Advertising Spending and Stock Return

Amit Joshi

Dominique M. Hanssens*

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***Amit Joshi is an Assistant Professor at the University of Central Florida and Dominique M. Hanssens is the Bud Knapp Professor of Marketing, UCLA Anderson School of Management, and Executive Director, Marketing Science Institute, Cambridge, MA. The authors gratefully acknowledge the financial support of the Marketing Science Institute.

Corresponding Author: Amit Joshi, Department of Marketing, College of Business Administration, P.O. Box 161400, Orlando, FL 32816-1400. Tel: 407-823-5355. Fax: 407-823-3891
Dominique M. Hanssens Executive Director, Marketing Science Institute, 1000 Massachusetts Avenue, Cambridge, MA 02138, Tel: 617- 491-2060

Abstract

The paper investigates one important aspect of long-term investor response to marketing actions, namely, the relationship between advertising spending and stock return. We hypothesize that advertising can have a *direct* effect on valuation, i.e. an effect over and above its known impact on revenue and profit response. The empirical results in two industries support our hypothesis and quantify the investor-response impact of advertising spending.

Introduction

The shareholder value principle advocates that a business should be run to maximize the return on shareholders' investment. Shareholder Value Analysis (SVA) is thus becoming a new standard for judging managerial action (Doyle 2000). In this changing scenario, where short-term accounting profits are giving way to SVA, it is imperative that all investments made by managers be viewed in the context of shareholder returns. Thus, every investment, be it in the area of operations, human resources or marketing may now have to be justified from the SVA perspective. The common yardstick used by most investors in this context is the share price, or more generally, the wealth created by a firm is measured by its market capitalization.

This evolution presents a great opportunity for marketing. Indeed, traditional accounting, by focusing on short-term profits at the expense of intangible assets, may marginalize marketing. For example, current accounting criteria may dictate the arbitrary reduction of sales training budgets in order to meet quarterly profits, but this reduction may have a negative impact on the firm in the long run (Cleland and Bruno 1996). In contrast, SVA takes a long-term perspective and encourages managers to make profitable investments.

In order to capitalize on this opportunity, marketing will have to justify its budgets in shareholder value terms. This is a difficult task, as the goals of marketing are traditionally formulated in customer attitude or sales performance terms. Furthermore, marketing may impact business performance in both tangible and intangible ways. Consequently, marketing budgets are vulnerable, especially advertising spending, as noted in the MAX conference on Improving Advertising Budgeting (Donath 1999). While the effects of advertising on sales have been researched in depth (see e.g. Hanssens, Parsons and Schultz 2001 for a review), there has been little effort to study the direct impact of advertising on stock price (Figure 1). Thus the primary

motivation of our paper is to investigate the impact of advertising spending on firm value above and beyond its effect on sales revenues and profits.

Insert Figure 1 about here

Tangible and Intangible Effects. Firm value has been classified as tangible and intangible value (Simon and Sullivan 1993). From a marketing perspective, tangible assets include sales and profits, and the impact of marketing instruments on these has been well documented for both the short run (e.g. Blattberg, Briesch and Fox 1995, Lodish et al 1995) and the long run (e.g. Nijs et al 2001, Pauwels et al 2002). In modern economies, however, a large part of firm value may reflect its intangible assets, such as brand equity (Chan, Lakonishok and Sougiannis 2001). Since these intangible assets are not required to be reported in firms' financial statements under the generally accepted U.S. accounting principles, their valuation is complicated further. At the same time, research suggests that non-financial indicators of investments in "intangible" assets, such as customer satisfaction, may be better predictors of future financial performance than historical accounting measures, and should supplement financial measures in internal accounting systems (Ittner and Larcker 1998).

Intangible assets may be classified as: (i) market specific factors such as regulations that lead to imperfect competition, (ii) firm-specific factors, such as R&D expenditures and patents, and (iii) brand equity (Simon and Sullivan 1993). To date, the finance and policy literatures have established a relationship between firm value and factors (i), which are beyond the scope of this paper.

Firm-specific factors (factor (ii)) have been shown to have a positive impact on firm value. Research has linked firm value to R&D expenditures (Doukas and Switzer 1992, Chan, Lakonishok and Sougiannis 2001), discretionary expenditures such as R&D and advertising

(Erickson and Jacobson 1992, Griliches 1981, Pakes 1985, Jaffe 1986), and innovation (Bayus et al 2003, Pauwels 2004).

A few marketing papers deal with the link between brand-related intangible assets (iii) and firm value. These include studies on the stock-market reaction to the changing of a company's name (Horsky and Swyngedouw 1987), to new-product announcements (Chaney et al 1991), perceived quality (Aaker and Jacobson 1994), brand extensions (Lane and Robertson 1995) and brand attitude (Aaker and Jacobson 2001). Furthermore, the linkages between advertising and brand-related intangible assets, including perceived quality (Moorthy and Zhao 2000) and brand attitude (Berger and Mitchell 1989), have been well established. Research has also established that the impact of marketing variables on brand-related intangible assets may be moderated by the type of branding strategy adopted by a firm (Rao et al 2004, Joshi 2005). Recent work in marketing has also established a strong relationship between customer satisfaction and firm value (Fornell et al 2006). Based on the results in these studies, we may expect advertising to have an indirect impact on firm value (through an increase in sales and profits), as well as a direct effect (by building brand-related intangible assets). Our research thus relates factors (ii) and (iii) to firm value.

Capital Market Efficiency. Most of the studies mentioned above use the "Event Study" methodology, where stock prices / abnormal stock returns are tracked around a time window surrounding the concerned event(s). As such, none of these studies address the long-run impact of the change on stock prices. The event window considered in most studies is small, typically under a few months at a time, and the method relies on the Efficient Capital Markets hypothesis (ECM hereafter). The ECM hypothesis (Fama 1970) states that the current stock price contains all available information about the future expected profits of a firm. Future profit expectations are the only driver of stock price, and hence stock prices may be modeled as a random walk, in which changes in these expectations are incorporated immediately and fully. However, more recent

work in finance, marketing and strategy suggests that the ECM hypothesis may not always hold (Merton 1987, Fornell et al 2006). In particular, researchers have questioned the appropriateness of the assumptions of *immediate* dissemination of all available information. Indeed, Kothari (2001) acknowledges that there is increasing evidence that "*markets may be informationally inefficient*" and "*prices might take years before they fully reflect available information*". In marketing, Pauwels et al. (2004) demonstrate that marketing activities such as new-product introductions contain information that takes several weeks to be fully incorporated in firm value. This finding motivates the use of long-run or persistence models instead of event windows to study the impact of intangible assets on firm value.

In conclusion, while there is some evidence of a possible relationship between marketing activities and financial performance, this relationship has not received adequate attention. Specifically, no studies have directly examined the long-run effects of advertising expenditures on firm value. If the ECM hypothesis holds, we would find no long-run effects, since the impact of advertising would be fully contained in next-period's stock price. The fact that some studies suggest otherwise indicates there can be an effect build-up beyond the short run.

In this study, we use persistence or VAR modeling (Dekimpe and Hanssens 1995a) to study the long-term effect of advertising expenditures on stock return. VAR models allow us to investigate long-run investor response to advertising, while recognizing the endogeneity of discretionary expenditures (such as advertising and R&D) with profits, and hence firm value. In addition, we will illustrate the economic impact of our results by simulating changes in market capitalization under different advertising spending scenarios. We begin with the development of our hypotheses, which are divided in two categories for ease of exposition.

Hypothesis Development

Customer Response Effects

Extensive prior research on the effects of advertising on sales provides an empirical generalization that the short-term elasticity on own brand sales is positive but low (Leone and Schultz 1980) and that advertising will have a long-run effect only if the short run effect is significant (Lodish et al 1995) . This generalization is supported in the literature survey of Aaker and Carman (1982), and by the meta-analysis of Assmus, Farley and Lehmann (1984). The latter study reports an average short-term elasticity of 0.22, though others report an even smaller magnitude of about 0.10 (Sethuraman and Tellis 1991). On the other hand, advertising elasticities have been shown to be higher for new products (Parsons 1975). Hence we propose our first hypothesis:

H1: Advertising will have a positive impact on sales revenue.

Research in marketing and strategy has demonstrated the positive impact of new- product introductions on sales (Morbey and Reithner 1990, Nijs et al 2001). Furthermore, since product innovation requires research and development, it has also been established that R&D expenditures have a positive impact on the *market value* of the firm (Doukas and Switzer 1992, Cockburn and Griliches 1988). Geroski, Machin and Reenen (1993) propose two possible effects of innovation. In the short run, new products derived from R&D increase sales and profitability, which give the firm temporary market power. This is called the 'product effect'. In the long run, innovation itself transforms a firm's capabilities, thereby providing it with a competitive advantage. This is called the 'process effect.'

However, the 'product effect' of R&D expenditures and innovation involves risk. New products are the manifestation of a successful R&D program, but their commercial success can

only be judged correctly in the long run, depending on the evolution of demand. In that sense, R&D expenditures can be considered a pathway for gaining comparative advantage (Erickson and Jacobson 1992). Taking this into account, we propose:

H2: R&D expenditures will have a positive long-run impact on sales revenue.

Investor Response Effect

We hypothesize that advertising will impact firm value through two effects: *spillover* and *signaling,* which we discuss in turn.

Spillover. Advertising seeks to differentiate a firm's products from those of its competitors, thereby creating brand equity for its products (Aaker 1991). We hypothesize that this equity, which is created through marketing activity, and is ostensibly directed at customers and prospects, can *spill over* into investment behavior as well. For example, in a recent study, Frieder & Subrahmanyam (2001) find that investors favor stocks with strong brand names, even though these powerful brands did not generate superior short-run returns. The authors acknowledge that "*individual investors may believe, correctly or not, that they can expect greater appreciation potential in the stock of companies whose products are recognized brand names.*" Overall, their results indicate that brand awareness and perceived brand quality in consumer products may spill over to the demand for stocks of their companies.

Research in behavioral decision theory provides support for the spillover effect. Heath and Tversky (1990) find that individuals prefer to bet in areas where they feel confident and have knowledge about the uncertainties involved, compared to more ambiguous areas. Such a preference could carry over to investment decisions in that investors may prefer to hold branded stocks for which the flow of public information is higher. Further support is provided by Huberman (2001), who finds that investors often invest in the familiar, while ignoring principles

of portfolio theory. Insofar as advertising generates familiarity (MacInnis and Jaworski 1989), we would expect that heavily advertised stocks are more attractive investment options.

As we hypothesize that advertising impacts customer response as well as investor response, it becomes necessary to consider the branding strategies used by firms, since the advertising expenditures by a firm interact with the type of branding adopted (Rao et al 2004). The literature identifies three broad strategies that firms use (Laforet and Saunders 1994). Companies like Microsoft or Nike are classified as having a *Corporate* branding strategy, wherein the company name is synonymous with their product brands. In the *House of Brands* strategy, product brands are distinct from the company name (e.g. P&G, Unilever). Finally, the *Mixed* branding strategy arises when firms use a combination of the above two strategies (e.g. Ford, Toyota). The Corporate branding strategy has been associated with higher values of Tobin's Q on account of it enabling firms to better leverage their overall brand equity (Rao et al. 2004). Based on these findings, we propose that advertising will have a direct impact on firm value for firms that use a corporate branding strategy, and restrict our investigation to firms that use this strategy[1].

Signaling. In addition, advertising can also act as a signal of financial well-being or competitive viability of a firm. Numerous signaling mechanisms can influence investor behavior. Among the more recent research on this effect is Mathur and Mathur (2000) on the stock market's reaction to the announcement of "green" marketing strategies, and Mathur et al (1997) on the celebrity endorsement effect on firm valuation. The latter study finds that Michael Jordan's much publicized return to NBA basketball resulted in an average increase in the market-adjusted values of his client firms of almost 2 percent, or over $1 billion in market capitalization. Thus, advertising in various forms may serve as a signal of future earnings potential. In a study of the

[1] We leave the investigation of the advertising impact on firm value for firms with other types of branding for future research.

impact of environmental friendliness on firm value, Gifford (1997) found that merely establishing a pro-environment practice was insufficient, and that firms had to *advertise* this fact to the investment community before it translated into increased financial returns. In this case, advertising provides information that does not necessarily impact the *sales* of the firm, but has a direct effect on its stock price. Similarly, Mizik and Jacobson (2003) find that value creation (e.g. R&D) alone does not enhance firm value, and that it is necessary to have value appropriation (e.g. through advertising) for that to occur.

Further evidence in favor of signaling effects is provided by Chauvin and Hirschey (1993) who report that "*data on advertising and R&D spending appear to help investors form expectations concerning the size and variability of future cash flows".* Although their analysis is restricted to short-run effects, the results point in the direction of a positive impact of advertising on firm value.

While the studies above provide evidence that advertising may have a direct and positive effect on valuation, we do not know its possible magnitude. In the short run, advertising will likely work through the indirect route, i.e., increasing valuation through lifting sales and profits. The direct effect is expected to appear only in the long run, when advertising succeeds in differentiating a firm's products in the minds of consumers and investors. Based on the arguments above, we propose:

H3: Advertising will have a positive long-run effect on stock return above and beyond its impact through sales revenues and profits.

Model

Model Specification

The relation between profits (P) and valuation has been examined extensively in the finance literature (valuation $\propto$ P). Furthermore, sales revenue (R) and profits are expected to be monotonically related[2] (R $\propto$ P). On the other hand, the direct relationship between advertising (A) and valuation is more ambiguous. Only effective advertising can generate sales profitably, and not all advertising is effective. Furthermore, even effective advertising can reduce profit in the short run, since the advertising budget is a direct expenditure against current revenue. Lastly, there could be a *branding effect* of an ad campaign by itself, over and above the additional cash flows generated by the advertising, which could impact the intangible assets of a firm. Thus we will need a systems model as opposed to a single-equation approach to study our hypotheses.

In addition, the workings of advertising need to be studied in the long run because its impact lasts well beyond the accounting period in which the advertising is spent. In so doing, we must recognize that company value, sales, profits and advertising expenditures can all have feedback effects on one another. For example, a higher profit in a period may lead to increased advertising budgets, which in turn may boost sales and future profits. In order to disentangle these effects, we use a dynamic systems representation, in particular a vector-autoregressive (VAR) model in which the advertising and performance variables are jointly endogenous.

Alternative cross-sectional measures of the market value (or stock return) of the firm may be used. Fama and French (1996) demonstrated the importance of using a three-factor model, which controls for firm size, market-to-book-value and return relative to a market portfolio when investigating stock return. In terms of sample design, Barber and Lyon (1997) showed the superiority of the control-firm approach, in which the target firm's performance is compared with

[2] Assuming no changes in price

similar firms when analyzing long-run (one –to five year) abnormal stock returns. This approach yields well specified test statistics in virtually all sampling situations. Our empirical studies will thus use the three-factor model in a control-firm design.

We arrive at our stock-return metric as follows. Monthly abnormal returns[3] for the firms in our study are obtained using the CRSP database. We then match each firm for each month with a control firm in the same Standard Industrial Classification (SIC). We first search for firms closest in size to our target firm, as defined by the market value of equity. We shortlist all firms that have a size between 70% to 130% of that of our target firm (Barber and Lyon 1997). Then, from this group of firms, we select the one that has the closest market-to-book value to our target firm. Since we use matching of firms on these two criteria to arrive at our metric, we refer to the metric as the Matched Firm Return (MFR henceforth)[4].

In addition to valuation, profits, sales and advertising expenditures, we include a feedback equation for R&D expenditures, as previous studies have concluded that stock prices react favorably to R&D spending (e.g. Griliches 1981, Pakes 1985 and Jaffe 1986).

Since the variables Advertising (A), Sales Revenue (R), Profit (P) and R&D expenditures (RD) can all be jointly endogenous with stock return (MFR), a VAR model in differences with J lagged periods is[5]:

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[3] Abnormal or excess returns are defined as: $\varepsilon_{it} = R_{it} - \alpha_i - \beta R_{mt}$, where R_{it} is the period t return on stock i, R_{mt} is the period t return on the market portfolio, and α, β are the standard parameters in the market model.

[4] An alternative approach would be to use the market-to-book ratio as a dependent variable, controlling for exogenous variables such as the market index. We obtain similar results using both approaches. Detailed results from the market-to-book value estimation are available on request from the authors.

[5] In a time-series context, we know from the finance literature that MFR will have a random-walk component, so the VAR models will be specified in differences (Δ) or a mixture of levels and differences. In what follows we assume the former.

$$\begin{bmatrix} \Delta MFR_t \\ \Delta R_t \\ \Delta P_t \\ \Delta A_t \\ \Delta RD_t \end{bmatrix} = \begin{bmatrix} \gamma_{MFR,t} \\ \gamma_{R,t} \\ \gamma_{P,t} \\ \gamma_{A,t} \\ \gamma_{RD,t} \end{bmatrix} + \sum_{j=1}^{J} \begin{bmatrix} \pi_{11}^{j} \pi_{12}^{j} \pi_{13}^{j} \pi_{14}^{j} \pi_{15}^{j} \\ \pi_{21}^{j} \pi_{22}^{j} \pi_{23}^{j} \pi_{24}^{j} \pi_{25}^{j} \\ \pi_{31}^{j} \pi_{32}^{j} \pi_{33}^{j} \pi_{34}^{j} \pi_{35}^{j} \\ \pi_{41}^{j} \pi_{42}^{j} \pi_{43}^{j} \pi_{44}^{j} \pi_{45}^{j} \\ \pi_{51}^{j} \pi_{52}^{j} \pi_{53}^{j} \pi_{54}^{j} \pi_{55}^{j} \end{bmatrix} \begin{bmatrix} \Delta MFR_{t-j} \\ \Delta R_{t-j} \\ \Delta P_{t-j} \\ \Delta A_{t-j} \\ \Delta RD_{t-j} \end{bmatrix} + \begin{bmatrix} u_{MFR,t} \\ u_{R,t} \\ u_{P,t} \\ u_{A,t} \\ u_{RD,t} \end{bmatrix} \tag{1}$$

This representation combines market-response and decision-response effects. Consider the partitioned coefficient matrix for the first lag in this model:

$$\begin{matrix} \pi_{11}^{1} & \pi_{12}^{1} & \pi_{13}^{1} & \vdots & \pi_{14}^{1} & \pi_{15}^{1} \\ \pi_{21}^{1} & \pi_{22}^{1} & \pi_{23}^{1} & \vdots & \pi_{24}^{1} & \pi_{25}^{1} \\ \pi_{31}^{1} & \pi_{32}^{1} & \pi_{33}^{1} & \vdots & \pi_{34}^{1} & \pi_{35}^{1} \\ \cdots & \cdots & \cdots & \vdots & \cdots & \cdots \\ \pi_{41}^{1} & \pi_{42}^{1} & \pi_{43}^{1} & \vdots & \pi_{44}^{1} & \pi_{45}^{1} \\ \pi_{51}^{1} & \pi_{52}^{1} & \pi_{53}^{1} & \vdots & \pi_{54}^{1} & \pi_{55}^{1} \end{matrix}$$

In this matrix, the top-left partition represents the market-response coefficients for stock return, sales revenue and profit, respectively. The (3 x 2) matrix in the top-right corner shows the direct response effects of advertising and R&D on firm value, revenue and profit[6]. The bottom-right partition captures firm-specific decision rules between advertising and R&D spending. Finally, the bottom-left matrix measures performance feedback effects. For example, an increase in next-period advertising spending due to higher sales revenue would be captured by the coefficient π^{1}_{42}.

[6] Note that traditional single-equation advertising response models such as the Koyck model emerge as special cases of our VAR model, by setting the appropriate response parameters equal to zero.

Furthermore, if some or all variables are cointegrated, the VAR model is expanded to a vector-error correction (VEC) model[7]:

$$\begin{bmatrix} \Delta MFR_t \\ \Delta R_t \\ \Delta P_t \\ \Delta A_t \\ \Delta RD_t \end{bmatrix} = \begin{pmatrix} \alpha_{MFR} & 0 & 0 & 0 & 0 \\ 0 & \alpha_R & 0 & 0 & 0 \\ 0 & 0 & \alpha_P & 0 & 0 \\ 0 & 0 & 0 & \alpha_A & 0 \\ 0 & 0 & 0 & 0 & \alpha_{RD} \end{pmatrix} \begin{bmatrix} e_{MFR,t-1} \\ e_{R,t-1} \\ e_{P,t-1} \\ e_{A,t-1} \\ e_{RD,t-1} \end{bmatrix} + \sum_{j=1}^{J} \begin{pmatrix} \pi_{11}^j & \pi_{12}^j & \pi_{13}^j & \pi_{14}^j & \pi_{15}^j \\ \pi_{21}^j & \pi_{22}^j & \pi_{23}^j & \pi_{24}^j & \pi_{25}^j \\ \pi_{31}^j & \pi_{32}^j & \pi_{33}^j & \pi_{34}^j & \pi_{35}^j \\ \pi_{41}^j & \pi_{42}^j & \pi_{43}^j & \pi_{44}^j & \pi_{45}^j \\ \pi_{51}^j & \pi_{52}^j & \pi_{53}^j & \pi_{54}^j & \pi_{55}^j \end{pmatrix} \begin{bmatrix} \Delta MFR_{t-j} \\ \Delta R_{t-j} \\ \Delta P_{t-j} \\ \Delta A_{t-j} \\ \Delta RD_{t-j} \end{bmatrix} + \begin{bmatrix} u_{MFR,t} \\ u_{R,t} \\ u_{P,t} \\ u_{A,t} \\ u_{RD,t} \end{bmatrix} \tag{2}$$

In both systems of equations (1 and 2), $[u_{MFR}, u_R, u_P, u_A, u_{RD}]' \sim N(0, \Sigma_u)$, and the order of the system, J, is determined by minimizing Schwartz' Bayes Information Criterion.[8]

The addition of the error correction terms $\{ e \}$ in (2) implies that in every period there is a partial adjustment towards restoring the underlying, temporarily disturbed equilibrium. That is, the system partially corrects for the previously observed deviations and the coefficients α reflect the speed of that adjustment.

Model (2) can be estimated across firms (pooled) or separately for each firm. Pooled estimation offers the advantage of more degrees of freedom, at the expense of detailed firm-specific inferences. Given the volatility in both the PC industry and the sporting goods industry (see our discussion on industry setting below), we will focus on obtaining firm-specific elasticities, so we estimate model (2) separately for each firm. In addition, we also estimate the pooled model as a validation test, which implicitly accounts for the impact of competition.

All variables, except MFR and firm profits, are taken in natural logarithms, so that the response effects may be interpreted as elasticities. However, some firms incur losses (negative profits) and negative MFR in certain time periods in the sample. Although logarithms could still

[7] The model given here is valid when there exists one cointegrating equation in the system.

be taken using an additive constant, this is an arbitrary data adjustment that biases the elasticity interpretation, and therefore we prefer to measure these variables in levels.

Our analysis comprises five parts. First, we test for evolution of all the variables in our study. A priori, we expect to find the performance variables to be evolving, following random-walk theory and extant marketing literature (Dekimpe and Hanssens 1995b). If evolution is found, we test for the presence of cointegration, or long-term co-evolution. For example, profits and advertising expenditures may both be evolving, but if advertising budgets were set in function of profits, we would expect a long-run relationship between the two variables. Depending on the outcome of these tests, VAR or VEC models are estimated subsequently.

Next, impulse response functions (IRFs) are derived from the VEC or VAR models. The IRFs trace the over-time impact of a unit shock to any endogenous variable on the other endogenous variables. Following Dekimpe and Hanssens (1999), we use generalized IRFs (or simultaneous shocking) to ensure that the ordering of variables in the system does not affect the results. Given a VAR model in differences, the total shock effect at lag k is obtained by accumulating the lower-order IRFs. Following Nijs et al. (2001), we determine the duration of the shock (maximum lag k) as the last period in which the IRF value has a $|t|$ statistic greater than 1.

Finally, we calculate the variance decomposition of the IRFs, i.e., the percentage of the forecast error variance of firm value that is attributable to advertising shocks, separate from the contributions of R&D, sales and profit shocks. This analysis separates the *direct* impact of advertising on firm value from its indirect impact via sales and profits.

[8] These systems may be augmented by exogenous variables in practice. For ease of exposition, exogenous variables are not shown in (1) and (2).

Industry Setting and Data

Industry Setting

As our hypotheses posit that advertising will positively impact value for firms that use corporate branding, we focus on industries where such a branding strategy has been the norm. Furthermore, we choose industries that were in different stages of the product life cycle, to help generalize our findings. The PC manufacturing industry experienced unprecedented growth in the 1990's (Figure 2), and was clearly in the growth phase of its life cycle. Dell, a relatively new participant, became the dominant PC manufacturer in the world, while older players such as HP and IBM diversified their businesses (e.g. printers, services) to compensate for lost market share in the PC market. A survey of PC industry related articles appearing in the Wall Street Journal (WSJ hereafter) from 1991 to 2000 reveals that capturing market share with aggressive advertising and pricing was the focus of most PC manufacturers. Advertising messages "moved from emphasizing superior technology across offerings to highlighting perceived flaws in competitors" (WSJ Oct 21 1992), while Dell highlighted its 1st place in the first J.D. Power customer satisfaction survey for the industry (WSJ May 14 1991). Apple unveiled a $100 million ad campaign in 1994 to launch its new iMac, partly with the intention of improving dealer morale (WSJ Aug 14 1998). Overall, the major competitors in the industry were using advertising campaigns to establish positions of superiority in a growing market and thus ensure long-run success (Bronnenberg et al 2000).

In contrast, the sporting goods market was well established, with brands such as Nike and Reebok looking to gain market share at the expense of smaller competitors, through aggressive advertising and celebrity endorsements. A survey of articles in the WSJ reveals the highly competitive nature of the market ("New Reebok Ads Enrage Rival by Taunting Nike's Star Endorsers" WSJ Feb 6 1991; "Reebok Signs up Newest Star in Basketball for $15 million" WSJ Jan 6 1993).

Thus, despite their different stages in the product life cycle, it is clear that aggressive advertising was a key element in the strategies of firms in these two industries. For the PC industry, advertising would help establish the brand, while in the sporting goods industry, it would help in gaining market share over other established brands.

Data

We obtained 15 years (1991-2005) of monthly data on revenue, income, stock return, advertising and R&D expenditures for the leading players in the PC manufacturing industry (Apple, Compaq, Dell, HP and IBM) and 10 years of data (1995-2004) for the sporting goods industry (Nike, Reebok, K-Swiss, Skechers). The stock-return data were converted to matched-firm return data using the procedure outlined above. The five PC manufacturers accounted for 70% of the PC desktop market and almost 80% of the portable computer market at the end of 2005. Similarly, the leaders of the sporting goods market are represented in our sample, with the four firms accounting for $19 billion in sales revenue for 2004, which is about 28% of the industry. While the PC manufacturing industry was in a growth phase in the 1990's (Figures 2), the sporting goods industry was in a mature phase (Figure 3). Dell emerged as the leading contender in the PC industry, while firms like Apple struggled (Figure 2). In the sporting goods industry, however, Nike maintained its market leadership, despite the entrance of a new competitor (Skechers). This variability in performance and marketing efforts over time, both within each industry as well as across the two industries, provides a unique opportunity to study the long-term impact of advertising on stock return.

Insert Figures 2 and 3 about here

Data on income, stock return, sales and R&D expenditures were obtained from the CRSP and COMPUSTAT databases. Firm-specific information and accounting data are obtained from the COMPUSTAT database. Data on monthly advertising expenditures were provided by TNS Media Intelligence. The monthly Consumer Price Index was used to deflate all monetary variables.

Results

Augmented Dickey-Fuller tests were used to verify the presence of unit roots in the data. MFR was found to be evolving, as predicted by the finance literature. In addition, most sales revenues and advertising expenditures were also found to be evolving, in line with the empirical generalizations described in Dekimpe and Hanssens (1995b). Tables A1a and A1b in the appendix provide the details of the unit-root test results.

The estimated VAR models in differences, with the appropriate lags determined by the SBIC, showed a good fit, with R^2 ranging from 0.148 to 0.196 in changes (0.894 to 0.988 in levels) for the PC industry and 0.178 to 0.299 in changes (0.896 to 0.963 in levels) for the sporting goods industry (see Table 1). Model adequacy was verified by performing portmanteau tests on the residuals, also shown in Table 1. The results indicate that the model residuals are white noise.

Insert Table 1 about here

In keeping with the development of our hypotheses, the substantive results are presented in two categories.

Customer Response Effects

The accumulated advertising and R&D elasticities are given in Table 2. The advertising elasticities have the expected magnitude for all firms under study and are statistically significant for three of the five firms in the PC industry and two firms in the sporting goods industry. Furthermore, all significant IRFs indicated persistent effects. Hence, for Apple, Compaq, IBM, K-Swiss and Skechers, advertising spending has a persistent impact on sales revenue, and H1 is partially supported.

Insert Table 2 about here

The results also partially support H2. The positive sign of these elasticities is as predicted above, and the small magnitude is attributable to the uncertainty and the long gestation period generally associated with R&D. Further, the R&D elasticities are persistent for Compaq, Dell and IBM. Hence, a shock to R&D expenditure has a long-term impact on firm sales revenue. We find that the R&D elasticities for all sporting-goods firms are insignificant, which may reflect the relatively low importance and variability of R&D spending in this industry (about 2 to 3% of sales),

Investor Response Effects

Next, we examine the total effect of advertising on stock return. Table 3 shows the accumulated advertising elasticities on MFR. Note that these values combine the direct and the indirect advertising effects on firm value over time.

Insert Table 3 about here

The effect of an advertising shock accumulates over 8, 6, 7 and 7 periods for Apple, Compaq, Dell and HP respectively (or, the IRFs for these 3 firms are significant for 8, 6, 7 and 7 periods, respectively). Similarly, for Nike, Reebok and Skechers, the advertising shock accumulates over 6, 6 and 8 periods respectively. Since changes in advertising spending are typically not reported to investors, they are informed only through actual exposure. This explains why the effect of a change in advertising is not absorbed in stock price instantly. Instead, there is a long-run effect beyond the first period, consistent with our expectation, and hence we find partial support for H3.

Apple, Compaq, Dell and HP have positive and significant investor response elasticities, ranging from .007 to .01. The elasticity for IBM is positive but not significantly different from zero, which may be explained by the large size and scope of this company's operations. Indeed, the PC division of IBM accounted for only 11% of its revenue, in contrast with 78% for Apple and 63% for Compaq.

In the sporting-goods industry, three of the firms under study show positive and significant investor-response elasticities, ranging from .005 to .009. The highest elasticity is found for Skechers, which is also the youngest firm in this industry in our data[9].

Overall, the investor-response elasticities are of an order of magnitude that is lower than the typical sales-response elasticities. This is to be expected, as the dependent variable is excess return, which is the (scaled) residual of the random-walk process that is known to underlie the behavior of stock prices. Even so, these low elasticities can generate a sizeable economic impact, as we will explore below[10].

[9] The elasticities obtained are aggregate elasticities across all products of the firms. While advertising expenditures and elasticities can vary across products, there is only one company stock price, which reflects overall performance, thus the need for aggregation.

Variance Decomposition

In order to measure the *direct* impact of advertising on stock return relative to other factors, we examine the forecast error variance decomposition (FEVD) of firm value. The FEVD calculates the contribution of the various covariates to the forecast variance of MFR. The results are presented in Tables 5a and 5b. This analysis is only meaningful for firms with significant investor-response elasticities from the IRF analysis.

Insert Tables 5a and 5b about here

Tables 5a and 5b show that advertising expenditures initially have a small impact on MFR. In the first few periods after the impulse, firm value is largely determined by past value, as predicted by the random-walk model. However, the impact of advertising increases over time (see Figure 4 for an example). Thus, for Apple, advertising explains only 0.569% of the forecast error variance in period 1, but 4.68% of the variance by period 8. Unlike the IRFs, the variance decomposition does not involve simultaneous shocking and hence the percentages represented here indicate the impact of advertising on firm value *over and above* its effect on sales and profits[11]. In conclusion, we find that advertising shocks often increase firm value in the long run, and beyond the impact that may be expected from their effect on revenues and profits.

Insert Figure 4 about here

[10] The investor-response elasticities for innovation and promotion in the automobile industry are even lower, yet still statistically significant (see Pauwels et al. 2004).
[11] Cholesky Decomposition was used to estimate FEVD. The results are not sensitive to the ordering of the variables.

Empirical Validation

To check the validity of our model, we carried out two tests. The first checks for the presence of structural breaks in the data. Since these data span a period of fifteen years for the PC industry and ten years for the sporting goods industry, structural breaks in one or more of the series could occur. If a series in our sample were comprised of two stationary regimes separated by a structural break, it could appear to be evolving (Perron 1990). To guard against this, we carried out rolling-window unit-root tests (Smith and Taylor 2001, Pauwels and Hanssens 2006): a suitably long window of observations is selected (40 in this case), and the window is moved along the length of the series (180 observations for PCs and 120 for sporting goods). All the Dickey-Fuller (DF) statistics thus obtained are then compared to their unit-root critical values. These rolling-window unit-root tests indicated no evidence of structural breaks in the data.

Second, we test for the possible effect of temporal aggregation in our series. While the MFR and advertising series were available at the monthly level, sales, R&D and profit series were only available quarterly. Using all series at the quarterly level causes a degrees of freedom problem, unless the data can be pooled across firms (Bass and Wittink 1975). Thus we re-estimated our VAR model in quarterly panel form for each industry. This resulted in (60 x 5) = 300 observations for the PC industry and 149 observations for the sporting goods industry (Skechers entered the market in the 4th quarter of 1997). The poolability of the model was tested using the Chow F Test, extended to a system of equations (Chow, 1960):

$$\mathrm{F} = \frac{(RRSS - URSS)/r}{URSS/d},$$

where *RRSS* is the restricted (pooled model) sum of squared residuals, *URSS* is the sum of squared residuals in the unrestricted model (trace of the variance-covariance matrix), *r* is the number of linearly independent restrictions and *d* is the number of degrees of freedom for the unrestricted model. For a model with firm-specific intercepts and fixed response effects, this test yields F-values of 2.27 (PC) and 2.13 (sporting goods), which are below the critical value of 2.4 at the 95% confidence level. Hence, we conclude that the data are partially poolable, with firm-varying intercepts and common slopes[12]:

$$\begin{bmatrix} \Delta MFR_{i,t} \\ \Delta R_{i,t} \\ \Delta A_{i,t} \\ \Delta P_{i,t} \\ \Delta RD_{i,t} \end{bmatrix} = \left[\gamma + \beta_{Compaq} + \beta_{Dell} + \beta_{HP} + \beta_{IBM} \right] + \sum_{n=1}^{J} \begin{bmatrix} \pi_{11}^{j} \pi_{12}^{j} \pi_{13}^{j} \pi_{14}^{j} \pi_{15}^{j} \\ \pi_{21}^{j} \pi_{22}^{j} \pi_{23}^{j} \pi_{24}^{j} \pi_{25}^{j} \\ \pi_{31}^{j} \pi_{32}^{j} \pi_{33}^{j} \pi_{34}^{j} \pi_{35}^{j} \\ \pi_{41}^{j} \pi_{42}^{j} \pi_{43}^{j} \pi_{44}^{j} \pi_{45}^{j} \\ \pi_{51}^{j} \pi_{52}^{j} \pi_{53}^{j} \pi_{54}^{j} \pi_{55}^{j} \end{bmatrix} \begin{bmatrix} \Delta MFR_{i,t-j} \\ \Delta R_{i,t-j} \\ \Delta A_{i,t-j} \\ \Delta P_{i,t-j} \\ \Delta RD_{i,t-j} \end{bmatrix} + \begin{bmatrix} u_{MFR,i,t} \\ u_{R,i,t} \\ u_{A,i,t} \\ u_{P,i,t} \\ u_{RD,i,t} \end{bmatrix} \tag{3}$$

The R^2 in changes for the panel VAR model is 0.237 (0.939 in levels) for the PC industry and 0.269 (0.966 in levels) for the sporting goods industry. The optimal number of lags, determined by the SBIC criterion, is 2, and the residual portmanteau test indicated that residuals are white noise. The most important confirmatory result is that the advertising elasticity of MFR is significant and positive for both industries (PC: 0.007, t-stat = 1.94 and sporting goods: 0.006, t-stat = 1.76)[13]. Thus our generalized estimate of the long-run advertising effect on firm valuation is between 0.006 and 0.007, and both the structural-break test and the temporal-aggregation test validate the results of our model.

[12] In Equation (3), γ is the common vector of intercepts. β_i is a (5 x 1) vector of company specific dummy variables. Thus, β_{Compaq} is 1 when variables correspond to Compaq and 0 otherwise.

Market Capitalization Projections of Increased Advertising Spending

The estimated investor response elasticities may be used to project the impact on market capitalization of various changes in the advertising level of firms with significant response effects. These forecasts quantify the economic impact of advertising spending on firm value. Indeed, even though the elasticities are small in magnitude, they can translate into a substantial impact on market capitalization. We discuss, in turn, the simulation results and their interpretation from the perspective of relative advertising spending (advertising-to-sales ratios) and profit-maximizing spending (Dorfman-Steiner conditions, Dorfman and Steiner 1954)).

Table 5 shows the change in market valuation for a 100% increase in advertising spending for the PC brands with significant customer as well as investor response to advertising, viz. Apple and Compaq. In projecting the market valuation figures, we adjusted for the increased advertising spending, as well as the effects of a reduction in firm profits (and hence, stock returns). Compaq achieves gains in total market value that exceed the loss from the implied profit reduction in all four years of the simulation, while Apple gains in only one of the four years. These results derive from the opposing forces of cost increases (profit reduction), revenue and profit enhancement, and brand equity gains. In all cases, the direct effect of advertising on valuation is insufficient to justify a sizeable increase in spending, i.e. a consumer response (indirect) effect is required as well. We therefore examine more closely the role of relative advertising spending, as well as profit-maximizing spending.

Insert Table 5 about here

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[13] Significant at $p<.05$ for a one-tailed test.

Diminishing returns. The differences in our results reflect a decreasing-returns effect, as illustrated by examining the firms' advertising-to-sales (A/S) ratios. Figure 5 shows the projected net gains in market value against the firms' A/S ratios prior to doubling their advertising spending, as well as the regression line between the two. As expected, advertising's impact on firm value decreases as the A/S ratio increases (the R^2 of the regression is 0.5). Thus an A/S ratio beyond 6.2% in our example does not provide net gains in market value, as exemplified by the results for Apple in 1997, 1998 and 2000.

Insert Figure 5 about here

Profit-maximizing spending. Using the well known Dorfman-Steiner (1954) conditions, optimal advertising for a profit maximizing firm is given by:

$$Adv_{opt,t} = (Sales_{b,t} * G_t * \varepsilon_A)^{1/(1-\varepsilon_A)} \quad (4)$$

, where $Adv_{opt,\,t}$ is the optimal advertising spend, $Sales_{b,\,t}$ is baseline sales (sales due to factors other than advertising), G_t is Gross Margin at time t and ε_A is the advertising elasticity[14]. Baseline sales may be obtained as:

$$Sales_{b,t} = Sales_t / Adv_t^{\varepsilon_A} \quad (5)$$

Gross margins were obtained from annual financial reports for the respective firms. Using these data, we may derive the annual DS-optimal advertising budgets, and compare them with the actual expenditures. Table 6 provides these comparisons for the time period 1997-2000.

Insert Table 6 here

We conclude that that an increase in advertising spending would result in a gain in market capitalization only when the initial advertising expenditure is between 96% and 116% of the DS optimal level.

Overall, our conclusion is that the market-capitalization effect of increased advertising spending can be sizeable, but is still subject to economic reasonableness: there must be a consumer-response impact to supplement the direct effect, the A/S ratio must not exceed industry norms, and the spending must be in the vicinity of the profit-maximizing level.

Conclusions and Future Research

This study has provided conceptual and empirical evidence of a positive relationship between advertising expenditures and the market value of firms. The results show that there is an investor response effect of advertising *over and above* its expected effects through revenue and profit sales increases. The pooled estimate of the investor response elasticity in two industries is between .006 and .007.

Several limitations help set an agenda for future research. First, we have only studied two industries, viz. PC manufacturers and sporting goods. A replication of the model in other industries and time periods will provide further cross-validation of the results. Second, this work may be extended to the differential impact of advertising media on market valuation. Third, it would be interesting to examine our hypotheses for firms that use either a house-of-brands or a mixed-branding strategy. Finally, it would be interesting to separate the *volume* effect of branding from the *price premium* effect.

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[14] For ease of exposition, we assume revenue elasticity to be unity.

There are some limitations in our dataset as well. As in most valuation studies, revenue and profit data are *aggregated* to the firm level, i.e. they are not broken down by division. When applied to *tracking* stocks where there is a closer match between the product category and the corporate identity, our approach may reveal higher advertising-to-market value elasticities. Similarly, our advertising data did not include a breakdown of spending on product advertising vs. brand-image advertising.

Nevertheless, our results succeed in linking advertising directly to firm value, and thus underline the importance of building intangible assets. The direct relation between advertising and firm value provides managers with a new, more comprehensive metric of advertising effectiveness, viz., firm value. Even though the investor-response elasticity is small in magnitude, advertising can induce substantial changes to the market capitalization of firms.

Our findings open up several areas for further research. Among these, the presence of a long -run effect of advertising on the market value of a firm, possibly through the creation of brand equity, suggests that any action that grows brand equity may affect firm value. Thus, order of entry, distribution intensity or even choice of media may be hypothesized to affect the brand equity of a firm and thereby its market value. Another area of interest is the potential relationship between the quality of advertising execution and its impact on firm value. Anecdotally, Apple is highly regarded for its advertising campaigns. Its "1984" advertisement was rated the 'Best Ever Super Bowl Ad' by ESPN, and won a CLIO award (the world's largest advertising competition). Between 1990 and 1998, various Apple Computers advertisements won 23 CLIO awards in different categories, compared to 1, 0, 7 and 11 awards for Compaq, Dell, HP and IBM respectively. Future research should examine to what extent such differences in perceived

advertising quality have an influence on the investor community. Finally, since market value is affected by both the level and the volatility of sales revenue, further research needs to examine the effect of marketing variables on volatility.

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Table 1: Model Fit and Residual Analysis

	Fit Statistics		Portmanteau Test	
	R^2 (In Changes)	R^2 (In Levels)	Q- Stat	Probability
Apple	0.148	0.894	91.09	<0.0003
Compaq	0.188	0.911	117.57	<0.0001
Dell	0.196	0.893	135.82	<0.0001
HP	0.172	0.944	67.38	<0.0001
IBM	0.152	0.988	84.40	<0.0001
Nike	0.299	0.963	85.28	<0.0001
Reebok	0.258	0.934	100.62	<0.0001
K-Swiss	0.275	0.948	131.44	<0.0001
Skechers	0.177	0.895	117.98	<0.0001

Table 2: Customer Response Effects

	Advertising Elasticity	t-statistic	R&D Elasticity	t-statistic
Apple	0.248	1.76**	-0.005	0.79
Compaq	0.110	1.85**	0.313	1.76**
Dell	0.015	1.06	0.122	1.83**
HP	0.013	0.93	0.008	1.07
IBM	0.146	1.70**	0.080	1.77*
Nike	0.085	1.05	0.386	0.31
Reebok	0.110	1.03	0.117	0.55
K-Swiss	0.096	1.66**	-0.028	0.97
Skechers	0.107	1.62*	-0.076	1.28

* Significant at p<.10 for a one-tailed test. ** Significant at p<.05 for a one-tailed test.

Table 3: Investor Response Effects

Firm	Elasticities	t-statistic
Apple	.010	1.83**
Compaq	.007	1.79**
Dell	.008	1.85**
HP	.008	1.64**
IBM	.009	1.25
Nike	.005	1.57*
Reebok	.007	1.32*
K-Swiss	.002	0.97
Skechers	.009	1.61*

* Significant at p<.10 for a one-tailed test. ** Significant at p<.05 for a one-tailed test.

Table 4: Forecast Error Variance Decompositions*

4a: PC Industry

	Apple		Compaq		Dell		HP	
Period	**MBR**	**Adv**	MBR	**Adv**	MBR	**Adv**	MBR	**Adv**
1	87.481	0.596*	92.971	1.435	94.183	0.943	97.772	0.953
2	83.571	2.038	90.315	2.856	91.632	2.644	84.369	2.010
3	80.287	3.670	84.583	3.241	88.742	2.997	81.189	3.134
4	78.733	4.587	83.875	4.542	84.950	4.201	80.905	3.124
5	78.488	4.651	83.489	5.338	84.112	5.184	80.849	3.248
6	78.442	4.679	83.433	5.452	82.895	5.523	80.840	3.266
7	78.440	4.679	83.330	5.676	80.799	5.715	80.831	3.285
8	78.438	4.681	83.327	5.677	79.854	5.692	80.828	3.288
9	78.438	4.681	83.308	5.716	79.850	5.726	80.828	3.289
10	78.438	4.681	83.307	5.717	79.849	5.727	80.827	3.290

4b: Sporting Goods Industry

	Nike		Reebok		Skechers	
Period	**MBR**	**Adv**	MBR	**Adv**	MBR	**Adv**
1	98.268	0.077	99.116	0.183	98.433	0.095
2	96.580	0.878	96.734	0.639	92.737	1.452
3	91.414	2.787	91.092	0.822	89.831	1.954
4	89.126	4.003	90.313	1.464	88.669	2.822
5	88.960	4.108	89.881	1.894	88.420	3.223
6	88.696	4.118	89.821	1.951	88.402	3.523
7	88.600	4.185	89.710	2.065	88.395	3.528
8	88.588	4.189	89.707	2.065	88.392	3.529
9	88.574	4.198	89.687	2.085	88.391	3.529
10	88.564	4.208	89.685	2.086	88.391	3.529

* Read: if Matched Firm Return (MFR) for Apple is projected 1 to 10 periods into the future, only 0.596% of the forecast error variance in the first forecast period is explained by shocks to advertising expenditures. This percentage grows to 4.681% of the variance by the tenth forecast period. In contrast, 87.481% of the forecast error variance in period 1 is explained by momentum (variance in past values of MFR). This percentage declines to 78.438% of the variance by period 10.

Table 5: Market Valuation Impact of Doubling Advertising

Apple						
Year	**Current MV***	**Increase due to Revenue**	**Increase due to Direct Effect**	**Reduction due to Cost**	**New MV**	**Net Gain**
1997	$1,500	$15.44	$0.76	$27.24	$1,488	**No**
1998	$3,700	$38.29	$1.88	$45.33	$3,694	**No**
1999	$12,700	$130.74	$6.42	$53.63	$12,783	**Yes**
2000	$3,700	$38.09	$1.87	$80.63	$3,659	**No**

Compaq						
Year	**Current MV**	**Increase due to Revenue**	**Increase due to Direct Effect**	**Reduction due to Cost**	**New MV**	**Net Gain**
1997	$35,600	$231.60	14.04	$27.24	$35,818	**Yes**
1998	$57,800	$376.02	22.80	$45.33	$58,153	**Yes**
1999	$36,600	$238.10	14.44	$53.63	$36,798	**Yes**
2000	$19,800	$128.81	7.81	$80.63	$19,855	**Yes**

All figures in millions of dollars

* Market Valuation

Table 6: Comparison of Actual Advertising Expenditures with Optimal

Apple

	DS Optimal Advertising Expenditure	Actual Expenditure	Deviation from Optimal
1997	$319,134	$406,760	27.46%
1998	$299,814	$676,570	125.66%
1999	$426,437	$400,530	-6.08%
2000	$411,020	$1,203,630	192.84%

Compaq

	DS Optimal Advertising Expenditure	Actual Expenditure	Deviation from Optimal
1997	$797,084	$923,330	15.84%
1998	$885,658	$720,582	-18.64%
1999	$1,029,938	$1,204,020	16.90%
2000	$1,199,531	$1,163,920	-2.97%

* All figures are in thousands of dollars

Figure 1

Advertising and Firm Valuation

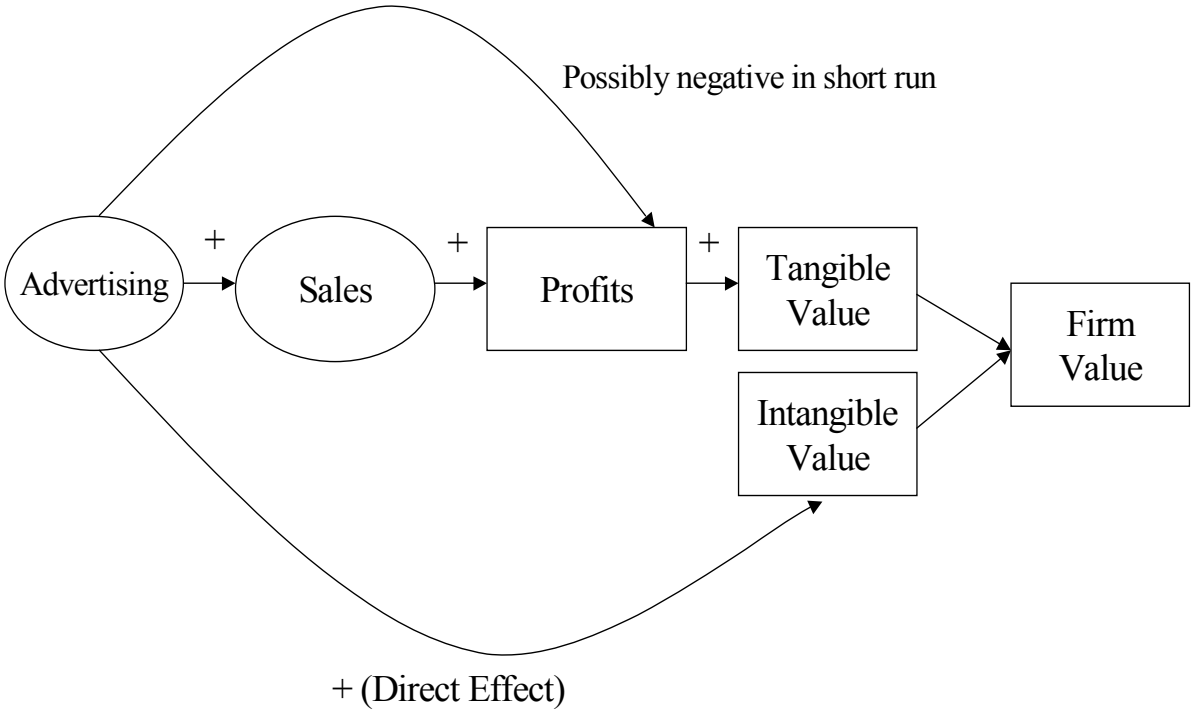
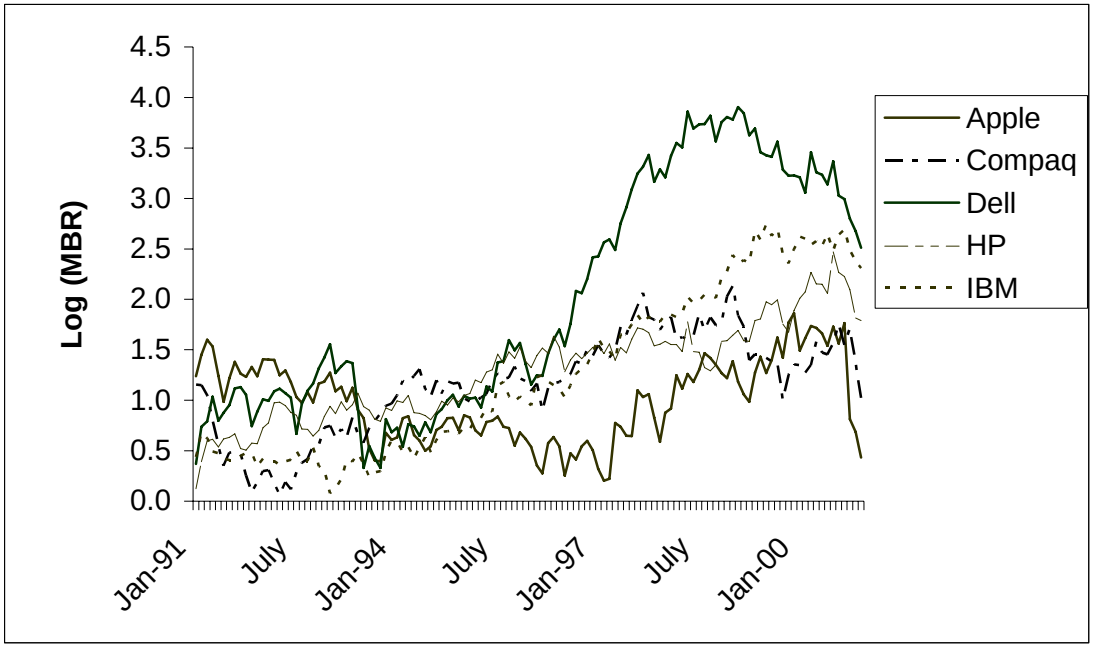
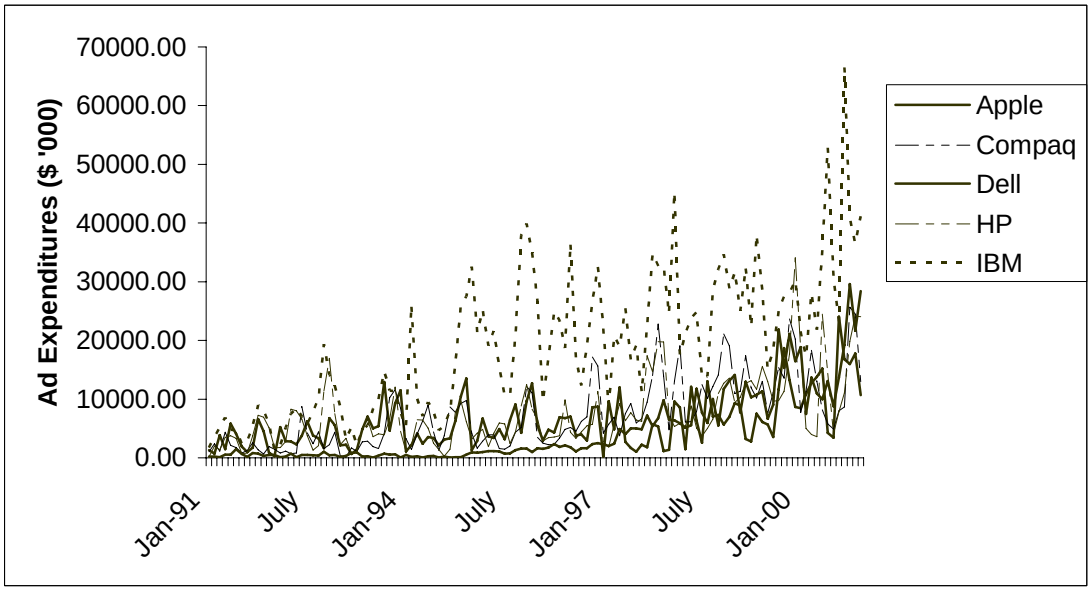


Figure 2

Market-to-Book ratio and Advertising in the PC industry*

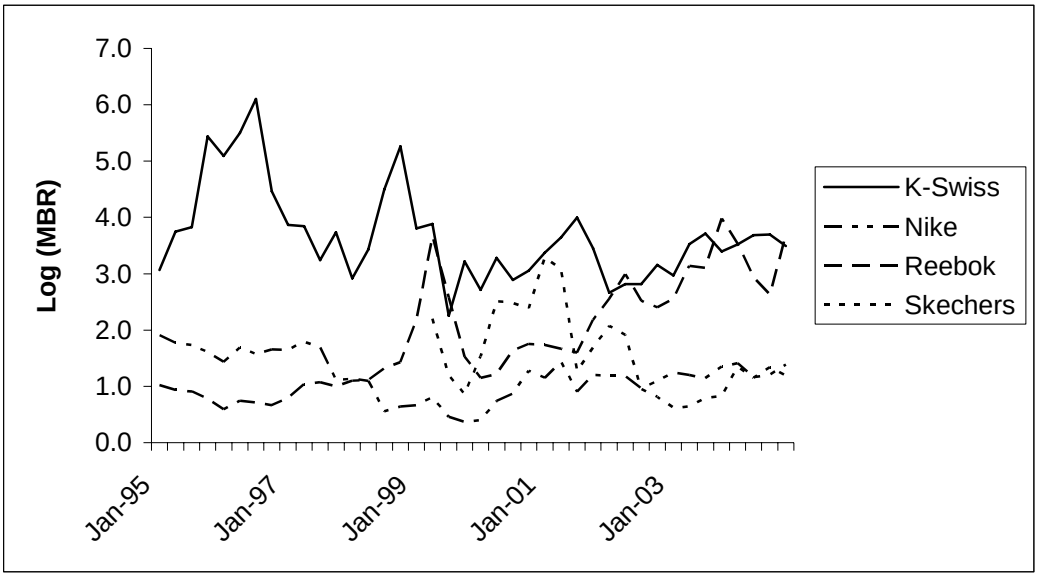


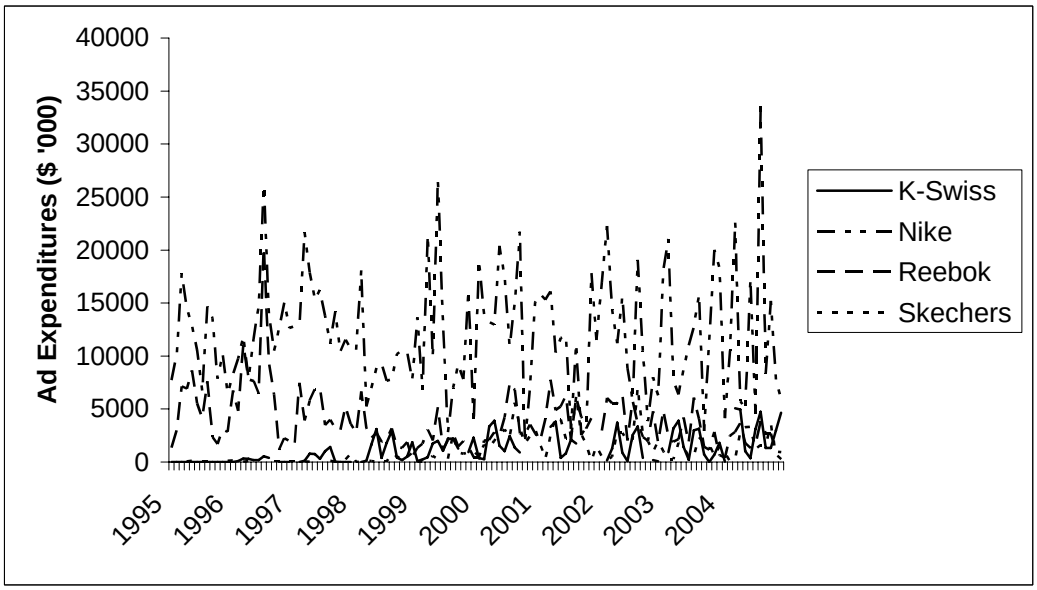


*For ease of exposition, Market-to-Book ratio has been expressed in logs and advertising in levels

Figure 3

Market-to-Book ratio and Advertising in the Sporting Goods Industry*

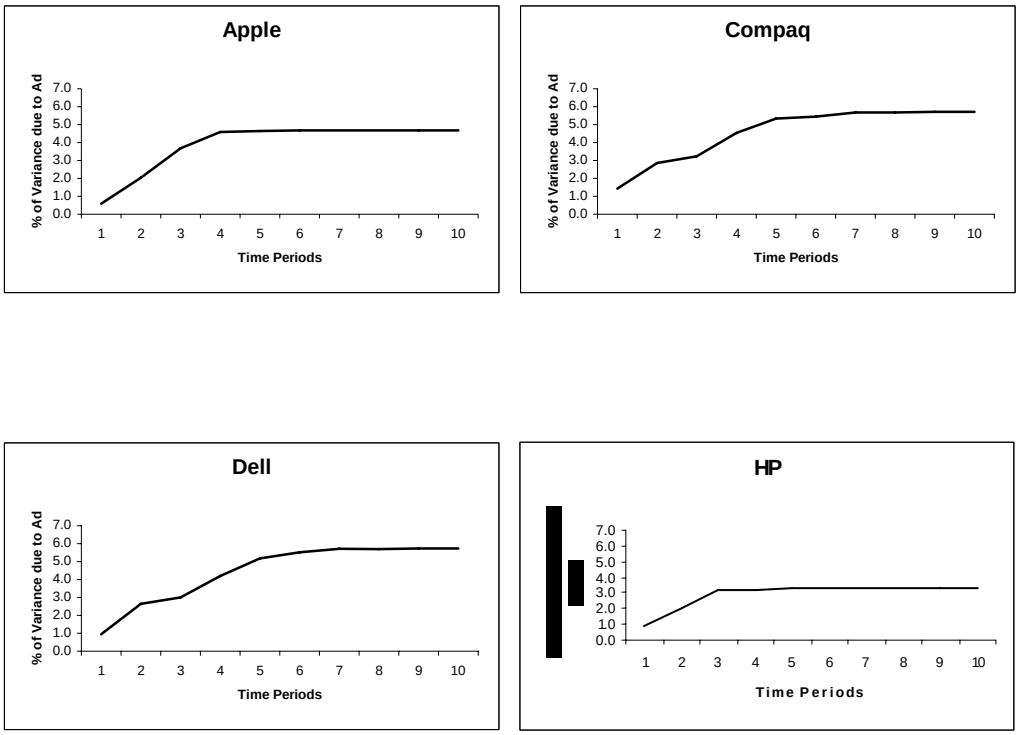




*For ease of exposition, Market-to-Book ratio has been expressed in logs and advertising in levels

Figure 4

Forecast Error Variance Decomposition*:
An Illustration in the PC Industry

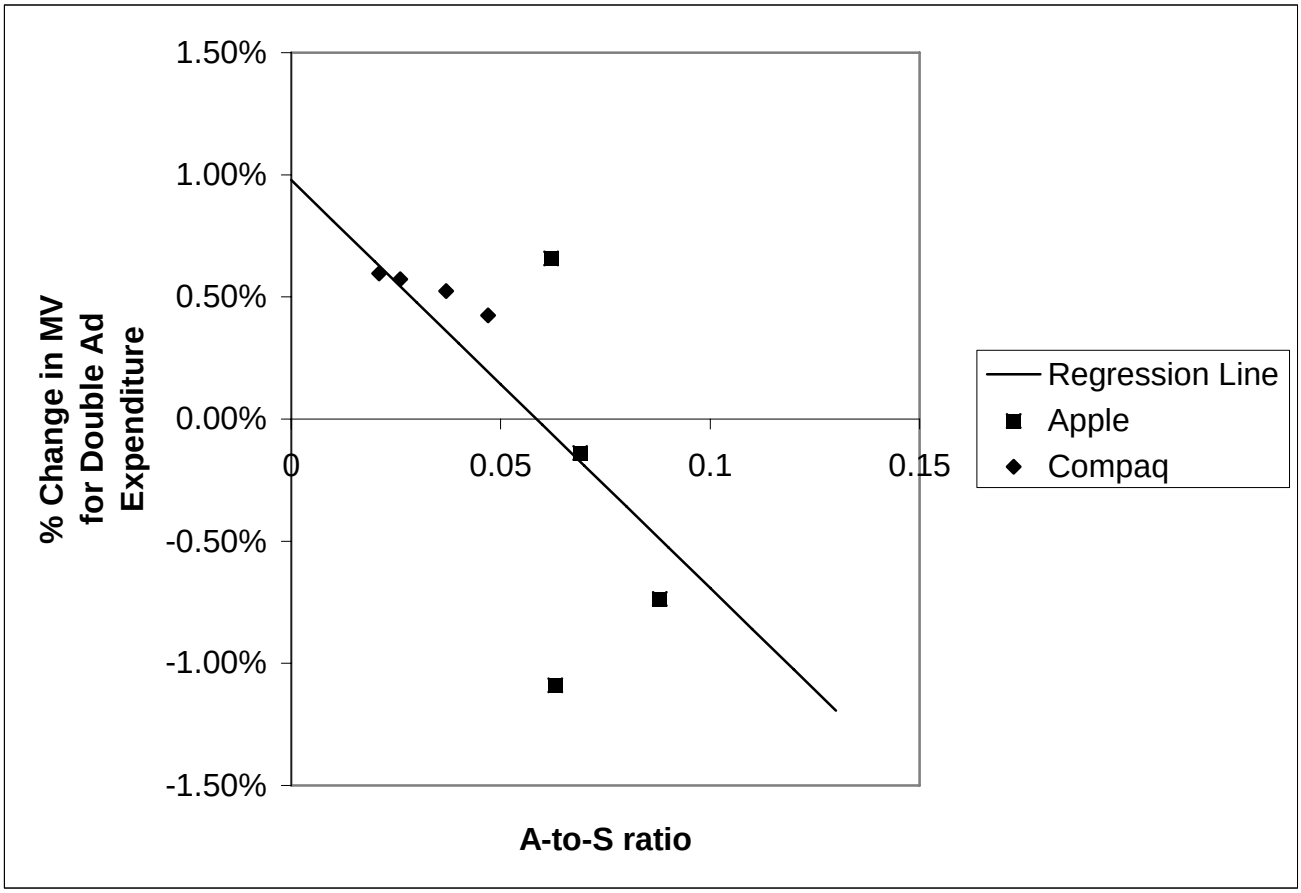


*Read as mentioned for Table 4

Figure 5

Market Valuation and the A/S Ratio:

An illustration in the PC Industry



Appendix

Table A1a: Unit-Root Test Results (PC Industry)

Apple

	ADF Stat	5% critical Value	Unit Root?
MFR	-2.12	-3.44	Yes
Revenue	-2.07	-3.44	Yes
Profits	-1.96	-3.44	Yes
Advertising	-3.01	-3.44	Yes
R&D	-1.61	-3.44	Yes

Compaq

	ADF Stat	5% critical Value	Unit Root?
MFR	-1.86	-3.44	Yes
Revenue	-2.45	-3.44	Yes
Profits	-4.17	-3.44	No
Advertising	-2.92	-3.44	Yes
R&D	-2.29	-3.44	Yes

Dell

	ADF Stat	5% critical Value	Unit Root?
MFR	-2.25	-3.44	Yes
Revenue	-3.03	-3.44	Yes
Profits	-2.58	-3.44	Yes
Advertising	-2.67	-3.44	Yes
R&D	-4.47	-3.44	No

HP

	ADF Stat	5% critical Value	Unit Root?
MFR	-1.92	-3.44	Yes
Revenue	-1.99	-3.44	Yes
Profits	-1.57	-3.44	Yes
Advertising	-2.47	-3.44	Yes
R&D	-3.05	-3.44	Yes

IBM

	ADF Stat	5% critical Value	Unit Root?
MFR	-2.03	-3.44	Yes
Revenue	-3.14	-3.44	Yes
Profits	-3.84	-3.44	No
Advertising	-2.29	-3.44	Yes
R&D	-2.89	-3.44	Yes

Table A1b: Unit-Root Test Results (Sporting Goods Industry)

Nike

	ADF Stat	5% critical Value	Unit Root?
MFR	-2.31	-3.44	Yes
Revenue	-3.86	-3.44	No
Profits	-0.75	-3.44	Yes
Advertising	-2.35	-3.44	Yes
R&D	-3.51	-3.44	No

Reebok

	ADF Stat	5% critical Value	Unit Root?
MFR	-2.95	-3.44	Yes
Revenue	-4.01	-3.44	No
Profits	-2.09	-3.44	Yes
Advertising	-1.18	-3.44	Yes
R&D	-4.39	-3.44	No

K-Swiss

	ADF Stat	5% critical Value	Unit Root?
MFR	-3.06	-3.44	Yes
Revenue	-2.86	-3.44	Yes
Profits	-2.14	-3.44	Yes
Advertising	-2.48	-3.44	Yes
R&D	-2.93	-3.44	Yes

Skechers

	ADF Stat	5% critical Value	Unit Root?
MFR	-2.58	-3.44	Yes
Revenue	-3.07	-3.44	Yes
Profits	-1.59	-3.44	Yes
Advertising	-1.99	-3.44	Yes
R&D	-2.31	-3.44	Yes