ADVERTISING, RESEARCH AND DEVELOPMENT AND SYSTEMATIC RISK OF THE FIRM

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July 2006

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Abstract

Marketing executives are being urged to "speak in the language of finance" with top management and their finance colleagues to gain support for marketing initiatives. Responding to this call, in this paper, we examine the impact of a firm's advertising and its research and development (R&D) on the systematic risk of its stock, a key metric for publicly listed firms. Integrating developments in the accounting, finance and marketing literatures, we propose that both a firm's advertising and its R&D will create market-based intangible assets that will insulate the firm from changes in the stock market, thereby lowering its systematic risk.

We test the hypotheses using data on 644 publicly listed firms for the period between 1979 and 2001 by creating a panel data set consisting of five-year moving windows. We scale the firm's advertising expenditure and its R&D expenditure by its sales. We estimate the effect of advertising/sales and R&D/sales on systematic risk incorporating unobserved firm heterogeneity and serial correlation in errors. After controlling for factors that accounting and finance researchers have shown to be associated with systematic risk, we find that a firm's advertising/sales and R&D/sales lower its systematic risk.

For theory, this study's findings extend past research that has, for the most part, focused on the effect of marketing initiatives on performance metrics without consideration of the impact of those initiatives on a firm's systematic risk. For practice, the ability of advertising and R&D to reduce systematic risk highlights the multi-faceted financial implications of advertising and research programs. The paper's findings may also surprise senior management and finance executives, some of whom are skeptical of the financial accountability of advertising and R&D programs.

Keywords: beta, systematic risk, advertising, R&D, marketing metrics, risk

INTRODUCTION

There is a growing consensus that senior management and finance executives, focused on maximizing shareholder value, do not value marketing performance metrics (e.g., awareness, sales growth, loyalty, customer satisfaction, and repeat purchase) because they do not understand how, or even whether these metrics are of interest to the firm's shareholders (Ambler 2003). Consequently, marketing executives are urged to "speak in the language of finance" with their finance colleagues and senior management (Srivastava and Reibstein 2004) as "…financial return is the dialogue required to access funds from the financial purse strings" crucial for the implementation of marketing programs. To address this gap, in this paper, we examine whether a firm's advertising and R&D expenditures affect a metric of interest to both finance executives and senior management: the firm's "systematic risk" β.[1] we first provide the motivation for the study.

Portfolio theory (Lintner 1965; Sharpe 1964), a key development in finance, posits that investors can diversify away a portion of the risk associated with a firm's stock by constructing a portfolio of stocks whose returns correlate imperfectly with each other. In equilibrium, the risk that is priced in the stock market is the stock's systematic risk, which is a function of the extent to which the stock's return changes when the overall market changes.[2] This market-driven variation in a firm's stock returns, which cannot be diversified away, is its "systematic risk", or β.[3] By construction, the stock market, as a whole, has a β of 1.0. A stock whose return, in response to a change in the market, falls (or rises) more than does the market's return falls (or

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[1] As we subsequently discuss, to eliminate potentially confounding effects of firm size on systematic risk, in the empirical estimation, we scale the firm's advertising and R&D by its sales.

[2] Thus, beta is measured as (covariance (stock and market))/(variance (market)).

[3] We use the terms 'systematic risk', 'beta', or β to denote the systematic risk of the firm's stock.

rises) has a β above 1.0. If, in response to a change in the market, a stock's return falls (or rises) less than the market's return falls (or rises), its β is less than 1.0. Thus, β, a measure of the stock's sensitivity to market changes, is an important metric for publicly listed firms.

In this paper, we examine the relationship between a firm's advertising and R&D and its systematic risk. Recent developments in the market-based assets theory (Srivastava et al. 1998) suggest that a firm's advertising creates intangible market-based assets (e.g., brand equity) and that those assets strengthen performance including sales growth, market share and profitability (Boulding and Staelin 1995; Erickson and Jacobson 1992) and shareholder value (Joshi and Hanssens 2004; Rao et al. 2004). We suggest that the consumer loyalty and the bargaining power over distribution channel partners inherent in those intangible market-based assets help insulate the firm from the impact of stock-market downturns, thereby lowering the firm's systematic risk. Based on developments in the finance literature, we suggest another way in which advertising-created market-based assets might affect a firm's systematic risk. Frieder and Subrahmanyam (2001; p. 57) note that because of increased firm awareness due to advertising, *ceteris paribus*, "investors prefer holding stocks with high recognition and consequently, greater information precision." Grullon et al. (2004) found that a firm's advertising results in broader ownership of the stock. We anticipate that this broader ownership may insulate the stock's return from market downturns.

Consistent with these theoretical developments, two recent studies (Madden et al. 2006; Singh et al. 2005) have explored the relationship between a firm's advertising and its systematic risk. Singh et al. (2005) reported a significant, negative relationship between a firm's advertising and its systematic risk. Using a sample of "best-performing firms" from the Stern-Stewart database for the period between 1998 and 2001, Singh et al. found that higher advertising expenditure (operationalized as advertising dollars) was associated with lower systematic risk. Madden et al. (2006) compared the performance of three stock portfolios which included a portfolio of firms with strong brands (using Interbrand's measure of brand strength), a portfolio of firms excluding firms with strong brands, and a portfolio of all firms and found that the portfolio of firms with strong brands, relative to the other two portfolios, had higher returns and lower systematic risk.

The Singh et al. (2005) and Madden et al. (2006) studies raise intriguing research questions: Will the negative relationship between advertising (or brand strength) and systematic risk hold under other conditions including a more general sample that includes poorly performing firms, or with measures of advertising scaled for firm size (to remove the confounding effect of firm size)? Will the negative relationship between advertising and systematic risk hold controlling for other accounting characteristics that have been shown to link to a firm's systematic risk which may vary across portfolios (but not controlled for in the Madden et al. study)? In addition, we perceive a research opportunity for us to incorporate unobserved firm heterogeneity (to rule out endogeneity caused by omitted variables) and to use lagged predictor variables (to rule out reverse causality), issues not examined in past research.

There is also evidence in the literature linking a firm's R&D expenditure to its financial performance (Boulding and Staelin 1995; Capon et al. 1990; Erickson and Jacobson 1992) and shareholder value (Jaffe 1986). We hypothesize that, as in the case of advertising, R&D will create intangible market-based assets that insulate the firm from the negative impact of stock-market downturns, lowering the firm's systematic risk.

Accordingly, in this paper, we examine the impact of a firm's advertising and R&D on its systematic risk proposing that a firm's advertising and R&D will lower its systematic risk. We test the hypotheses using data on publicly listed firms obtained from the COMPUSTAT and Center for Research on Stock Prices (CRSP) databases for the period between 1979 and 2001, which resulted in the creation of a panel data set of 19 five-year moving windows with 3198 observations for 644 firms. Following precedent in the finance literature (Damodaran 2001), we estimate the firm's systematic risk, β, using 60 months of stock returns in a five-year moving window using equal-weighted stock market returns. To eliminate the potentially confounding effects of firm size on systematic risk, we scale the firm's advertising and R&D expenditures by its sales.

We control for the firm's growth, leverage, liquidity, asset size, earnings variability, and dividend payout—factors that have been shown by finance and accounting scholars to be associated with its systematic risk. The model includes two additional control variables that may affect a firm's systematic risk: firm age and competitive intensity in the industry. We estimate the effect of a firm's advertising/sales and R&D/sales on its systematic risk using a fixed effects model formulation that accounts for unobserved firm heterogeneity and serial correlation of errors.

The results strongly support the hypotheses that higher advertising/sales and higher R&D/sales lower a firm's systematic risk after controlling for factors shown in past research to be associated with systematic risk. These two effects are robust to alternative estimates of systematic risk (estimating β using value-weighted, as opposed to equal-weighted market returns and relaxing the restriction that all 60 months of stock returns must be present to estimate β) and to alternative measures of advertising and R&D (scaling them by assets rather than scaling them by sales) and that the results are not driven by multicollinearity. The paper's findings are novel and important with implications for both marketing theory and practice, which we discuss.

We organize the paper as follows. In the next section, we provide a brief overview of systematic risk. Following that, we develop hypotheses that relate a firm's advertising and R&D to its systematic risk. We then describe the proposed estimation approach, the data, the measures, and the results. We conclude with a discussion of the paper's contributions, its limitations, and opportunities for further research.

AN OVERVIEW OF SYSTEMATIC RISK

A central issue in portfolio theory in finance is the maximization of returns for individuals investing in assets i.e. in firms' stocks (Lintner 1965; Mossin 1966; Sharpe 1964). The key idea of portfolio theory is that investors can construct a portfolio of stocks with imperfectly correlated returns and thus eliminate non-systematic (i.e., individualistic) risk associated with those stocks. The remaining variability, the firm's systematic risk, reflects the extent to which its stock's return responds to movement of the average return on all stocks in the market. That is, a firm's systematic risk measures its stock's sensitivity to market-wide events and is, referred to as, its β.

In 1970, Beaver, Kettler, and Scholes (1970) related systematic risk, β, to variables that describe the financial position of a firm. Specifically, they suggested that higher systematic risk will be related to:

- Higher growth because, in a competitive economy, the excessive earnings opportunities may erode when new firms enter the industry.

- Higher leverage because the earnings stream of common shareholders becomes more volatile as debt increases.

- Lower liquidity because liquid or current assets result in less volatile returns than do fixed assets.

- Smaller asset size because smaller firms have higher default risk.

- Lower dividend payout because the need to offer steady dividends will cause firms with greater volatility to pay out a lower percentage of earnings.

- Higher levels of earnings variability because this will result in a lower payout to stockholders.

- Higher earnings co-variability with the market because this will result in higher earnings volatility again lowering the return on the stocks.

Considering two ten year periods (1947-1956 and 1957-1965), BKS (1) regressed the aforementioned firm characteristics on systematic risk in the first time period and (2) examined whether a model of systematic risk from time period 1 predicted systematic risk in time period 2 better than did systematic risk in time period 1.

Two diverse streams of empirical research have emerged from the BKS study. The first stream of research, not related to this paper's research objectives, focuses on the prediction of the firm's systematic risk, β, in a future period (Elgers 1980; Eskew 1979; Ismail and Kim 1989). The second stream of research, more pertinent to this paper, augments the predictor variables in the BKS study with additional firm characteristics that may explain systematic risk. While there are several studies in this stream, our review indicated a lack of cumulative knowledge building in this area. Rather, each study added some new variables to a subset of the variables in the BKS study. Variables considered in past research include dividend policy (Bildersee 1975), financial structure (Hill and Stone 1980), operating leverage (Mandelker and Rhee 1984), earnings funds flow and cash flow (Ismail and Kim 1989), international diversification (Goldberg and Heflin 1995) and strategic profiles (Veliyath and Ferris 1997).

Related, two studies (Bharadwaj and Menon 1993; Kroll et al. 1999) have explored the relationship between aspects of a firm's marketing strategy and its risk. Using service strategic business units (SBU's) from the PIMS (Profit Impact of Marketing Strategy) database, Bharadwaj and Menon (1993) found that some aspects of marketing (i.e., promotional expenditure, sales force expenditure, relative price) are associated with lower variability in return on investment while other aspects of marketing (i.e., advertising, and customization) are associated with higher variability in return on investment. Though variability in return on investment, a surrogate for total risk, confounds systematic risk with non-systematic risk, these results suggest a relationship between firms' marketing activities and their systematic risk. Kroll et al. (1999) considered a surrogate for systematic risk, the covariance of firms' cash flows relative to a market portfolio of equities, and found that the superior product quality of SBU's (again using the PIMS database) decreased that surrogate measure of risk. As noted earlier, Singh et al. (2005) and Madden et al. (2006) found that higher levels of advertising expenditure are associated with lower systematic risk.

Note that there is a vigorous, ongoing debate about the usefulness of systematic risk for predicting future firm value in the finance literature (Fama and French 1992).[4] However, our focus is on β as a measure of risk, not on β as a predictor of future firm value. Reiterating its central role in investment practice, systematic risk, β, is an important metric for publicly listed firms measuring their stocks' vulnerability to market downturns. Indeed, as testimony of its importance, a review of current investment practices indicated that leading investment firms (e.g., Fidelity Inc., Merrill Lynch, and Value Line) use β extensively in the construction of investment portfolios. Thus, shareholders and senior management of publicly traded firms are very interested in β and, consequently, in the impact of advertising and R&D on β.

[4] Specifically, Fama and French (1992), using historical data, examined whether expected returns are better predicted by the firm's past beta's than by other variables. Using realized average returns, they found a stronger empirical correlation of future firm value with a firm's book-to-price and with size but not with the measure of its historic beta.

In sum, while there is much work relating a firm's accounting characteristics (e.g., dividend payout, growth, leverage, liquidity, asset size, and earnings variability) to its systematic risk, we know much less about the relationship between important indicators of marketing strategy (e.g., advertising and R&D expenditures) and systematic risk. Singh et al. (2005) and Madden et al. (2006) are two exceptions. Addressing this research gap, we examine the effects of a firm's advertising and R&D, two important manifestations of the firm's marketing strategy, on its systematic risk.

THEORY

We next develop hypotheses relating a firm's advertising and R&D to its systematic risk. Note that, to eliminate the potentially confounding effects of firm size on systematic risk, in the empirical estimation, we scale the firm's advertising and R&D by its sales. We first discuss the effects of the firm's advertising on its systematic risk, followed by the effects of R&D on systematic risk.

Advertising

To start with, a large body of work indicates that advertising has a direct effect on various firm performance metrics including sales (Leone 1995), profit (Erickson and Jacobson 1992) and firm value (Joshi and Hanssens 2004). Reinforcing these performance rewards to advertising, developments in brand equity (Aaker 1996; Keller 1998) suggest that advertising efforts of firms create consumer and distributor brand equity, an intangible market-based asset, with important strategic and performance implications. For example, increased advertising, and the resulting brand equity, increase the differentiation of a firm's products (Kirmani and Zeithaml 1993) and make them less easily substitutable (Mela et al. 1997). Increased brand equity also increases price premiums (Ailawadi et al. 2003) and lowers price sensitivities (Kaul and Wittink 1995;

Sethuraman and Tellis 1991). Further, increased advertising, with resultant higher brand equity produces an asymmetric sales response to sales promotions (Blattberg et al. 1995) such that highly advertised brands are affected less (than less advertised brands) by competitors' sales promotions.

In addition to the benefits of advertising and brand equity in current product-markets, advertising, and the resulting brand equity also strengthen and stabilize the firm's performance in new product markets. For example, the brand equity of current flagship brands generate greater receptiveness of consumers and distribution channel partners to new product introductions (Kaufman, Jayachandran and Rose 2006) and will enable the firm to migrate customers to more profitable products and/or cross-sell products to existing customers (Kamakura et al. 2003). Thus, as suggested by Srivastava et al. (1998), brand equity may function as financial hedging contracts when firms enter new markets with new technologies. In addition, brand equity also creates both consumer and distributor loyalty, acts as a barrier to competition and provides bargaining power over distributors—benefits that insulate a firm's stock from market downturns and, hence, lower its systematic risk (Veliyath and Ferris 1997).

Finally, a firm's brand equity may also lower its systematic risk by serving as a capital market information channel to the firm's stockholders (Frieder and Subrahmanyam 2005; Grullon et al. 2004). Grullon et al. (2004) reported that firms' with higher advertising had higher liquidity and greater breadth of stock ownership. Frieder and Subrahmanyam (2005) reported that a firm's increased brand perceptions (consistent with higher brand equity discussed above), a direct outcome of its increased advertising, increased ownership of the firm's stock by individual investors, relative to institutional investors, because of individual investors' preference for stocks with higher quality information (advertising plays an information role for a firm's stockholders).

This higher liquidity and increased breadth of ownership may help insulate the firm's stock returns from market downturns, lowering its systematic risk. Thus, we propose:

H1: The higher a firm's advertising, the lower its systematic risk.

Research and Development (R&D)

There is a large body of finance, management, and marketing research relating the intangible assets created by R&D to the firm's financial performance. While, there is a debate about the sizes of the effects of R&D investments on different performance metrics (Boulding and Staelin 1995; Erickson and Jacobson 1992), it is well-established that firms' R&D investments generate persistent profits (Roberts 2001), high stock returns (Chan et al. 2001; Mizik and Jacobson 2003; Pakes 1985) and superior market value (Jaffe 1986). In a meta-analysis of 210 profitability studies, Capon, Farley and Hoenig (1990, p. 1157) concluded that, "Dollars spent on R&D have an especially strong relationship to increased profitability."

As with advertising-created market-based assets, R&D-created market-based assets may also insulate a firm's stock from market downturns. Veliyath and Ferris (1997) reported a relationship between the strategic profile of a firm, including its advertising- and R&D-driven differentiation, and its systematic risk. Similarly, the number of a firm's new product introductions lowers its systematic risk (Chaney et al. 1991). This relationship between R&D and systematic risk occurs because a firm which invests in R&D exhibits greater dynamic efficiency and greater flexibility than its competitors (who invest less in R&D) enabling it to adapt to environmental changes including in input prices, technologies and customers (Miller and Bromiley 1990). This efficiency and flexibility help insulate the firm from market downturns, lowering its systematic risk.

Note that we focus on the effects of a firm's R&D, an activity with uncertain returns, a firm's systematic risk. If the focus is on total risk (non-systematic risk and systematic risk), R&D may increase total risk because R&D may decrease the predictability of a firm's future income streams (Kothari et al. 2002). Analysts exhibited greater disagreement about year-ahead earnings for R&D intensive firms than for other firms (Barth et al. 2001). Another study reported that post-investment reported earnings are more highly variable for firms with higher R&D levels than for firms with lower R&D levels (Chambers et al. 2002). To the extent that these kinds of volatility are specific to a firm or an industry, they are non-systematic and can be diversified away (Lubatkin and O'Neill 1987).

In sum, while extant empirical research suggests that R&D may increase a firm's non-systematic risk, that literature also suggests that R&D creates strategic differentiation, efficiency and flexibility, which insulate the firm from market downturns, hence lowering its systematic risk. Thus, we propose:

H2: The higher a firm's R&D, the lower its systematic risk.

METHOD

Data

The data for this study included all firms listed on the New York Stock Exchange (NYSE) during the period between 1979 and 2001. We obtained accounting, financial, advertising and R&D data on firms from COMPUSTAT and their stock prices, for the computation of systematic risk, from CRSP.

Measures

The dependent variable, systematic risk, is an inherently long-term construct capturing the extent to which a firm's stock return co-varies with market return (Beaver, Kettler and Scholes 1970). A firm's systematic risk changes slowly over time. We follow the precedent in past finance research (Damodaran 2001) and estimate the firm's systematic risk, β, using a five year moving window.

Accordingly, we estimate the firm's systematic risk, β, for a five-year moving window using stock returns for the previous 60 months, relative to the equal-weighted return for the stock market for that period. We subsequently test the robustness of the results to beta estimates relative to the value-weighted returns and for beta estimates when monthly stock returns were available for at least 50 of the 60 months of the moving window (which allows us to increase the number of firms in the data set). In addition, to avoid problems associated with very low-priced stocks, we excluded a stock from the five-year moving window if the average of its monthly closing stock prices was less than 2$ (Ball et al. 1995; Hertzel et al. 2002). Finally, we include a firm in the moving window only if it reported information on its advertising and R&D in COMPUSTAT for all years in the 5-year moving window.

Systematic Risk. Like BKS (p. 664), we use monthly stock data to compute firm *i*'s systematic risk measure $\hat{\beta}_i$, *ex post*, for a period by using a least squares regression of the form:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}, \; t = Start, \ldots, End \text{ where} \qquad (1)$$

$$R_{it} = \ln\left[\frac{D_{it} + P_{it}}{P'_{it-1}}\right] \text{ and } R_{mt} = \ln\frac{L_t}{L_{t-1}}$$

where R_{it} is the *ex post* rate of return for stock *i* during period *t*, R_{mt} is an index of the *ex post* return for all NYSE firms during month *t* (i.e., the market rate of return) and α_i is the intercept of the fitted line of R_{it} using R_{mt}. D_{it} is cash dividend payable on common stock *i* in month *t*, P_{it} is closing price of common stock *i* at end of month *t*, P'_{it-1} is closing price at end of month *t-1* adjusted for capital changes (e.g., stock splits, and stock dividends) and L_t and L_{t-1} are the Fisher's link relative, a market price index of all firms on the NYSE at months *t* and *t-1* respectively, adjusted for dividends and all capital changes. The slope of the regression equation $\hat{\beta}_i$ is the empirical estimate of systematic risk β_i of firm *i*.

We obtained $\hat{\beta}_i$ by estimating a separate regression using the monthly stock returns for each firm *i* for each five-year moving window resulting in up to 19 observations per firm. For the first moving window, we used the monthly stock returns for all firms on CRSP for 1979, 1980, 1981, 1982 and 1983 to compute the firm's systematic risk, β. For the second moving window, we used the monthly stock returns for firms for 1980, 1981, 1982, 1983 and 1984. For the last and 19th moving window, we used the monthly stock returns for all firms for 1997, 1998, 1999, 2000 and 2001. To ease interpretation of the results, we eliminated 52 observations where the firm's estimated systematic risk was negative.

Advertising and R&D. We measured *advertising* by the mean of the firm's advertising expenditure as reported in DATA45 scaled by its sales reported in DATA12 for the five-year period from the annual data reported in COMPUSTAT. DATA45 in COMPUSTAT includes the cost of advertising media (radio, television, newspapers, and periodicals) and promotional expenses.[5] We measured *R&D* by the mean of the firm's R&D expenditure as reported in

[5] Past research has shown that sales promotion activities negatively affect brand loyalty (Mela, Gupta, Lehmann and 1997) and have a nil effect on stock returns (Pauwels et. al. 2004). We are cognizant that some firms may report sales promotion expenditure as a part of their advertising expenditure. However, because firms don't indicate, the split between advertising and sales promotions, we assume that most advertising expenditures reported in DATA45 in COMPUSTAT relate to communication of product benefits to customers. Thus, differences in the percent of such mis-reported advertising expenditure that pertains to sales promotion adds error to our estimates, making our tests of hypotheses conservative.

DATA46 scaled by its sales reported in DATA12 for the five-year period from the annual data reported in COMPUSTAT. Scaling the firm's advertising and R&D expenditures by its sales rules out the alternative explanation that the negative effect of advertising and R&D on systematic risk may be because larger firms may have lower systematic risk. We subsequently test and report that the model estimation results are robust to scaling of the advertising and R&D by the firm's assets DATA6 (instead of its sales).

Given the theoretical processes discussed in the hypotheses development, we anticipate a lagged effect of a firm's advertising and R&D on its systematic risk. Thus, we used lagged measures of advertising/sales and R&D/sales, which preclude a potential reverse causality explanation of the effects (Boulding and Staelin 1995).

Accounting Variables. Given this paper's objective of exploring the effects of a firm's advertising and R&D on its systematic risk we, like accounting researchers before us, use accounting variables used by BKS as control variables in our model. Accordingly, we included six accounting characteristics of the firm in the model: asset growth rate, leverage, liquidity, asset size (log), earnings variability, and dividend payout. See BKS (p. 666) for the logic for the operationalization of these variables. Note that the inclusion of the firm's asset size serves as a further control for the effects of the firm's size on its systematic risk. We are unable to include covariability of earnings, which was included in the BKS model, because its calculation requires ten years' data. We provide the definitions of these measures and the data fields from COMPUSTAT used for their computation in the Appendix.

Additional Control Variables. We also include two additional control variables in the model. First, we include the firm's age measured by the number of years since its listing on the stock market as older firms may have lower systematic risk. Second, to control for industry-specific effects, following the suggestion of an anonymous reviewer, we include the industry's competitive intensity, measured by the Herfindahl's four-firm concentration ratio as the proportion of market shares of the largest four firms to the industry's sales at the 2-digit standard industry classification (SIC) level. *A priori*, we do not hypothesize the directional effect of competitive intensity. The fixed effects formulation we employ to estimate the model precludes the inclusion of time-invariant industry dummies in the model.

The number of observations for which we had complete data on systematic risk, lagged advertising/sales, lagged R&D/sales, and the control variables is 3198 (for 644 firms). The number of firms in the sample by each moving window, suggests that over time, the number of firms in each moving window increases at first, reaches a maximum (N = 371 in moving window 10 (years = 1989-1993)) and then declines to N = 162 in the last moving window (years = 1997-2001). This drop in the number of firms in the moving windows, over time, occurred because of missing data for advertising and R&D. The average value for systematic risk, β for all firms in a given window, varies across the years ranging from 0.856 (window 14) to 1.140 (window 18), while average asset size (log) ranges from $6.243 million (window 14) to $4.951 million (window 6). Lagged advertising/sales and lagged R&D/sakes vary as follows: average lagged advertising: highest = 0.055 in window 15 to lowest = 0.033 in window 1; average lagged R&D: highest = 0.088 in window 15 to lowest = 0.036 in window 1. 3% of observations reported zero advertising expenditure and 3.9 % of observations reported zero R&D expenditure. Table 1 contains the descriptive statistics and correlation matrix of the measures and Figures 1a and 1b contains the frequency distribution of asset size (log) and systematic risk respectively of observations in the study.

---- Insert Table 1 and Figures 1a and 1b here ----

A perusal of Table 1 and Table 2 (which we discuss in detail subsequently and contains the results of the model estimation) suggests that the pattern of bivariate correlation matrix in Table 1 is different from the pattern of regression results in Table 2. For example, the model estimation results in Table 2 indicate that advertising/sales and R&D/sales have coefficients that are negative and significant at $p < 0.01$. However, in the bivariate correlation matrix in Table 1, the correlation between R&D/sales and β is positive and significant at $p < 0.01$ and the correlation between advertising/sales and β is negative, but is only significant at $p < 0.10$. This "disconnect" is occurring because the bivariate correlation matrix does not account for the fixed effects, serial correlation or window dummies in our model structure. To explore this issue further, we created an "adjusted" bivariate correlation matrix, wherein we remove the effects of fixed effects, serial correlation and window dummies from the predictor variables by regressing fixed effects, serial correlation and window dummies on each of the predictor variables and systematic risk. We used the residuals from each of these regressions to create an adjusted correlation matrix (this and all other results not reported in the paper are available, on request, from the authors). The pattern of correlations in the adjusted correlation matrix corresponds closely to the regression results in Table 2.[6] Thus, multicollinearity does not appear to be driving the results of the model estimation (discussed below).

RESULTS

Model Estimation Procedure

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[6] We also performed stepwise regression analyses, adding one predictor variable at a time to the model, and found consistent results for the effects of lagged advertising and lagged R&D (the directionality, significance and the sizes of the coefficients) across these stepwise regressions showing that there are no harmful effects of multicollinearity.

As the panel data set of moving windows consists of repeated observations of firms, we estimated a fixed effects, cross-sectional, time series regression, model with a correction for serial correlation of errors (Baltagi and Wu 1999; Bhargava et al. 1982; Woolridge 2002). Specifically, the model has the following structure:

$Y_{it} = \alpha + X_{it}\beta + \nu_i + \varepsilon_{it}$ $i = 1,\ldots, N$; $t = 1,\ldots, T_i$ and where

$\varepsilon_{it} = \rho\varepsilon_{i,t-1} + \eta_{it}$ in addition, where $|\rho| < 1$ and η_{it} is independent and identically distributed (i.i.d) with mean 0 and variance $\sigma^2{}_\eta$ and ν_i are assumed to be fixed parameters that may be correlated with the covariates X_{it}. These X_{it} includes the accounting variables of growth, leverage, liquidity, asset size, earnings variability, dividend payout, age, competitive intensity and advertising and R&D. The failure to correct for serial correlation of errors, if present, can result in inflated standard errors of parameter estimates and incorrect tests of hypotheses. See Bhargava, Franzini, and Narendranathan (1982) for the detailed statistics of the fixed effects panel data model with correction for first order serial correlation of errors. [7]

We estimate the model using the *xtregar* procedure in STATA 9.0. In addition to the predictor variables of lagged advertising/sales and lagged R&D/sales, we also include the BKS control variables and the two additional control variables of age and competitive intensity discussed earlier. As discussed earlier, we used lagged measures of advertising/sales and R&D/sales. Because this structure precludes a potential reverse causality explanation, we can explore a causal relationship between advertising/sales, and systematic risk and R&D/sales and

[7] The most frequently analyzed process in the empirical econometrics literature is the first order autoregression or AR(1) process where the errors across time *t* and *t-1* are correlated. Higher order processes involving several periods are both intractable and place a high burden on the researchers to justify more complex time series processes. Thus, as noted by Greene (2003; p. 257), "the first-order autoregression has withstood the test of time and experimentation as a reasonable model for underlying processes that probably, in truth, are impenetrably complex."

systematic risk (Boulding and Staelin 1995). We include dummies for each moving window to account for any differences across windows.

We first checked for first order serial correlation in errors proposed by Woolridge (2002). This test rejected the hypothesis that there is no first order serial correlation ($p < 0.01$) supporting the inclusion of an auto-regressive (AR)(1) disturbance term. We report the results of the estimation of the proposed model in Column 1 of Table 2.

---- Insert Table 2 here ----

The proposed model is statistically significant ($F (671, 2527) = 17.90$, $p < 0.01$) and the R-square (within) for the proposed model is 0.161. The rejection of the hypothesis of null fixed effects (F-value significant at $p < 0.01$) reinforces the need for fixed effects correction. The estimated autocorrelation coefficient, ρ is large at 0.668 and the Durbin-Watson statistic (Baltagi and Wu 1999) is non-significant ($t = 1.200$, ns) reconfirming the need to adjust for serial correlation in errors.

We first compare the coefficients of the accounting variables in this study with the results obtained by BKS. We note that BKS reported significant effects for dividend payout ($b = -0.58$, $p < 0.01$), growth ($b = 0.84$, $p < 0.05$) and earnings variability ($b = 3.03$, $p < 0.01$). In the results we obtained, significant coefficients indicated that growth ($b = 0.359$, $p < 0.01$) and leverage ($b = 0.515$, $p < 0.01$) are positively associated with a firm's systematic risk, while asset size ($b= -0.091$, $p < 0.01$) is negatively associated with systematic risk. Given the changes in stock market regimes over time, and the refinements in the estimation procedure we use in this paper (i.e. we use a panel data model, with incorporation of fixed effects and serial correlation in errors), the differences in this study's coefficients relative to those reported by BKS are not surprising.[8] We infer that differences between the this paper's findings, that of the BKS paper's and of the BKS model approach using the 1980-1999 data reported in footnote 7 arise, because, of 1) differences in stock market regimes across the years arising from changes in the range of predictor variables, and 2) differences in econometric estimation procedure across our study and the BKS study—we incorporate information on the panel data structure in the estimation, while the BKS study did not.

With respect to the other control variables, the firm's age (b = -0.022, p < 0.01) and competitive intensity (b = -0.885, p < 0.01) are significantly associated with lower systematic risk. The accounting variables of liquidity (b = 0.001, ns), earnings variability (b = -0.018, ns) and dividend payout (b = 0.000, ns) are not related to systematic risk.

We next discuss the two hypothesized effects. The results indicate that, as expected in H1 and H2 respectively, higher lagged advertising/sales (b = -3.187, p < 0.01) and higher lagged

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[8] We also estimated the model estimated by BKS for the twenty years in this study by constructing two data sets: one for period 1980-1989 and another data set for the period 1990-1999 by averaging the various accounting variables for the ten years following the procedure in the BKS paper.

The results of the ordinary least squares regression for the model with accounting variables was significant in both ten year periods: period 1: $F(6, 338)=22.501$, $p < 0.01$; period 2: $F(6, 231)=17.742$, $p < 0.01$; with the following R-squares: period 1: R-sq: 0.285; period 2: R-sq: 0.315). The following accounting variables were significant: period 1: growth (+ and $p < 0.01$), leverage (+ and $p < 0.05$), earnings variability (+ and $p < 0.01$) and asset size (- and $p < 0.01$); period 2: growth (+ and $p < 0.10$), leverage (+ and $p < 0.05$), earnings variability (+ and $p < 0.01$) and asset size (- and $p < 0.01$).

From the above we can see the impact of methodology. BKS, with their data and methodology, found growth, earnings variability, and dividend payout significantly associated with beta but asset size and leverage were not associated with beta. Considering the question of why BKS didn't identify asset size and leverage as predictors of beta, recall that BKS eliminated leverage and asset size in a stepwise regression of data averaged over ten years. We conjecture that panel-structure-adjusted correlations may have shown that leverage and asset size were then (as they are now) good predictors of systematic risk. The raw correlation structure in our panel data is consistent with this conjecture. Correlations of liquidity, in the panel data set, with both asset size ($\rho = .34$) and leverage ($\rho = -.37$) are high. In summary, we suggest that the difference between our results and BKS's results are, in large part, driven by an up-to-date econometric estimation approach in this paper. After correcting for methodology, the remaining differences in our findings might be due to change in the marketplace—or they might be due to the fact that BKS's use of stepwise regression artificially eliminated leverage and asset size that our proposed model (with its panel structure) identifies as important predictors of beta.

R&D/sales (b = -0.501, $p < 0.01$) lower the firm's systematic risk. Following the suggestion of an anonymous reviewer, we re-estimated the proposed model including the square of lagged advertising/sales and the square of lagged R&D/sales to explore non-linear effects. The results were similar to those reported in Column 1 of Table 2 with no significant effect for the squared terms. We discuss this finding in detail in the discussion section. We also re-estimated the model using the interaction effect of lagged advertising and lagged R&D, but find no support for this interaction effect.

Thus, the estimation results strongly support H1 and H2 indicating that, after controlling for factors that accounting researchers have shown, in past research, to affect the firm's systematic risk, increases in both advertising/sales and R&D/sales lower a firm's systematic risk. We next report the results of additional analyses that examine the robustness of the results.

Additional Analyses

Explanatory Power of Proposed Model. We compared the performance of the proposed model, which includes lagged advertising/sales and lagged R&D/sales with a baseline model that only includes the accounting measures of growth, leverage, liquidity, asset size, dividend payout, and earnings variability, and the two additional control variables of age and competitive intensity (results not reported here). The model with lagged advertising/sales and lagged R&D/sales outperforms the baseline model based on the Schwarz Bayesian Information Criterion (SBC) (lower number indicates superior fit): SBC (proposed model) = 3705.873 versus SBC (baseline model) = 3741.607. The direction and significance level of the coefficients of the BKS variables in this baseline model without lagged advertising/sales and lagged R&D/sales are unchanged again confirming that there is no evidence of multicollinearity of lagged advertising/sales and lagged R&D/sales with the control variables.

Alternative Estimates of Systematic Risk. The proposed model reported in Column 1 of Table 2 uses equal-weighted market returns to estimate the firm's systematic risk, β. To examine the robustness of the proposed model's results to alternative specifications for systematic risk, we also estimated beta for the five-year moving window using the value-weighted market return and obtain generally consistent results for the effects of advertising/sales and R&D/sales on the firm's systematic risk with value-weighted beta estimates (Column 2 of Table 2).

To examine the robustness of the negative effects of advertising/sales and R&D/sales on beta, we expanded the data to include firms for which only 50 of the 60 months of stock returns in a moving window were available for estimating beta. Columns 3 and 4 of Table 2 contain the results of model estimation using equal-weighted and value-weighted measures of market return in the estimation of beta for the expanded sample that includes observations with 50 or more months of stock returns for the 60-month moving window. The effects of advertising/sales and R&D/sales on systematic risk using the larger data set of firms with as few as 50 months of stock returns are similar to those obtained using the smaller data set which includes firms for which all 60 months of stock returns are available to estimate beta.

Changes Regression. Following the suggestion of an anonymous reviewer, we explored the robustness of the results using a changes regression (Boulding and Staelin 1995). We first created the difference value for a variable, as the difference between the variable at time t and at time t-1. The correlation matrix of the differenced variables suggested potential multicollinearity problems, especially between "change in advertising scaled by sales" and "change in R&D scaled to sales" which is, perhaps, not surprising as increases in R&D are likely to be associated with increases in advertising. To reduce the impact of this multicollinearity, we orthogonalized predictor variables using factor analysis. Varimax rotation ensured that each factor had one and only one predictor variable loading heavily on that factor (variables' loadings on their respective factors exceeded 0.98). We report the results of the changes regression models using difference scores for beta estimated 60 months of equal returns with both raw and factor score predictor variables in Column 5-6 of Table 2. The results of this estimation indicate that a reasonable model fit and that increases in a firm's lagged advertising/sales and increases in lagged R&D/sales reduce the firm's systematic risk, again supporting the H1 and H2.[9]

Reverse Causality. As we have noted, the model we estimated considered the impact of the firm's advertising/sales in period t-1 and R&D/sales in period t-1 on systematic risk, β in period t to rule out reverse causation. However, it is possible that either because of inertia (i.e., advertising budgets and R&D budgets are set as a percentage of sales) or because managers are forward looking, advertising and R&D budgets in period t-1 may be related to period t's firm characteristics, particularly, systematic risk.

To rule out reverse causality, we performed the Granger-Causality Wald Tests (Dekimpe and Hanssens 2000; Granger 1969). Specifically, we performed Granger-causality Wald tests for each time series in the data set using a bivariate approach (Leeflang and Wittink 1992) between 1) the firm's systematic risk and its advertising/sales and 2) the firm's systematic risk and its R&D/sales. The results of the Wald tests indicated that a firm's systematic risk did not "Granger cause" either advertising or R&D, empirically ruling out the reverse causality explanation.

In addition, we performed two regressions to rule out potential reverse causality explanations. First, we regressed advertising/sales in time period t as a function of all predictor variables in the proposed model *and* beta in time period t-1. Second, we regressed R&D/sales in time period t, as a function of all predictor variables in the proposed model *and* beta in time

[9] We obtain generally similar results for the models using beta computed using value-weighted market return.

period t-1. Both models included fixed effects, an auto correlation error term and window dummies. The results of the regressions (not reported here) indicated that, consistent with the lack of reverse causality established above, beta in time period t-1 does not affect either advertising/sales or R&D/sales in time period t.

Potential Endogeneity of Advertising and R&D. Following the explanation that a firm's managers may be forward looking, we also seek to rule out potential endogeneity explanations of the firm's advertising/sales and R&D/sales. First, we note that our fixed-effects formulation already rules out endogeneity that might be caused by omitted variables. Second, following Boulding and Staelin (1995), we check for endogeneity of lagged advertising/sales and lagged R&D/sales using an instrumental variable estimation procedure.

We use the firm's advertising/sales and R&D/sales in time period t-2 as the instrument for the firm's advertising/sales and R&D/sales in time period t-1 and re-estimate the model relating a firm's 2-period-lagged advertising/sales and R&D/sales to its systematic risk. The results of this instrumental variable estimation procedure (not reported here) are consistent with those obtained with the one-period-lagged predictor variables of advertising/sales and R&D/sales reported for the proposed model in Column 1 of Table 2. Following the instrumental variable estimation, we also performed the Davidson-MacKinnon test (Woolridge 2002; pp. 118-122) of endogeneity for lagged advertising and lagged R&D and find no support for endogeneity of either advertising or R&D.

Alternative Measures of Advertising and R&D. In the results discussed thus far, we scaled both the firm's advertising and R&D expenditures by its sales. Following the suggestion of an anonymous reviewer, we re-estimated the model with measures of the firm's advertising and R&D scaled by its assets. The results (not reported here) using a model identical to the model reported in Column 1 of Table 2 with advertising/sales and R&D/sales replaced by the advertising/assets and R&D/assets respectively indicate a reasonable model fit (F significant at $p < 0.01$). The directionality of the parameter estimates of the predictor variables are consistent with those reported in Column 1 of Table 2 although the significance level changes to $p < 0.05$; advertising/assets ($b = -0.737$, $p < 0.05$) and R&D/assets ($b = -1.024$, $p < 0.05$) lower the firm's systematic risk.

Alternative Measure of Earnings Variability. In addition, following the suggestion of an anonymous reviewer, we re-estimated the model using cash flow variability as a control variable instead of earnings variability used by BKS. Once again, the results (not reported here) indicated a reasonable model fit (F significant at $p < 0.01$) with consistent results for the effects of both advertising/sales ($b = -3.509$, $p < 0.01$) and R&D/sales ($b = -0.443$, $p < 0.05$) on systematic risk.

Thus, the results are robust to alternative model specifications including the regression of differenced variables, alternative measures of systematic risk including, equal weighted or value weighted market returns, 60 months' or 50 months' of returns, alternative measures of advertising and R&D scaled by firm's sales or assets and to earnings variability or cash flow variability. We also empirically rule out reverse causality (that systematic risk is lowering advertising and R&D) and endogeneity of both advertising and R&D expenditures. In sum, these additional analyses strengthen our confidence in this paper's key findings i.e. that both lagged advertising/sales and lagged R&D/sales lower a firm's systematic risk.

DISCUSSION

The accountability of marketing initiatives, especially as measured by metrics of interest to a firm's shareholders, is under increasing scrutiny from senior management and finance executives who control marketing budgets. Not surprisingly, marketing scholars have turned their attention to relationships between various aspects of a firm's marketing strategy and shareholder value producing a wealth of insights that indicate an important role for marketing in shareholder wealth creation. However, there are few insights relating a firm's marketing initiatives to its systematic risk, an important metric of risk for publicly listed firms. In this paper, we examine the impact of a firm's advertising and R&D, two important manifestations of a firm's marketing strategy on its systematic risk. We conclude with a discussion of the paper's findings, theoretical contributions, managerial implications, limitations, and opportunities for further research.

Theoretical Implications

To our knowledge, this is the first empirical study covering a broad multi-industry sample of firms over a 22-year period to demonstrate that, after controlling for those accounting and finance factors related to systematic risk, increases in advertising/sales and R&D/sales lower a firm's systematic risk. The negative relationship between a firm's advertising expenditure and its systematic risk (shown by Singh et al. (2005) in a limited empirical context, and by Madden et al. (2006) without controlling for accounting and finance factors and firms specific effects) holds up for all firms across a long time that extends from 1979 to 2001. By focusing on the firm's systematic risk, an important metric of considerable interest to senior executives of publicly listed firms, we address the several calls for marketing scholars and practitioners to speak in the language of finance (Rust et al. 2004; Srivastava et al. 1998).

The finding of a non-significant effect of the quadratic term for a firm's advertising/sales and R&D/sales on its systematic risk is interesting and merits discussion. We offer two possible explanations for this phenomenon. First, perhaps there are diminishing returns to increased advertising/sales (and R&D/sales) for some range of advertising/sales (and R&D/sales) values, but that advertising/sales (and R&D/sales) values have been constrained well below that optimum, in a range for which that relationship is linear. Such a situation may occur, if firms were wise enough to set advertising/sales (and R&D/sales) for optimal financial returns, and if that optimal financial return level were lower than that required to deliver the lowest beta. Alternatively, the linear effect of advertising/sales may be occurring because a firm's senior management and finance executives, lacking tools to evaluate the potential impact, were setting its advertising/sales below levels that would yield the lowest systematic risk. A second possible explanation for our inability to detect a quadratic effect when, in fact, there are diminishing returns to increases in advertising/sales, is heterogeneity across firms, industries and/or time in the relationship between advertising/sales and beta. Like finance and accounting researchers before us, in the interest of generality, we estimate our model with the broadest possible cross-section of firms and industries and for an extended period, which builds confidence in the study's findings. Future research, which explores firm, industry and/or time specific effects moderating the effects of advertising on its systematic risk may uncover firms or industries or periods for which such diminishing returns may be identifiable.

Second, in a departure from most past studies on systematic risk, β, which have used a silo-based approach (i.e., using only accounting and financial measures), we include accounting, financial and marketing variables (in this case, advertising and R&D) in our model of systematic risk. The negative impact of advertising/sales and R&D/sales on systematic risk in our model that also includes financial variables suggests potential interchangeability between the firm's marketing and financial choice variables in managing its systematic risk. Future research that examines other such interchangeable effects of other aspects of firms' marketing and financial strategies on metrics of interest to capital markets (e.g. cost of capital, intangible value, stock returns) would be valuable to senior marketing executives, under pressure from their senior management teams to justify investments in their advertising and R&D programs.

Third, this study's finding that a firm's advertising/sales and R&D/sales lowers its systematic risk combined with results from other studies (Mizik and Jacobson 2003; Madden et al. 2006) showing that a firm's advertising increases its stock return leads to an interesting conjecture. Consistent with advertising and R&D increasing a firm's stock returns, a post hoc analysis indicated that lagged advertising/sales and lagged R&D/sales were highly correlated with the firm's intangible value (ρ(advertising/sales, Tobin's Q)= 0.013, $p < 0.01$) and ρ (R&D/sales, Tobin's Q) = 0.283, $p < 0.01$). Specifically, we conjecture that advertising's and R&D's risk-lowering and return-enhancing effects may, perhaps contribute to the anomaly identified by Fama and French (1992). Though the CAPM assumes that firms with higher systematic risk can expect higher future returns, Fama and French (1992) found that there was no relationship between a firm's risk in one period and its return in the future. If it is the case that those firms who invest in advertising and R&D have been able to raise their returns while lowering their risk, then one might expect no empirical evidence of the "high risk leads to high return" link. Such an effect would be consistent with the finding in the finance literature that investors prefer highly advertised firms (Grullon et al. 2004) and the finding in the marketing literature that advertising has a direct impact on stock price over-and-above its indirect effect through increased sales (Joshi and Hanssens 2004). Future empirical research that explores this issue further would be valuable, contributing importantly to both the marketing and finance literatures.

Managerial Implications

The study's findings also generate useful implications for managerial practice. Given the increasing calls for accountability of marketing initiatives, this paper's findings that a firm's higher advertising/sales and R&D/sales lower its systematic risk are novel and useful. Marketing executives can use these findings to stress the multi-faceted role of strong advertising and R&D programs, over and above their effects on market (e.g., sales, market shares) and financial (e.g. return on assets, cash flow) performance outcomes.

Second, given the dual benefits of advertising and R&D for firm value both, through its effects on stock returns (Mizik and Jacobson 2003) and systematic risk, firms must be cautious in cutting back on their advertising and R&D programs. A reduction in a firm's advertising or R&D can have a double whammy, negative effect not only reducing its financial performance, attendant cash flows stock returns, but also increasing its systematic risk, cost of capital and discount rate.

Third, we think the study's findings may surprise senior management and finance executives, some of whom may view their firm's advertising programs and perhaps, even R&D programs as discretionary activities. Indeed, marketing executives can raise, we think, potentially provocative questions about whether extant allocation norms for advertising and R&D (e.g., as a fixed percentage of sales) still apply. Could marketing executives, rightfully we submit, argue that some proportion of the firm's advertising and R&D budgets, be considered a financial expenditure aimed at lowering its interest burden?

While we are mindful about this paper's limited influence in changing established finance managers' mindsets about the uncertain returns to their firms' advertising and R&D investments, we hope that this paper serves as an impetus for an ongoing dialog among senior management, finance and marketing executives on the important 'financial' role of their firms' advertising and R&D expenditures (Rust et al. 2004).

Indeed, the study's specific findings can guide marketing executives to initiate a dialogue with their finance counterparts. For example, what are their firm's historical levels of advertising/sales, R&D/sales, and systematic risk, both independently and compared to those of other firms in the industry? What are the implications of advertising and R&D budgets going forward, not only on the firm's marketing objectives (e.g., sales, and market share) and financial objectives, (e.g., cash flows, return on assets) but also on its systematic risk? We anticipate that the answers to these and related questions could guide the development of benchmarks to assess the returns to advertising and R&D programs. Such ongoing dialogues may be very instructive to senior management and finance executives, who control advertising and R&D budgets, but are very skeptical about the financial accountability of returns to these investments.

Limitations and Future Research

Given data availability constraints for publicly listed firms, in this study, we focused on the relationship between a firm's systematic risk and advertising and R&D, two important indicators of the firm's emphasis on differentiation, and therefore of its marketing strategy. Theoretical research using complementary methods (e.g., in-depth interviews, surveys, field studies) to develop a conceptual model and propositional inventories relating other elements of marketing strategy (e.g., marketing channels) to systematic risk will be useful in setting a research agenda for further empirical research.

Further, we measured the firm's advertising and R&D using their aggregated, annual dollar amounts scaled by the firm's sales. While, advertising and R&D expenditures are important, especially from the perspective of senior management and finance executives, they represent consolidated, input measures, which do not account for differences in implementation of advertising (e.g. creativity of advertising campaigns, efficiency of media planning etc.) and new product development programs (e.g. intellectual property rights, new product success rates, entry timing etc.). Disaggregated measures of a firm's advertising and R&D programs for all publicly listed firms are not available. Future research focused on a few industry contexts, and using disaggregated measures of the various elements of advertising programs, and its new product development programs, including aspects of the programs' effectiveness, will represent an useful extension to generate actionable managerial implications on the effects of various elements of a firm's advertising and new product development program on it systematic risk.

In sum, we view this study as an important first step in establishing that advertising and R&D lower systematic risk of the firm's stock. We hope that the study's findings stimulate further work in this area.

APPENDIX
PROPOSED MODEL PREDICTOR VARIABLE DEFINITIONS AND MEASURES

We define the measures for the various predictor variables in the following way for each firm *i* for each of the 19 five-year moving window. Note that all the variables have a subscript *i* for each firm.

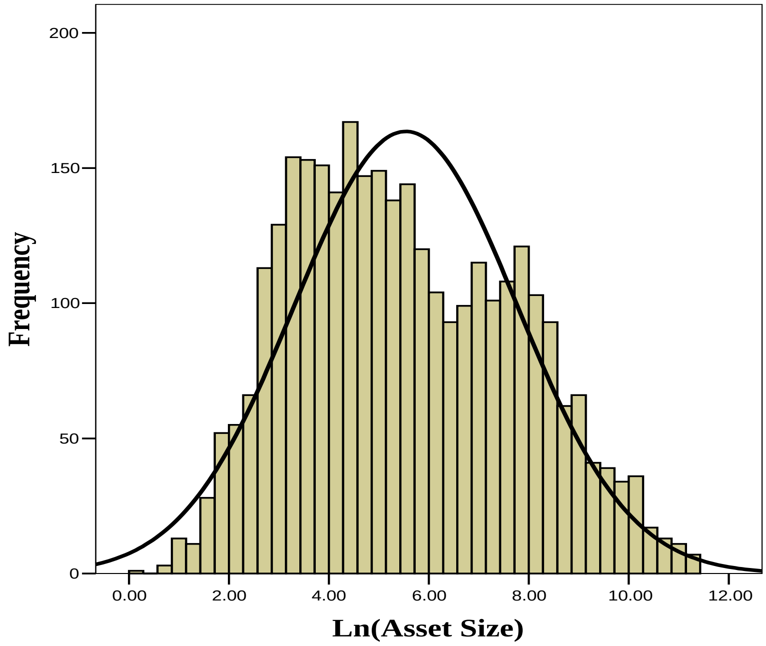
Variable	Definition	Measure
Advertising/Sales	The 5-year moving average of advertising/sales.	$(1/5) \times \sum_{t=1}^{5} \frac{Data45}{Data12}$
Research and Development/Sales	The 5-year moving average of Research and Developments/sales	$(1/5) \times \sum_{t=1}^{5} \frac{Data46}{Data12}$
Dividend Payout	5-year moving average of Cash Dividends /Earnings	$DP_{i5} = (1/5) \times \frac{\sum_{t=1}^{5} CashDividend_t}{\sum_{t=1}^{5} AvailIncome_t}$
Growth	5-year moving average of Terminal Total Assets/ Initial Assets	$G_{i5} = \ln\left[\frac{TotalAsset_5}{TotalAsset_1}\right] / 5$
Leverage	5-year moving average of Total Senior Securities (Preferred Stocks and Bonds)/Total Assets	$LEV_{i5} = \sum_{t=1}^{5} \frac{TotalSecurity_t}{TotalAsset_t} / 5$
Liquidity	5-year moving average of Current ratio	$LiQ_{i5} = \sum_{t=1}^{5} \frac{CurrentAsset_t}{CurrentLiability_t} / 5$
Asset Size	5-year moving average of Total Assets	$AS_{i5} = \sum_{t=1}^{5} \ln(TotalAsset_t) / 5$
Variability of Earnings	5-year moving average of Standard Deviation of Earnings-Price Ratio ($\frac{E_t}{P_{t-1}}$) where P_t, and E_t are the market value of common stocks and earnings at time t respectively and where $\frac{\overline{E}}{\overline{P}}$ is the average, for the moving window, of the Earnings-Price Ratio.	$VE_{i5} = (\sum_{t=1}^{5} (\frac{E_t}{P_t} - E(\frac{E_t}{P_t}))^2 / 4)^{\frac{1}{2}}$ $VE_{i5} = (\sum_{t=2}^{5} (\frac{E_t}{P_{t-1}} - E(\frac{\overline{E}}{\overline{P}}))^2 / 4)^{\frac{1}{2}}$

Firm Age	Number of years since the stock's first listing on the stock market	-
Competitive Intensity	The four-firm Herfindahl's concentration index	Proportion of market share of the top four firms in the industry defined by two digits of the standard industrial classification (SIC) code.

COMPUSTAT DATA ITEMS USED IN CONSTRUCTING VARIABLES

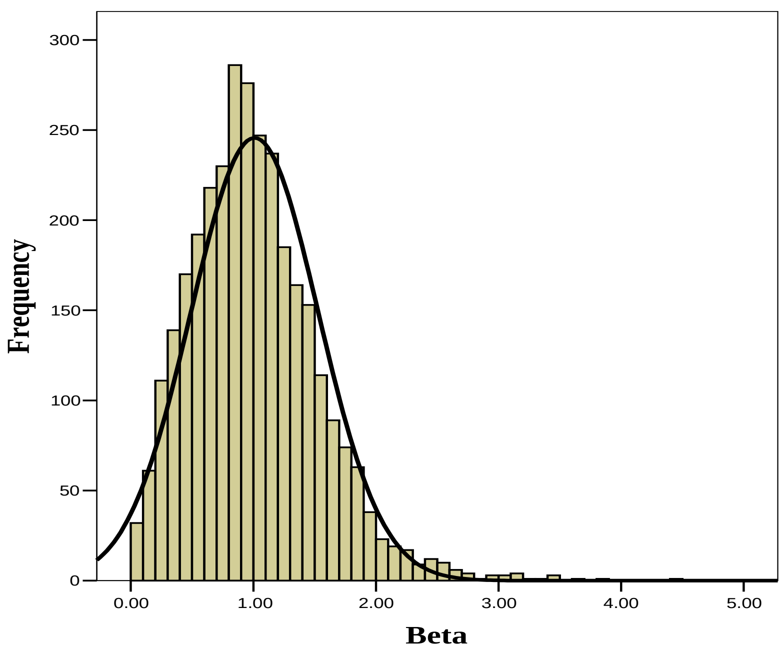
Name of Variable Component	COMPUSTAT Annual Data Items
Advertising/Sales	DATA45/DATA12
Research and Development (R&D)/Sales	DATA46/DATA12
Total Assets	DATA6
Income Available for Common Stockholders	DATA20
Market Value of Common Stock (P_t)	DATA24× DATA25×1000
Total Senior Securities (*TotalSecurity*)	DATA5+DATA9+DATA10
Current Asset (*CurrentAsset*)	DATA4
Current Liabilities (*CurrentLiability*)	DATA5
Cash Dividends (*CashDividend*)	DATA21
Herfindahl's concentration index	DATA12

FIGURE 1A
Frequency Distribution of Firm Size



Mean (standard deviation) = 5.167 (2.221)

FIGURE 1A
Frequency Distribution of Systematic Risk (Beta)



Mean (standard deviation) = 1.042 (0.527)

TABLE 1

Descriptive Statistics and Bivariate Correlation Matrix for Variables in Proposed Model

Variable	Mean (standard deviation)	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Systematic risk	1.042 (0.527)	1.000									
2. Lagged advertising/sales	0.040 (0.053)	-0.051	1.000								
3. Lagged R&D/sales	0.068 (0.120)	0.228	0.155	1.000							
4. Growth	0.081 (0.112)	0.147	-0.019	0.002	1.000						
5. Leverage	0.410 (0.237)	0.058	0.068	-0.036	-0.121	1.000					
6. Liquidity	3.153 (2.989)	0.104	0.083	0.380	0.056	-0.369	1.000				
7. Asset size	5.167 (2.221)	-0.389	0.046	-0.164	-0.009	0.105	0.340	1.000			
8. Earnings variability	0.077 (0.159)	0.220	0.005	0.054	-0.250	0.181	-0.052	-0.174	1.000		
9. Dividend payout	0.388 (0.853)	-0.024	-0.004	0.003	-0.025	0.002	-0.012	0.028		1.000	
10. Age	19.152 (0.112)	-0.392	0.079	-0.189	-0.154	0.107	-0.243	-0.105	-0.128	0.022	1.000
11. Competitive intensity	0.399 (0.112)	0.065	-0.182	-0.076	-0.047	0.009	-0.016	0.629	0.060	-0.004	-0.071

*** all correlations above 0.220 significant at $p < 0.01$, correlations above 0.11 significant at $p < 0.05$, and correlations above 0.023 significant at $p < 0.10$.

TABLE 2
Advertising, R&D and Systematic Risk: Estimation Results

Variable	(Column 1)	(Column 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)
Minimum number of returns observations for estimating beta	60	60	50	50	60	60
Market return used in estimating beta	Equal-weighted	Value-weighted	Equal Weighted	Value-weighted	Equal-weighted	Equal-weighted
Model Specification	Levels of variables	Levels of variables	Levels of variables	Levels of variables	Changes in variables	Changes in variables^
Intercept	-0.542 (0.037)***	-0.221 (0.039)***	-0.598 (0.038)***	-0.278 (0.041)***	-0.034 (0.045)	0.025 (0.014)*
Lagged Advertising/sales	-3.187 (0.754)***	- 2.282 (0.785)***	-3.419 (0.705)***	-1.845 (0.732)***	-2.608 (0.584)***	-0.022 (0.004)***
Lagged R&D/sales	-0.501 (0.180)***	-0.989 (0.190)***	-0.467 (0.175)***	-1.000 (0.183)***	-0.202 (0.118)*	-0.009 (0.004)**
Growth	0.359 (0.084)***	0.403 (0.089)**	0.339 (0.081)***	0.379 (0.085)**	0.443 (0.073)***	0.026 (0.004)***
Leverage	0.515 (0.124)***	0.006 (0.129)	0.474 (0.115)***	-0.065 (0.119)	0.459 (0.090)***	0.021 (0.004)***
Liquidity	0.001 (0.010)	0.002 (0.011)	0.001 (0.010)	0.001 (0.010)	0.005 (0.007)	0.001 (0.004)
Asset size	-0.091 (0.032)***	-0.093 (0.033)***	-0.107 (0.031)***	-0.092 (0.032)***	-0.014 (0.031)	-0.001 (0.004)
Earnings variability	-0.018 (0.032)	-0.059 (0.034)*	-0.081 (0.028)	-0.018 (0.029)	-0.036 (0.032)	-0.004 (0.004)
Dividend payout	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.001 (0.004)
Age	-0.022 (0.006)***	0.021 (0.007)**	-0.021 (0.006)***	-0.023 (0.007)***	-	-
Competitive intensity	-0.885 (0.335)***	-0.598 (0.346)*	-0.830 (0.327)***	-0.065 (0.338)*	-0.530 (0.331)	-0.008 (0.005)
Serial correlation (ρ)	0.668	0.656	0.654	0.643	-	-
R-sq	0.161	0.106	0.155	0.102	0.052	0.052
Number of firms (observations)	644 (3198)	644 (3198)	711 (3457)	711 (3457)	644 (3198)	644 (3198)
F (degrees of freedom)	17.901 (671, 2527)	11.051 (671, 2527)	18.472 (738, 2719)	11.421 (738, 2719)	6.910 (25, 3172)	6.910 (25, 3172)

[#] Coefficient (standard errors) in the columns. *** denotes $p < 0.01$, ** $p < 0.05$ and * $p < 0.10$. The models also include window dummies, some of which are significant at $p < 0.01$. ^ factor scored predictor variables used for this model.

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