer liking for a new product introduction, and (6) increasing the perceived quality for a new product introduction. Of these effects, only the first and fourth have been addressed by Pauwels and colleagues (2004). Table 8 reports the effect sizes and also highlights the new managerial insights (over Pauwels and colleagues') we obtained by comparing Columns 2 and 3 (for a graphical comparison summary of marketing variables' impact on stock returns, see Figure 3).

First, the stock return impact is U shaped with the innovation level, with a preference for new market entries (.98%) over minor updates (.55%). In comparison, Chaney, Devinney, and Winer (1991) find a stock market impact for new product announcements of approximately .75%. These results support the interpretation that investors look beyond current financial returns and consider spillover innovation benefits, which may include increased revenues from opening up whole new markets and reduced costs from applying the innovation technology to different vehicles in the manufacturer's fleet (Sherman and Hoffer 1971). While a new product introduction generates only modest stock return gains, the gain generated by a pioneering new product is much higher at 4.28%. Thus, the impact of introducing a pioneering innovation on stock returns is approximately seven times higher than that of introducing a minor update.

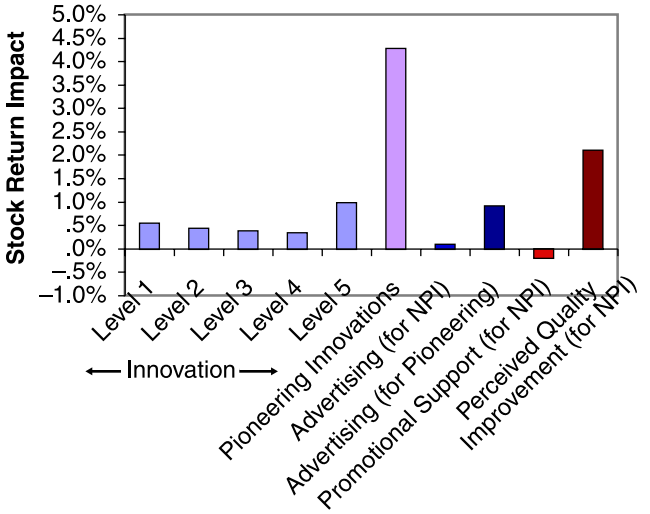
Second, an incremental outlay of $1 million in advertising support of an innovation generates up to .10% in stock returns but up to .91% gains for advertising support of a pioneering innovation. Note that these gains occur in addition to the direct sales and profit impact of such advertising support. The reverse is true for promotional support for new product introductions and pioneering innovations because these are negative (–.20%) in terms of stock return impact. Finally, improvements in perceived quality score by 100 points or a 45% improvement relative to the sample average score of 221 (see Table 5) results in a stock return impact of

TABLE 8
Impact of Firm Actions on Stock Returns

	Effect on Stock Returns	
Impact of …	Pauwels et al. (2004) Variables (Table 7, Column 5)	Focal Model (Table 7, Column 7)
New Product Introductions		
Level 1	.47%	.55%
Level 2	.23%	.43%
Level 3	.20%	.38%
Level 4	.16%	.34%
Level 5	.65%	.98%
Pioneering innovations		4.28%
Advertising support for new product introductions		.10%
Advertising support for pioneering innovations		.91%
Promotional support for new product introductions		–.20%
Improvement in customer liking for new product introductions		n.s.
Improvement in perceived quality for new product introductions		2.10%

Notes: n.s. = the estimate is not significant. The simulation for the impact of a pioneering innovation is based on the assumption that when a pioneering innovation is introduced, the level of innovation increases from Level 0 to Level 5.

FIGURE 3
Marketing Impact on Stock Returns



Notes: NPI = new product introduction.

2.10%. In contrast, financial markets do not seem to incrementally value improvements in customer liking scores for new product introductions. The reason for this difference may reside in the sampling of only current car owners, who logically like the car features (thus the low informational value of customer liking, beyond the informational value of measures such as sales and earnings, to future company cash flows) but may or may not have experienced problems (thus the high informational value of perceived quality to future company cash flows, which likely suffer from negative word of mouth and poor retention in the case of negative perceived quality).

Conclusions

This article investigates the impact of new product introductions and the associated marketing investments on stock returns. We postulated several hypotheses in this regard that are centered on the role of the marketing mix in enhancing, accelerating, and stabilizing cash flows for the firm and/or increasing its residual value. We tested these hypotheses using stock return response modeling on six years of weekly automotive data.

First, we conclude that new product introductions have positive postlaunch effects on stock returns. These effects are stronger in larger, high-growth categories. In addition, the stock return benefits of pioneering (new-to-the-market) innovations are seven times larger than those of innovations that are merely new to the company. This finding contrasts with the reality that managers favor the rollout of frequent incremental innovations over that of fewer, more fundamental innovations. Such incremental innovations are less costly and risky, which is important in light of the multibillion dollar cost of new car platforms (White 2001). Our research controls for these costs empirically by including firm revenue and earnings performance as drivers of stock returns. However, we do not claim to have fully captured the financial and time investment of innovation development. Companies should compare our reported findings with their internal data on project costs to help determine the extent to which they should aim for pioneering innovations.

Second, the marketing of these innovations plays an equally important role. We find that the stock return impact of new product introductions is greater when they are backed by substantial advertising investments. In other words, communicating the differentiated added value to consumers yields higher firm value effects of innovations, especially for pioneering innovations. In contrast, promotional incentives do not increase firm value effects of new product introductions, because they may signal an anticipated weakness in demand for the new product. Third, the stock return impact of new product introductions is higher for innovations with higher levels of perceived quality.

This study has several limitations that provide worthwhile avenues for further research. First, we analyzed only one industry, albeit an important one in which product innovation, advertising, and consumer incentives are a major part of the marketing mix. Therefore, we emphasize that our findings on stock drivers pertain to the automobile industry, and a validation of the results in this study to other industries is an important area for further research. Second, we did not consider specific launch strategy or innovation process measures, both of which have been researched extensively in prior literature. Third, the focus in this study was on postlaunch effects of innovations, including pioneering innovations on stock market returns. As such, we focused on product innovations that made it to market but censored out of the data those that did not make it to market. Further research using data on the development costs of innovations, including those that do not make it to market, would enable a direct assessment of the stock return impact of prelaunch effects of innovation. Fourth, we did not have data on advertising copy, and thus we leave the issue of advertising copy and effectiveness of new product advertising to further research. Finally, we leave the issues of investigating the presence or absence of threshold effects and reciprocal causation of advertising on stock market performance for further research.

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