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STOCK MARKET'S INFLUENCE ON MARKETING AND R&D BUDGETS: IMPLICATIONS FOR SHORT TERM AND LONG TERM FIRM PERFORMANCE

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ABSTRACT

Marketing and R&D investments create intangible assets whose financial value is appropriated over time in the form of accelerated cash flows and persistent revenue streams. In theory, managers are expected to be rational. Therefore, managers should determine marketing and R&D budgets keeping an organization's long term competitive advantage in consideration. My thesis is inspired by marketing and R&D budget allocation behavior that seems to deviate from theoretical rational expectations models in the following manner. Public firms have to convince investors of their potential for generating shareholder value in the form of earnings growth at short term intervals of a fiscal quarter or year. Consequently, in order to show earnings growth at short term intervals, managers may reduce spending on marketing and R&D activities or re-shuffle budgets between marketing and R&D activities in a manner that inflates short term earnings. Managers are able to justify such budgetary changes because the metrics for capturing the immediate and long term penalties for such changes are not clear. In the context of high technology industries, my first dissertation essay provides theoretical predictions and empirical evidence that historic stock price behavior influences firms to shift budget allocation emphasis from R&D to marketing activities such as sales promotions. In the process, even though organizations inflate yearend earnings, they incur opportunity costs in the form of foregone profits. In the context of manufacturing firms, my second dissertation essay provides theoretical predictions and empirical evidence that organizations make unscheduled cuts in marketing and R&D budgets in order to meet or beat analyst earnings forecasts towards the end of a fiscal year. Even though there are no immediate penalties, such budgetary reductions gradually increase stock return volatility over time and weaken organizational defense against stock market downturns.

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CHAPTER 1

INTRODUCTION

In April 2009, Intel's board of directors endorsed the following statement: "Our performance is tied to stock market performance more tightly than ever before. Our strategies are intended to focus employees at this critical inflection point on creating sustained increases in our stock price" (Intel Proxy Statement 2009). Such a statement reflects the extent of pressure on public firms to improve shareholder returns. As a result of these pressures, managers often pacify investor sentiments by making corporate investments designed to maximize near term earnings irrespective of the long term effects of such investments (Brandenburger and Polak 1996; Kaplan 1994; Laverty 1996; Mizik 2009). For example, in spite of the difficulties of merging with a firm of Wyeth's size, stagnating stock prices made Pfizer's board approve a merger with Wyeth in July 2009 (Karnitschnig and Rubenstein 2009). The merger came at the cost of internal R&D, but temporarily reduced research costs and appeased rising shareholder concerns of Pfizer's anticipated revenue gap due to upcoming patent expirations in 2010 and 2011. Consider another example. McKay and Terhune (2005) report that sagging stock prices tempted Coca Cola between 1997 and 1999 to offer downstream bottlers extended promotional and credit terms so as to induce them to purchase in excess of actual demand. Such inducements led to excess inventory at the bottlers, but Coca Cola reported 'higher' sales, and investors were appeased.

Managing investor sentiments by focusing on near term earnings has consequences for budgets assigned to discretionary expenditures such as R&D and marketing. Under the standard accrual based accounting methods, expenditures such as R&D (i.e., activities involved in new technology development for new product and process creation) and marketing (i.e., activities related to sales, customer relationships, brands and channel strategies) are not mandated to be reported in

income statements (Wyatt 2008). Thus, R&D and marketing are largely private information. The resulting information asymmetry between investors and firms may provide leeway for R&D and marketing budget modifications without investor scrutiny. In fact, research does provide evidence that R&D and marketing budgets are the first to be changed in response to poor financial performance, for example in a recessionary environment (Axarloglou 2003; Lamey et al. 2007; Picard 2001). Furthermore, although it is mandatory for firms to report accounting measures like earnings, researchers doubt whether investors are able to accurately judge the potential cash flow position of the firm based on earnings reports, thus leading to a "hidden information" problem (Hirschleifer, Hou, and Teoh 2009; Kothari, Laguerre, and Leone 2002), i.e., earnings reports may not reveal private information about internal budget allocations and about the firm's actual strategic prospects.

It is no surprise then that scholars are wary that concerns for near term stock performance could potentially be driving firms to adjust R&D and marketing budgets in a manner that best appeases near term investor sentiments (Hanssens, Rust, and Srivastava 2009). In spite of repeated warnings about the possible short term nature of R&D and marketing budget management practices (Lehmann 2004), there is limited research (e.g., Srinivasan, Rangaswamy and Lilien 2004 in the context of recessions, and Mizik and Jacobson 2007 in the context of seasoned equity offerings) about the different ways in which concerns for near term stock price performance influence managers to set budgets that may not be conducive to sustainable firm performance.

In my dissertation, I investigate how and to what extent historic stock price performance and security analyst forecasts for near term performance influence marketing and R&D budgets. I study two different budgetary strategies for improving near term stock price performance. The first budgetary strategy is the tradeoff between how much to allocate to R&D versus marketing activities. Also, referred to as strategic emphasis, organizations might divert financial resources from R&D projects to marketing activities such as sales promotions that yield relatively quicker financial payoffs

in the near term. The second budgetary strategy is to cut marketing and R&D budgets simultaneously. The reductions in marketing and R&D budgets are recorded as reductions in expenses in the balance sheet rather than as reduction in investments. Thus, immediate budgetary adjustments in marketing and R&D usually go unnoticed by investors, who are not able to grasp the possible adverse consequences of such budgetary management till after these adverse consequences are realized over time in the form of lower cash flows and loss of revenue streams. I show that marketing and R&D budget management for the goal of investor appeasement can lead to both near term opportunity costs in terms of foregone profits, and long term penalties in terms of increased idiosyncratic risk (i.e., increased stock returns volatility) and increased downside systematic risk (i.e., stock prices become sensitive to downward movements of the stock market).

My dissertation comprises two essays. Chapter 2 of my dissertation comprises the first essay. In this essay, I look at the context of small and medium sized high technology firms for whom both R&D and marketing are core value drivers of performance. The application of prospect theory suggests that managers may refer to their organization's historic stock price performance while determining budgetary strategies that may influence uncertainties about near term organizational cash flows, and therefore near term stock price performance. Consequently, as historic stock price performance increases, managers become risk averse for the immediate future, which drives them to favor marketing more than R&D in budget allocations because the financial payoffs from marketing investments are less uncertain and quicker than corresponding payoffs from R&D investments. Results from random effects Bayesian models show that at an aggregate level, as firms' historic stock returns increase, they display greater tendency to de-emphasize R&D and emphasize marketing activities such as sales promotions while allocating budgets. Furthermore, as historic stock volatility increases, the extent of de-emphasis on R&D relative to marketing in response to historic stock returns increases. I find that by adjusting budgets based solely on historic stock price performance

rather than on a range of private information, firms forego almost a 7.2% increase in potential yearend earnings.

Chapter 3 of my dissertation comprises the second essay. In this essay, I look at the broad context of manufacturing firms. As investors reward organizations for meeting or beating short term analyst earnings forecasts as well as penalize firms for not being able to do so, firms are pressured to engage in activities that boost short – term earnings. One such activity may be real activity manipulation (REAM) where firms make unscheduled cuts in marketing and R&D expenses in order to meet or beat analyst forecasts. The application of problem solving theory in this context helps to theoretically predict how and under what circumstances firms increase or decrease the extent of REAM in response to analyst forecasts. Results from a multivariate random effect Bayesian model show that top management annual bonuses intensify the extent to which firms engage in REAM in response to analyst forecasts. Furthermore, well performing firms are as likely as poorly performing firms to engage in REAM in response to analyst forecasts. However, organizations that manage high stock of intangible assets and have considerable marketing related experience within the top management team are less likely to engage in REAM than firms with low stock of intangible assets and negligible marketing related experience within the top management team. The results caution managers against REAM by showing that REAM, even if temporary, can persistently increase both idiosyncratic risk and downside systematic risk over four years following the unscheduled budget cuts in marketing and R&D. In other words, REAM gradually increases stock returns volatility and weakens organizational defense against market downturns, thereby leading to a loss in long term shareholder value.

My dissertation contributes to literature at the interface of marketing and finance in the following ways. Whereas the bulk of literature at the interface of marketing and finance focuses on determining the effects of marketing strategy on shareholder value, I investigate the interface of

marketing and finance from a contrarian perspective, i.e., do concerns for shareholder value drive marketing strategy? Scholars investigating the impact of marketing strategies on a firm's financial value mostly assume that the reverse relationship exists, and consequently use statistical techniques such as stock returns response models (e.g., Mizik and Jacobson 2008), and event studies (e.g., Srinivasan and Bharadwaj 2004) to prevent estimation biases due to the assumed endogeneity. In contrast to such a research approach, I show theoretically and empirically that the reverse relationship does exist because marketing and R&D budgetary tradeoffs are sometimes driven by historic stock price performance, and marketing and R&D budget cuts are motivated by analyst earnings forecasts.

The goal of research at the interface of marketing and finance is to try and understand how marketing and innovation related investments create sustainable shareholder value (Srivasatava, Shervani and Fahey 1998). Yet, much of the literature focuses on metrics for assessing short term performance effects of marketing and innovation related investments. Surprisingly, although marketing and innovation related investments are considered to create intangible assets that yield returns over a period of time, literature on the long term impact of marketing and innovation related investments on firm performance is scarce. Ataman, van Heerde, and Mela (2010) show that long term positive effects of advertising, product, and distribution strategies on sales are greater than their short term positive effects. Mizik (2010) uses a time series approach to show that the negative effects of unexpected advertising and R&D cuts on abnormal returns persist for at least four years. Such evidence suggests that temporary cut backs in customer centric activities should eventually lead to loss in customer equity and vulnerability to competition (Vargo and Lusch 2004). I contribute to the investigation of long term performance consequences of marketing and innovation related investments by showing that unscheduled reductions in marketing and R&D can magnify not only cash flow unpredictability as reflected by idiosyncratic risk but also magnify downside systematic risk

that investors cannot hedge against. Therefore, by allowing marketing and innovation related budgets to be influenced by concerns for near term stock performance, firms tend to jeopardize sources of sustainable shareholder value creation.

CHAPTER 2

Influence of Historic Stock Price Performance on Marketing and R&D Budgets: Implications for Short Term Earnings

In this essay, I study *whether* and *how* budgetary tradeoffs between R&D and marketing are driven by organizational historic stock price performance. I also investigate the consequences for a firm's bottom line when historic stock price performance influences budget allocations between R&D and marketing.

Following Mizik and Jacobson (2003), I conceptualize budget allocations between R&D and marketing as strategic emphasis. An increase in strategic emphasis on R&D relative to marketing occurs when the firm changes current R&D and marketing budgets in a manner that favors R&D more than marketing.[1] Similarly, a decrease in strategic emphasis on R&D relative to marketing occurs when changes made to current budgets favor marketing more than R&D. Strategic emphasis serves as a strategic tool to manage near term earnings performance. On one hand, rapidly changing technological environments call for new knowledge creation through R&D investments that are subject to uncertain financial payoffs (e.g., Anand and Khanna 2000). On the other hand, marketing activities yield both near term as well as long term financial payoffs. In terms of near term financial payoffs, activities such as sales force initiatives, promotions, and even advertising make near term financial performance more achievable and financial planning less risky (e.g., Ataman, van Heerde, and Mela 2010) than R&D related activities. Therefore, an increase in strategic emphasis on R&D relative to marketing makes financial planning in the immediate future difficult as risks associated with revenues and cash flows increase. In contrast, a decrease in strategic emphasis on R&D relative to marketing may be used as an investment strategy to appease investors in the near term because the strategy could better prevent shortfalls in near term earnings than an increase in strategic emphasis on R&D relative to marketing.

I use a decision making lens to predict how a firm's historic stock price performance may influence the strategic emphasis decision of managers. Specifically, I utilize prospect theory (Kahneman and Tversky 1979) to propose that a pattern of increasing stock returns may make managers loss averse. The loss aversion makes the downside of risky decisions more salient than the upside, which then escalates uncertainties about maintaining stock returns in the foreseeable future. As a result, managers may favor decisions that minimize uncertainties in near term revenue streams and cash flows, such as decreasing strategic emphasis on R&D relative to marketing, than decisions that escalate uncertainty about near term financial performance, such as increasing strategic emphasis on R&D relative to marketing. For example, after beating the S&P 500 stock index by more than 20% in terms of stock returns in 2007 and 2008, Hewlett Packard reported that its future strategy for sustaining shareholder returns was to decrease emphasis on brand new R&D investments, and focus more on marketing and operations that enhance the productivity of their development portfolio (Business Week, December 18, 2008).[2]

Furthermore, prospect theory also suggests that a pattern of decreasing stock returns induces managerial risk seeking tendencies as losses might be recovered by taking risks, even if such risks increase uncertainty in near term finances. Thus, a pattern of decreasing stock returns might make firms focus more on the upside than the downside of decisions that escalate uncertainties in maintaining stock returns in the foreseeable future (such as increase in strategic emphasis on R&D relative to marketing). For example, reacting to the recession, which saw a 10.8% decrease in Samsung's three year average stock returns (2005-2008), Samsung's CEO mentioned in the annual letter to shareholders that their focus in 2009, was on "creating shareholder value primarily by creative innovation and growing new businesses."

So far, the interface between R&D, marketing, and finance has been based on the premise that marketing and R&D investments create intangible assets whose financial value is appropriated

gradually over time (Srivastava, Shervani, and Fahey 1998). Thus, a literature stream has emerged that studies the impact of R&D and marketing actions on a firm's financial value. Studies in this literature stream assume that R&D and marketing actions can in turn be driven by the firm's financial value, and consequently use statistical techniques such as stock returns response models (e.g., Mizik and Jacobson 2008), and event studies (e.g., Srinivasan and Bharadwaj 2004) to avoid estimation biases due to the assumed inverse relationship between organizational strategy and financial value. In contrast to the existing research approach that focuses on the impact of organizational strategy on financial value, I show theoretically and empirically in the context of high technology firms that the inverse relationship, i.e., the firm's financial value impacts organizational strategy, does exist. In particular, I show that managers make strategic emphasis decisions by incorporating information on their historic stock returns and stock volatility.

An emerging body of literature does consider that a firm's financial condition may drive the manner in which discretionary expenses are managed (e.g., Markovitch, Steckel, and Young (2005) in the context of a firm's stock returns relative to industry, and Deleersnyder et al. (2009) in the context of business cycles). Most of this literature focuses on recessionary conditions (e.g., Lamey et al. 2007; Picard 2001; Srinivasan, Rangaswamy, and Lilien 2004) or on specific events such as seasoned equity offerings (e.g., Mizik and Jacobson 2007). I add to this body of literature by highlighting two factors.

First, a firm's financial condition may drive tradeoffs in budget allocations between multiple functions (in the high technology context of this research, these functions are R&D and marketing); thereby doing away with the existing assumption that budgetary decisions about R&D and marketing are independently influenced by financial conditions. The usage of strategic emphasis as a dependent variable instead of only R&D budgets or only marketing budgets incorporates the fact that all firms face budget constraints, and that budget allocation decisions are essentially tradeoffs

among organizational functions. Second, in contrast to prior literature, which argues that managers use discretionary expenses to improve near term earnings either when firms face excess investor scrutiny (e.g., a seasoned equity offering) or when existing organizational financial performance is poor (e.g., recessionary conditions), this research shows that budgetary adjustments for earnings inflation need not always be a consequence of poor financial performance. Instead even when the levels of historic stock returns are desirable, high technology firms adjust their R&D and marketing budgets in a bid to maintain or increase the returns in the near term. However, such type of budgetary management may lead to opportunity costs in terms of foregone profits.

I organize the rest of the chapter as follows. After defining historic stock price performance and strategic emphasis, I discuss prospect theory and its fit with the research context. Next, I apply prospect theory to suggest hypotheses for the association between historic stock price performance and strategic emphasis. I then describe my data, variable operationalizations and the random effects Bayesian estimation method followed by results. I wrap up the research with a discussion of contributions and managerial implications.

CONCEPTUAL FRAMEWORK

Historic Stock Price Performance

Historic stock price performance refers to two dimensions of stock movements. The first dimension comprises historic stock returns, which is defined as the trend and the magnitude of yearly stock price growth in the past. As historic stock returns increase, the construct not only reflects a trend of more gains than losses but is also reflective of the magnitude of such gains. Similarly as historic stock returns decrease, the construct captures a trend of more losses than gains and also reflects the magnitude of losses. In terms of investor sentiments, several studies suggest that historic stock returns reflect levels of investor optimism about future organizational financial performance (e.g. La Porta et al. 1997; Lakonishok, Shleifer, and Vishny 1994). In addition, investors

mostly do not have private information about a firm. Therefore, they often extrapolate historic stock returns for evaluating the firm's future financial health and for estimating the potential for future stock returns (e.g., Lakonishok et al. 1994). Because changes in levels of historic stock returns also reflect changes in a firm's reported earnings (e.g., Bartov, Givoly and Hayn 2002), security analysts attend to historic stock returns while forming near term stock returns forecasts and recommending trading strategies. Consequently, for managers, historic stock returns can serve as powerful references for understanding how investors expect the firm to perform, especially in the near term (e.g., Gu and Xue 2008). Prior research shows that firms reap stock market rewards in terms of growth in stock prices when they perform as per investor expectations, but investor valuations can fall when investor expectations are not met (e.g., Kasznik and McNichols 2002). As a result, managers are cognizant of historic stock returns while making strategic decisions that shape their organization's near term financial performance.

The second dimension of historic stock price performance is historic stock volatility, which is the degree of variation in a firm's daily stock price over multiple years prior to the current time period. Although historic stock returns and historic stock volatility are two separate characteristics of stock prices, stock prices can show both characteristics simultaneously. For example, although yearly stock returns may increase, the increasing trend may be characterized by either a high degree of intermittent daily stock price variation (i.e., increasing historic stock returns are accompanied by high volatility) or the increases over the years may have been smooth without frequent upward and downward daily variations in stock prices (i.e., increasing historic stock returns are accompanied by low volatility). Historic stock volatility may be unattractive to the average investor (e.g., Baker and Wurgler 2007). When stock prices have been volatile, investors may be wary of the persisting uncertainty about firm revenues and cash flows (e.g., Froot, Scharfstein, and Stein 1993) and may refrain from buying such stocks. The consequent undervaluation of an organization's stock can

activate the market for corporate control, which results in hostile takeover attempts and even changes in top management (Aharony, Jones, and Swary 1980; Miller and Bromiley 1990). Thus, the possible adverse consequences or risks of historic stock volatility lead managers to pay attention to historic stock volatility while making strategic decisions that could potentially increase uncertainties in future revenues and cash flows.

Strategic Emphasis

"The business enterprise has two and only two basic functions: marketing and innovation. Marketing and innovation produce results; all the rest are costs." These famous remarks of Drucker (1954, p. 34) reverberate even today as scholars repeatedly emphasize the importance of both R&D and marketing functions as precursors of a firm's growth and performance (Krasnikov and Jayachandran 2008; Mizik and Jacobson 2003; Srinivasan et al. 2009). However organizational budgets are limited, and although managers[3] realize the importance of R&D and marketing, they are forced to make tradeoffs in budget allocations between the two functions. The tradeoff in budget allocation between R&D and marketing functions is termed as the firm's strategic emphasis (e.g., Mizik and Jacobson 2003). An increase (decrease) in strategic emphasis on R&D relative to marketing implies that relative to R&D, there is a decrease (increase) in strategic emphasis on marketing.

The strategic emphasis decision can influence the uncertainty in a firm's financial payoffs over a near term horizon. In the high technology industry, which is the context for this research, gestation periods for R&D led new product and technology initiatives and low probabilities of successful new product commercialization makes immediate financial payoffs from R&D investments unlikely (Anand and Khanna 2000; Oriani and Sobrero 2008). In contrast, most marketing investments such as sales promotions, advertising, and channel expansion influence consumer perceptions and choices at a pace quicker than R&D investments. The proposition that

marketing investments may yield financial returns in the near term is supported by Ataman et al. (2010), who show that all aspects of marketing (promotions, advertising, product line length, and distribution) have positive short term effects on sales or revenue, although the authors do show that long term positive effects of advertising, product, and distribution strategies are greater than their short term positive effects on sales or revenue. In fact research reveals that the positive association between marketing investments and yearend overall firm performance is significantly greater than the corresponding positive association between R&D investments and overall yearend firm performance (e.g. Krasnikov and Jayachandran 2008). The varying uncertainties in near term financial returns between R&D and marketing investments make decreases in strategic emphasis on R&D relative to marketing a less risky decision for short run financial performance than increases in strategic emphasis on R&D relative to marketing.

Prospect Theory

The main element of prospect theory is a S-shaped value function that is concave in the domain of gains and convex in the domain of losses (Kahneman and Tversky 1979). Moreover, people are more sensitive to losses than to gains of the same magnitude. In this sense, people are loss averse. "One implication of loss aversion is that individuals have a strong tendency to remain in the status quo, because the disadvantages of leaving it, loom larger than advantages" (Kahneman et al.1991, p. 197). As a result, people will exhibit risk-averse behavior in the domain of gains and risk-seeking behavior in the domain of losses.

Prospect theory is a theory about decision making under uncertainty. Prospect theory may be applied to predict managerial behavior in the current research context because managers are boundedly rational (e.g., Simon 1979) and they make strategic decisions such as strategic emphasis under uncertain conditions i.e. under lack of complete information about the organizational environment (e.g., Grandori 1984). In addition, managers may use reference points such as the gains

and losses in their organization's historic stock price performance for taking strategic decisions. There are multiple reasons for managerial use of such reference points. First, managers as agents of the owners of public firms (i.e., investors) are accountable to investors for consistently improving stock price performance from prior levels (e.g., Agrawal and Knoeber 1996). Second, managerial compensation is tied to growth in short term organizational earnings and stock price performance in terms of bonuses (e.g., Leone, Wu and Zimmerman 2006), and to growth in short as well as long term stock price performance in terms of stock options (e.g., Huddart and Lang 1996). Third, investors may doubt the credibility as well as the competency of managers when organizations fail to deliver stock price improvements consistently (Srivastava, McInish, Wood, and Capraro 1997), which leads to management turnover (e.g., Brickley 2003). As a result, managers have incentives to take historic stock price performance into account in order to understand the extent of stock price improvement that investors expect in the near term.

Prospect theory appears suitable as a decision making theory in the context of this research also because the strategic emphasis decision, depending on the manner in which it is taken, can reflect either managerial risk aversion or a risk seeking tendency in response to historic stock price performance. A decrease in strategic emphasis on R&D relative to marketing is a reflection of managerial risk aversion rather than risk seeking because it reduces uncertainties about near term cash flows to a greater extent than an increase in strategic emphasis on R&D relative to marketing. In contrast, an increase in strategic emphasis on R&D relative to marketing is a reflection of managerial risk seeking tendency because it raises the uncertainties about near term cash flows to a greater extent than a decrease in strategic emphasis on R&D relative to marketing. Therefore, overall, because of the presence of managerial reference points of firm performance as well as the presence of a decision that reflects risk averse or risk seeking tendencies of managers, prospect theory does seem appropriate for the research context. In the next section, I apply prospect theory

to hypothesize how managers will make the strategic emphasis decision in response to historic stock price performance.

Hypotheses Development

Consistent with prospect theory (Kahneman and Tversky 1979), as historic stock returns increase, managerial desire to maintain performance should increase, which results in an increase in risk aversion. Conversely, as historic stock returns decrease, the need to reverse the downward trend is likely to increase managerial risk seeking tendencies. Thus, overall, as historic stock returns increase, managerial risk aversion should increase, and they are likely to focus more on the downside than on the upside of risky decisions. As a result, firms should decrease strategic emphasis on R&D relative to marketing; after all, decreasing strategic emphasis on R&D relative to marketing should ensure near term cash flows and revenues to a greater extent than increasing strategic emphasis on R&D relative to marketing. Thus, there should be a negative relationship between historic stock returns and strategic emphasis on R&D relative to marketing.

H1. As historic stock returns increase, firms decrease strategic emphasis on R&D relative to marketing.

Consistent with H1, prospect theory suggests that increasing historic stock returns make firms focus on the downside effects of risks; thereby, decreasing strategic emphasis on R&D relative to marketing. March and Shapira (1992) in an extension of prospect theory argue that in the domain of gains, the extent of risk aversion may vary depending on contextual factors that influence the salience of either the downside or the upside effects of risks. If the contextual factor makes the downside effects more salient than the upside effects, then risk aversion in the domain of gains will increase. However, if the contextual factor makes the upside effects more salient than the downside effects, the extent of risk aversion in the domain of gains will be significantly less than in the former scenario. The contextual factor may moderate the extent of risk seeking behavior in the domain of losses in a similar manner. Borrowing from the theoretical extension of prospect theory proposed by

March and Shapira (1992), in the current research context, historic stock volatility may be a contextual factor that can moderate the extent to which managers display risk aversion as historic stock returns increase. When increases in historic stock returns are accompanied by low volatility, firms focus only on maintaining the increases in stock returns and are not concerned with stabilizing stock prices. In contrast, when increases in historic stock returns are highly volatile, to decrease the volatility, firms seek to make strategic emphasis decisions that reduce threats or uncertainties associated with near term performance – such as a decrease in strategic emphasis on R&D relative to marketing. As a result, as historic stock volatility increases, the negative relationship between historic stock returns and strategic emphasis on R&D relative to marketing should increase (i.e., as historic stock volatility increases, the impact of increasing historic stock returns on decreases in strategic emphasis on R&D relative to marketing should increase).

Conversely, prospect theory suggests that decreasing historic stock returns make managers want to recover losses by taking risks; thereby firms focus on the upside potential of risky decisions and increase their strategic emphasis on R&D relative to marketing. In the domain of losses or decreasing historic stock returns, managers may not interpret the volatility accompanying historic stock returns as a source of threat. When decreasing stock returns are volatile, the downward trend of stock prices varies intermittently, thereby, indicating that although investors do not view the firm's future performance favorably, they do entertain the possibility of recovery. Thus, in the domain of decreasing stock returns, managerial desire to recover losses might lead them to interpret historic stock volatility as an opportunity to increase the risks necessary to recover losses. Furthermore, a high degree of historic stock volatility indicates that managers are familiar with taking risks (e.g., Brown and Kapadia 2007; Coles, Daniel, and Naveen 2006). Therefore, in the domain of decreasing historic stock returns and high volatility, managers may be more ready to take risks for recovering losses than in the domain of decreasing historic stock returns and low volatility.

In sum, increasing volatility can magnify risk seeking tendencies in the domain of decreasing historic stock returns, thereby leading to an increase in strategic emphasis on R&D relative to marketing. As a result, as historic stock volatility increases, the negative relationship between historic stock returns and strategic emphasis on R&D relative to marketing should increase (i.e., as historic stock volatility increases, the impact of decreasing historic stock returns on increases in strategic emphasis on R&D relative to marketing should increase). Overall, the hypothesis is as follows:

H2. As historic stock volatility increases, the negative influence of historic stock returns on the strategic emphasis on R&D relative to marketing should increase.

METHODOLOGY

Data

The research context requires data from industries wherein substantial budget is devoted to both R&D and marketing functions. Technology-driven industries should be appropriate because the general strategic importance of both R&D and marketing in such industries have been extensively recognized by scholars, practitioners, and the stock market (Andras and Srinivasan 2003; Dutta, Narasimhan, and Rajiv 1999; John, Weiss, and Dutta 1999; Mizik and Jacobson 2003). The research context also prevents the use of diversified firms. This is because in diversified firms with multiple business units, the strategic emphasis decision may vary by business unit, and data for every business unit is not available. Thus, the final sample is an unbalanced panel that comprises 309 single business unit firms from four high technology manufacturing industry groups: communication equipment (SIC: 366), electronic components and accessories (SIC: 367), household appliances (SIC: 363), and computer and office equipment (SIC: 357). In this sample, data on 141 firms is available for the 1985 to 2006 period and the data on the remaining 168 firms is available for part of the period. The total panel comprises 3915 observations. The source of the data primarily comprises two databases: COMPUSTAT and CRSP (Centre for Research in Security Prices).

I show the descriptive statistics in Table 2-1. The data comprises mostly small and medium sized firms. There are 3 firms with revenues more than $1bn, 11 firms with revenues between $500 mn and $1bn, 156 firms with revenues between $100 mn and $500 mn, and 149 firms with revenue between $50mn and $100 mn. The average revenue for the sample is $ 203.52 mn. Due to the distribution of firm size, the implications of this research will be most relevant for small and medium sized firms.

Variable Operationalization

Dependent Variable: The strategic emphasis of firm *f* in time period *t* is measured as the extent of adjustment in R&D budget relative to the extent of adjustment in marketing budget. The extent of adjustment in R&D budget in time period *t* is measured as the degree to which the R&D budget has been increased /decreased from the previous time period (% change). Similarly the extent of adjustment in marketing budget in time period *t* is measured as the % change in marketing budget from the previous time period. The strategic emphasis for firm *f* at time period *t* is adjusted for the industry mean as follows:

$$SE_{ft} = \frac{\left[\frac{R\&D_{ift} - R\&D_{ift-1}}{R\&D_{ift-1}}\right] - \left[\frac{MB_{ift} - MB_{ift-1}}{MB_{ift-1}}\right]}{\frac{1}{F_i}\sum_{1}^{F_i}\left[\frac{R\&D_{ift} - R\&D_{ift-1}}{R\&D_{ift-1}}\right] - \left[\frac{MB_{ift} - MB_{ift-1}}{MB_{ift-1}}\right]} \quad (1)$$

where,

F_i is the number of firms in industry *i*, MB_{ift} represents marketing budget for firm *f* in industry *i* at time *t*, which is measured as the difference in Sales, General and Administrative $Expenditures_{ift}$ and $R\&D_{ift}$ (e.g., Mizik and Jacobson 2007).

As per GAAP (Generally Accepted Accounting Principles), Sales, General and Administrative Expenses (SG&A) include among other marketing expenditures both advertising and R&D expenses, and therefore marketing budget may comprise whatever is left after separating out

the R&D expenditures (e.g., Jung and Shiller 2005). SG&A has been used to measure stock of marketing spending in the marketing literature (Dutta et al. 1999; Mizik and Jacobson 2007). In a recent study of SG&A spending among a randomly selected sample of 30 technology based manufacturing firms, managers reveal that marketing and sales related expenses comprise about 55% of their total SG&A budgets (Report 2010). Finally, the correlation between 'SG&A minus R&D' and advertising (advertising is the only direct but available measure of a component of marketing) in my research sample is as high as 0.79 and is statistically significant ($p < .01$). Therefore, SG&A minus R&D appears to be an indirect yet feasible measure for marketing budgets.

Since firms are allowed to include some operating expenses in SG&A, the absolute value of SG&A even after excluding R&D expenses is generally greater than the absolute value of R&D expenditures, which is true for 95% of the observations in the research sample. Thus, the advantage of measuring strategic emphasis as a difference of % changes in R&D and marketing budgets is that the absolute values of SG&A and R&D are controlled for. However, in order to test for the robustness of the hypothesized relationships to alternate specifications of strategic emphasis, I explore a ratio based alternate measure of strategic emphasis, which is adjusted for the industry mean as follows:

$$SE_{ft} = \left(\frac{R\&D_{ift} / MB_{ift}}{1/F_i \sum_1^{F_i} R\&D_{ift} / MB_{ift}} \right) \quad (2)$$

In either measure of strategic emphasis, increasing values indicate increase in strategic emphasis on R&D relative to marketing, and decreasing values indicate decrease in strategic emphasis on R&D relative to marketing.[4]

Independent Variables

Historic Stock Returns. The construct of historic stock returns requires a measure that can capture annual stock returns over a period of multiple years just prior to the current decision making period.

This measure should reflect not only the magnitude of annual stock returns but also whether the annual returns have shown gains or losses in each year. I therefore adapt the measure used by Markovitch et al. (2005) who capture relative annual stock returns over a period of two years prior to the focal decision period. The final measure of historic stock returns for firm *f* at time *t* is $\mathrm{HSR_{ft}} = \mathrm{R_{ft-1}} * \mathrm{R_{ft-2}} * \mathrm{K}$. $\mathrm{R_{ft-1}}$ represents annual stock returns for period *t-1*. It is measured as $(\mathrm{SP_{ft-1}} - \mathrm{SP_{ft-2}} + \mathrm{Dividend_{ft-1}})/\mathrm{SP_{ft-2}}$, where SP denotes stock price. The multiplicative term K is an indicator variable that measures the explicit pattern of annual stock returns over the two years. K takes the following values (1) 1 if annual stock returns both at years t-1 and t-2 are positive, (2) 0 if annual stock returns are positive in one year and negative in another year, and (3) -1 if annual stock returns in both years are negative. Therefore, a firm with positive annual stock returns over both the past two years is considered to have better historic stock returns than a firm with positive returns in one year and negative in another. Similarly a firm with positive returns in one year and negative returns in the other year is considered to be better off than a firm with negative returns in both years.

Historic Stock Volatility. Consistent with Sorescu and Spanjol (2008), I measure historic stock volatility as $\mathrm{HSV_{ft}} = 1/2\{(\frac{\text{High SP}_{\text{ft-1}} - \text{Low SP}_{\text{ft-1}}}{\text{Low SP}_{\text{ft-1}}}) + (\frac{\text{High SP}_{\text{ft-2}} - \text{Low SP}_{\text{ft-2}}}{\text{Low SP}_{\text{ft-2}}})\}$, where SP denotes stock price. The first component of the measure is the percentage difference between the highest and the lowest daily stock returns in period *t-1*, the second component is the percentage difference between the highest and lowest stock returns in period *t-2*. Now, stock volatility represents firm risk. Since on an average about 80% of total firm risk comprises idiosyncratic risk (e.g., Campbell et al. 2001), idiosyncratic risk may also capture the construct $\mathrm{HSV_{ft}}$. Thus, my alternate measure of $\mathrm{HSV_{ft}}$ is the standard deviation of the residuals of the Fama-French three factor model calculated for

a period of 720 days (two years) before the current time period. The Fama-French three-factor model is described as:

$$(R_{ft} - R_{f_r t}) = \alpha_{ft} + \beta_{mf}(R_{mt} - R_{f_r t}) + \beta_{sf} SMB_t + \beta_{hf} HML_t + \beta_{mf} MOM_t + e_{ft} \quad (3)$$

where,

R_{ft} is daily stock price return of firm *f* on day *t*, $R_{f_r t}$ is the daily risk free return on day *t*, R_{mt} is the daily return on a value- weighted market portfolio on day *t*, SMB_t is the Fama-French size portfolio on day *t*, HML_t is the Fama-French market-to-book ratio portfolio on day *t*, and MOM_t is the momentum factor.

Control Variables. In order to incorporate causal factors other than historic stock price performance, I create a one period lag between dependent and all control variables (e.g., see Lautman and Pauwels (2009) for a discussion on metric identification in marketing). Firm size represents the extent of resources that a firm may have, and may influence organizational budgets. Therefore, the first control variable is firm size, which is measured by the log of sales. The market shares of firms in industries with different levels of concentration may differ. As market share is proportional to resource size, and resource size may affect organizational budgets, I control for industry concentration. The Herfindahl-Hirchman index ($IC_{ft} = \sum_{f=1}^{F_i} [\text{Market Share}_{ift-1}]^2$) is used to measure industry concentration. The cash flows of a firm may determine financial constraints and affect future actions (Kaplan 1994). Thus, it is important to control for cash flows, the measure for which is extracted from COMPUSTAT ($NOCF_{ft}$).[5] Since volatile cash flows can make managers sensitive to downside dangers of risks, the volatility in cash flows may influence strategic emphasis. As a result, I control for volatility in cash flows (CFV_{ft}).

Research shows that a firm's annual stock returns relative to the industry average can influence subsequent investment decisions (Markovitch et al. 2005), and may therefore influence

strategic emphasis, which is an investment decision. In order to control for such relative stock returns, I introduce a dummy variable (HP_{ft}), which takes a value of 1 at time *t* if the firm's actual annual stock price return in time *t-1* is above the industry average in *t-1*, and takes a value of 0 otherwise. Bushee (1998) showed that the presence of institutional investors with at least 5% stock ownership may restrain top management from managing the investor by manipulating R&D expenses in the near term. In order to control for this, a dummy variable (IOW_{ft}) which takes a value of 1 if any single investor owns 5% or more of the firm's stock in period *t-1*, and a value of 0 otherwise should work.. Leverage may influence strategic emphasis because creditors typically desire stable financial returns, and encourage firms to pursue strategies with minimum financial risk (Gloy and Baker 2002; Siegel and Hoban 1991). Therefore I control for leverage ($FLEV_{ft}$). Finally, managers may increase marketing investments and reduce R&D expenses if the number of new products to be introduced is large. In order to control for the number of new products to be introduced in time *t* (NPR_{ft}), I use 10-K reports to count the number of new products introduced at time *t*, and adjust the measure for firm size by dividing it by sales.

Model Estimation

Any estimation procedure for a panel data set should correct for state dependence due to correlation between lagged variables and error terms. In addition, the estimation procedure should also incorporate heterogeneity in effects of historic stock price performance on strategic emphasis. Therefore, I apply a hierarchical Bayesian model that accounts for heterogeneity and use Arrellano and Bond's (1991) prescription for correcting biases due to state dependence.

In equation 4, I present my model. The dependent variable in the equation (SE_{ft}) is the strategic emphasis of firm *f* in time *t*. I include a one period lagged dependent variable (SE_{ft-1}) to avoid any bias due to unobserved factors (Jacobson 1990).

$$SE_{ft} = \beta_0 + \beta_{1f} SE_{ft\text{-}1} + \sum_{k=2}^{K} \beta_{kf} X_{kft} + \sum_{1}^{T} \varphi_t Yr_t + \epsilon_f + \varepsilon_{ft} \quad (4)$$

Where,

f = 1, 2,…F firms,

t =1, 2,..T_f years of firm F,

SE_{ft}= strategic emphasis of firm f at time t,

SE_{ft-1}= lagged value of strategic emphasis,

X_{kft} = k^{th} independent construct, K is the total number of independent constructs, which include historic stock returns, historic stock volatility, firm size, industry concentration, all interactions, all control variables, and the lagged dependent variable,

Yr_t represents year specific dummy variables,

φ_t are year specific fixed effects,

ϵ_f captures firm specific, time invariant unobservable factors,

ε_{ft} is random error.

As SE_{ft-1} is correlated with ϵ_f in equation 4, I take a first differenced form of equation 4. as shown in equation 5.

$$\Delta SE_{ft} = \beta_{1f}\Delta SE_{ft-1} + \sum_{k=2}^{K} \beta_{kf}\Delta X_{kft} + \sum_{1}^{T} \varphi_t \Delta Yr_t + \Delta\varepsilon_{ft} \quad (5)$$

In equation 5, an endogeneity problem occurs due to correlation between ΔSE_{ft-1} and $\Delta\varepsilon_{ft}$ (both have a common component: ε_{ft-1}). Arrellano and Bond (1991) prescribes using lagged values further back in time such as (ΔSE_{ft-3}) as well as industry and time effects as instruments to estimate the lagged dependent variable ($\widehat{\Delta SE}_{ft-1}$). Such an approach in essence treats the independent variables as exogenous shocks to the system that affect the strategic emphasis decision for firm f at time t (e.g., Tuli and Bharadwaj 2009, Mizik and Jacobson 2004). Thus, the final estimation model is described as follows in equation 6.[6]

$$\Delta SE_{ft} = \beta_{1f}\Delta\widehat{SE}_{ft-1} + \sum_{k=2}^{K}\beta_{kf}\Delta X_{kft} + \sum_{1}^{T}\varphi_t \Delta Yr_t + \Delta\varepsilon_{ft} \quad (6)$$

Finally, in order to incorporate firm level heterogeneity in the effects of historic stock price performance (and other independent variables) on strategic emphasis, I consider random effect parameterization for the coefficients of all K independent variables (e.g., Bradlow, Wainer, and Wang 1999; Gelman 2004) at the firm level.

I use the following assumptions to specify a hierarchical Bayesian prior structure for the parameters. The coefficients of all independent variables (total K coefficients) are distributed multivariate normal $\beta_f \sim N_K(\bar{b}, V^{-1})$, and are drawn from respective sample level distributions. The means of the sample level distributions are distributed multivariate normal $\bar{b} \sim N_K(\bar{\bar{b}}, C^{-1})$ such that $\bar{\bar{b}}$ represents means of population level distributions, which in turn are assigned the following multivariate normal prior $\bar{\bar{b}} \sim N_K(0, \tau^{-1})$. Finally, the precision matrices (V, C) are each assigned Wishart form of distribution, which is the prescribed distribution when specific prior information about the variance and co-variance between parameters is not available (e.g., Gelman 2006). τ is a precision matrix in which the off diagonals are set as 1.0 X 10^{-4} and the diagonal values are set as 1.0 X 10^{-6} (for a diffuse prior specification).

RESULTS

Model Selection

I estimate three separate models (see Table 2-2). Model 1 is a main effect model, model 2 includes main effects and control variables, and model 3 is a full model with all main effects, interaction terms, and control variables. I use Markov Chain Monte Carlo methods, where I discard the first 20000 draws for burn-in and use 5000 additional draws to characterize the posterior distributions of the parameters. I assess convergence across two chains of iterations with the Gelman-Rubin statistic (Brooks and Gelman 1998).[7] A comparison of the fit of alternative models

by calculating the pseudo-R squared (e.g., Ansari, Jedidi, and Jagpal 2000) shows that the pseudo R-squared varies from .26 to .51, with model 3 showing the highest value. Thus, the model with all the independent variables (historic stock returns, historic stock volatility, and control variables) and their interactions shows the best fit. I also assess the predictive validity of the three models in the following way. After deleting the last observation of the dependent variable (ΔSE_{ft} from equation 6) for each firm, I estimated models 1, 2 and 3 using the modified data. Thereafter, a calculation of the root mean square errors (RMSE) reveals that model 3 has the lowest root mean squared error (Model 1: 5.89, Model 2: 4.64, Model 3: 3.21). Therefore, I gain confidence in the choice of the final model 3.

Hypothesis Testing

I report results for all three models 1, 2 and 3 in Table 2-2. For tests of hypotheses, I refer to the results for model 3, which is the model with the lowest RMSE and highest pseudo-R squared. The reported results are the aggregate level posterior means. In addition to the posterior means, Table 2-2 also displays the 95% confidence interval for each posterior mean. Statistical significance of coefficients is denoted with * and ** that signify that 0 does not lie within the 90% confidence interval and the 95% confidence interval respectively. In terms of the hypotheses, a positive coefficient (b) shows that increase in an independent variable leads to an increase in strategic emphasis on R&D relative to marketing (also interpreted as decrease in strategic emphasis on marketing relative to R&D). A negative (b) then shows that increase in an independent variable leads to a decrease in strategic emphasis on R&D relative to marketing (also interpreted as an increase in strategic emphasis on marketing relative to R&D). The results are robust to alternate operationalization of the strategic emphasis construct.

In H_1 I propose that increases in historic stock returns should lead to decreases in the strategic emphasis on R&D relative to marketing; I find support for H_1 ($\bar{b}_{HSR}$ = -1.25**). I also find

support for H_2 in which I propose that the negative effect of historic stock returns on the strategic emphasis on R&D relative to marketing will be greater as historic stock volatility increases ($\bar{b}_{HSR*HSV}$ = 0.37**). A slope analysis of a two way interaction delineates the effects of historic stock returns on strategic emphasis at different levels of historic stock volatility (e.g., Aiken and West 1991). For the slope analysis (see Figure 2-1), I consider one standard deviation above and below the mean of historic stock volatility as high and low values of the construct respectively. The slope analysis shows that as historic stock returns increase, the decrease in the strategic emphasis on R&D relative to marketing is significantly greater ($p < .05$) when historic stock returns are accompanied by a high level of volatility ($\bar{b}_{HSR/\ High\ HSV}$ = -3.42*) than when they are accompanied by a low level of volatility ($\bar{b}_{HSR/\ Low\ HSV}$ = -0.96).

All results are robust to the alternate measure (idiosyncratic risk) of historic stock volatility.

Consequences for Organizational Bottom Line

Since the intention behind decreasing strategic emphasis on R&D relative to marketing is to ensure near term earnings growth, the obvious short term consequence of this decision should be an increase in yearend earnings. However, the marketing decision making literature suggests that the factors that drive a strategic decision make a difference to the consequences of the decision. For example, Perkins and Rao (1990) suggest that the extent to which firms achieve success through a marketing decision depends on whether or not the decision is driven by past experience. Similarly, Speier and Venkatesh (2002) show that firms that adopt sales force technologies because the sales force is motivated to use such technologies, perform better than firms that do not consider sales force motivation while adopting the technologies. Interpreted in the current research context, this particular decision making literature suggests that the increase in yearend earnings due to a decrease in strategic emphasis on R&D relative to marketing may differ depending on whether **scenario 1**: the strategic emphasis is driven only by historic stock price performance, as compared to **scenario**

2: when the strategic emphasis is not solely driven by historic stock price performance but is influenced by a range of reasons relevant to the firm. If the increase in yearend earnings in scenario 1 is lower than that predicted by scenario 2, then the short term repercussions of managing strategic emphasis for reasons related to the stock market takes the form of foregone earnings.

As per the above discussion, I first estimate the changes in yearend earnings under the two scenarios in order to gauge **whether** there is a difference in yearend earnings in the two scenarios. Then, in order to understand **how** the decision 'decrease in strategic emphasis on R&D relative to marketing' influences yearend earnings differently under the two scenarios, I content analyze CEO's discussion of results in annual reports. Such a content analysis may reveal how the strategic emphasis decision is implemented differently under the two scenarios.

In order to estimate the changes in yearend earnings under the two scenarios, I consider two separate models as shown in equations 7 and 8. I run these models on the entire sample of 309 firms. Exactly similar to equation 6, I use a hierarchical Bayesian structure to incorporate heterogeneity at the firm level in both equations 7 and 8.

Equation 7 represents scenario 1 because it accounts for the changes in yearend profits when changes in strategic emphasis on R&D relative to marketing are driven by historic stock price performance in the following manner.

$$\Delta PROF_{ft} = \alpha_{1f}\Delta\widehat{PROF}_{ft-1} + \alpha_{2f}\Delta\widehat{SE}_{ft} + \alpha_{3f}\Delta NCF_{ft} + \alpha_{4f}\Delta LIQ_{ft} + \alpha_{5f}\Delta FLEV_{ft} + \alpha_{6f}\Delta IC_{ft} + \alpha_{7f}\Delta SIZE_{ft} + \Delta\varepsilon_{ft} \quad (7)$$

Where,

$f = 1, 2, ..F$ firms,

$t = 1, 2 \ldots T_f$ years of firm F,

$\Delta PROF_{ft}$ is the first differenced form of earnings before interest and taxes,

$\widehat{\Delta PROF}_{ft-1}$ is the first differenced form of lagged earnings that is estimated using further lagged values of the same variable ($\Delta PROF_{ft-2}, \Delta PROF_{ft-3}$),

$\widehat{\Delta SE}_{ft}$ is the strategic emphasis as predicted from equation 6 using the following variables: historic stock returns (HSR), historic stock volatility (HSV) and HSR*HSV,

ΔNCF_{ft} is the first differenced form of net operating cash flow,

ΔLIQ_{ft} is the first differenced form of liquidity,

$\Delta FLEV_{ft}$ is the first differenced form of leverage,

ΔIC_{ft} is the first differenced form of industry concentration,

$\Delta SIZE_{ft}$ is the first differenced form of firm size,

$\Delta\varepsilon_{ft}$ is the first differenced form of the random error.

Equation 8 is similar to equation 7 except that in equation 8, I calculate the first differenced form of strategic emphasis (ΔSE_{ft}) from the actual data as opposed to using the predicted values of strategic emphasis from equation 6 ($\widehat{\Delta SE}_{ft}$) .

$$\Delta PROF_{ft} = \alpha'_{1f}\widehat{\Delta PROF}_{ft-1} + \alpha'_{2f}\Delta SE_{ft} + \alpha'_{3f}\Delta NCF_{ft} + \alpha'_{4f}\Delta LIQ_{ft} + \alpha'_{5f}\Delta FLEV_{ft} + \alpha'_{6f}\Delta IC_{ft} + \alpha'_{7f}\Delta SIZE_{ft} + \Delta\varepsilon''_{ft} \quad (8)$$

Therefore, in equation 8, change in yearend earnings is influenced by strategic emphasis, which is in turn not explicitly influenced (i.e., not predicted) by historic stock price performance. The use of strategic emphasis from actual data reflects scenario 2 in which the strategic emphasis decision is made using all factors relevant to the firm rather than being made solely on the basis of historic stock price performance.

When the strategic emphasis ($\widehat{\Delta SE}_{ft}$: scenario 1, predicted by historic stock price performance) takes a value one standard deviation below the mean, (i.e., slight decrease in strategic

emphasis on R&D relative to marketing), the predicted change in yearend earnings for an average firm is an increase of 8.7% (see Figure 2-2; for complete results of equations 7 and 8 see Table 2-3). However, when the strategic emphasis from the actual data (ΔSE_{ft}: scenario 2, not predicted by historic stock price performance) takes a value one standard deviation below the mean, the predicted change in yearend earnings for an average firm is an increase of 12.2%. Similarly at two standard deviations below the mean for strategic emphasis ($\widehat{\Delta SE}_{ft}$: scenario 1), i.e., when there is a large decrease in strategic emphasis on R&D relative to marketing, the dollar impact on yearend earnings is an increase of 12.6%, and for the actual data (ΔSE_{ft}: scenario 2) the dollar impact on yearend earnings is an increase of 19.8%.

Thus, for the purpose of preserving historic stock return gains and stabilizing stock volatility, an average firm (i.e. a small or medium sized high technology firm) can at the most increase yearend earnings by 12.6% by favoring marketing more than R&D. In contrast, by favoring marketing more than R&D not for reasons connected to stock price performance, an average firm can increase yearend earnings by 19.8%. Overall, the results show that an average firm can forego increases of up to 7.2% (19.8% - 12.6%) in yearend earnings when instead of being determined by a range of reasons relevant for the firm's viability, strategic emphasis is solely driven by considerations of near term stock price performance.

Understanding Reasons behind Foregone Yearend Earnings

Although strategic emphasis is less on R&D and more on marketing in both scenarios 1 and 2 (scenario 1: firms are influenced by historic stock price performance, and scenario 2: firms are not influenced by historic stock price performance), the financial payoff of strategic emphasis is less in scenario 1. One way to explain the difference in financial payoff is to understand whether firms focus on different marketing activities in the two scenarios. Literature suggests that if firms focus only on the value appropriating activities such as promotion and distribution that push products in

to the market, then firms are not able to realize all the benefits of their marketing expenditures in a high technology context (Kohli and Maltz 2000; Leendersa and Wierenga 2008). Instead, in a high technology context, value creating activities such as customer involvement, and joint planning of product markets with R&D can be more productive and generate more returns than value appropriating activities (John et al. 1999; Kohli and Maltz 2000).

In order to test whether the difference in financial payoffs of strategic emphasis in the two scenarios is due to managerial focus on value appropriating marketing activities versus value creating marketing activities, I use a content analysis approach. In the absence of secondary data, a content analysis of public statements made by managers is the only feasible method of understanding differences in marketing activities among firms.

In line with the above idea, I conduct an analysis of the words and phrases relevant to R&D and marketing in the CEO's discussion of results in annual reports. I conduct the analysis separately among two subsamples of firms derived from the estimations in equation 6. Subsample 1 comprises firms in which statistically significant effects of historic stock price performance on strategic emphasis are estimated. Thus, subsample 1 represents scenario 1. Subsample 2 comprises all firms in which no statistically significant effects of historic stock price performance on strategic emphasis are estimated. Thus, subsample 2 represents scenario 2.

Borrowing from research that espouses multiple roles of marketing in the innovation context (e.g., Griffin and Hauser 1996), I search for the frequency of words related to value appropriating marketing activities such as promotion, sales, distribution, as well as words related to value creating marketing activities such as 'development and marketing', 'lead user', 'customer relationship' , 'market orientation' and 'customer involvement'. On comparison of the average frequency of words and phrases in the two subsamples, I find that the average frequency of words that suggest the value appropriation role of marketing (e.g., distribution, channels, selling, promotion) is significantly

higher ($p < .01$) in subsample 1 (average frequency = 4.25) than it is in subsample 2 (average frequency = 2.76). In addition, words that are suggestive of the value creating role of marketing (e.g., customer relationship, market orientation, and functional collaboration) are significantly ($p < .01$) less frequent in subsample 1 (average frequency = 0.63) than in subsample 2 (average frequency = 2.41).

The content analysis (though exploratory), suggests that when managers decrease strategic emphasis on R&D in favor of marketing by being influenced by historic stock price performance, they seem to focus almost exclusively on the value appropriating roles of marketing, which they believe will help them achieve their financial goals. In contrast, firms that do not let their strategic emphasis be driven by considerations of the stock market, are actually the firms that focus on all aspects of marketing – both value creating as well as value appropriating activities. Thus, the former category of firms are not able to reap as much yearend earnings as the latter category of firms because in the former category, concerns for near term appeasement of investors lead to almost complete neglect of value creating marketing activities.

DISCUSSION

Budget allocations across multiple functions are essentially tradeoffs. Even though R&D and marketing are the lifelines of a high technology firm, one function may be emphasized less than the other function given that budget constraints are always present. Since a budgetary tradeoff with less emphasis on R&D and more emphasis on marketing reduces uncertainties in near term financial performance, it may become a preferred budget allocation strategy when historic stock price performance influences managers to focus on near term earnings and therefore near term stock returns.

The results of this research show that historic gains in stock returns lead managers to de-emphasize R&D relative to marketing in budget allocations, just so they can sustain the gains in the

near term. The de-emphasis on R&D relative to marketing increases when historic gains in stock returns are accompanied by volatility. A content analysis of annual reports provides evidence that when historic stock price performance drives managers to place less emphasis on R&D and more emphasis on marketing, managers actually emphasize only value appropriating marketing functions such as sales promotions and mostly ignore value creating functions such as involving customers in the new product development process. Managers may benefit by knowing that in a high technology context, increases in yearend earnings can be about 7.2% more when the focus is on all marketing functions than on only value appropriating functions. Thus, when strategic emphasis decisions are influenced by historic stock price performance, managers incur opportunity costs in terms of foregone yearend earnings.

In terms of performance consequences, foregone yearend earnings is one of the consequences of investor appeasement (by de-emphasizing R&D in favor of marketing). The primary managerial implication of such a performance consequence is that if managers in small and medium high technology firms are concerned about yearend investor expectations, they need not focus exclusively on promotional activities at the cost of value creating activities such as customer relationship management. They can satisfy investors in the short term even better by concentrating on the entire range of marketing activities rather than exclusively on promotional activities. Given that literature shows that most marketing activities such as customer relationships strengthen competitive advantage over time (e.g., Fornell et al 2006, Ataman et al 2010), such a strategy of focusing on the entire gamut of marketing activities may improve long term financial performance too.

The question remains whether in high technology firms, compromising R&D budgets can by itself have any adverse consequences. The near term adverse consequences, if any, of de-emphasizing R&D will not be apparent as the earnings inflation masks any negative short term

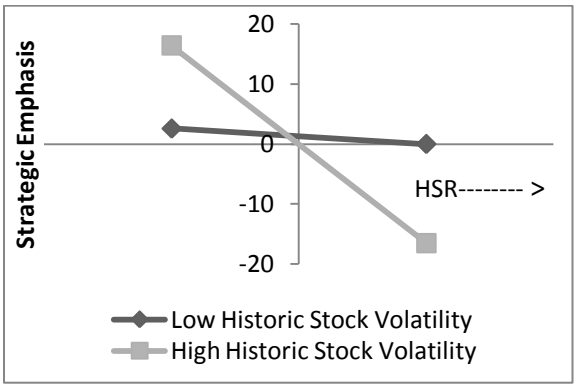
performance effects. However, delaying R&D projects or diverting resources from new product activities can set back firms in terms of long term competitiveness. As R&D gestation periods span multiple years, even temporary cut backs in R&D can prevent firms from keeping up with technology changes. Thus, the long term performance consequences of de-emphasizing R&D relative to marketing due to historic stock price performance remains an important topic for future research. I investigate the long term performance consequences of compromising R&D budgets for near term investor appeasement in chapter 3.

Given that a firm's strategic emphasis should be decided based on product market demands and is essential for a firm's viability (e.g., Dutta et al. 1999; Krasnikov and Jayachandran 2008; Mizik and Jacobson 2003), the finding that such a decision is often made in response to pressure induced by historic stock price performance provides insights in to decision making at the top management level. Top managers' performance and compensation as decision makers of the firm is often assessed by shareholders against the firm's performance on the stock market (Kaplan 1994; Puffer and Weintrop 1991; Stein 1989). The cash based component of compensation, i.e., the bonus is directly determined by near term earnings and stock return growth (Leone, Wu and Zimmerman 2006). Stock options have a short vesting period, after which managers are allowed to exercise their options anytime. Thus, top managers have personal incentives to keep the firm's historic stock price performance in mind and take actions to ensure growth in stock prices so they can profit from exercising their options (Huddart and Lang 1996). In summary, top manager compensation has associated agency costs. Perhaps, the solution for preventing the misuse of the strategic emphasis decision lies in restructuring compensation policies and disclosure requirements.

Managers should perhaps disclose budget allocation strategies, especially when managers feel that they may not be able to generate enough earnings for preserving gains in historic stock returns and stabilizing stock returns in the near term. Voluntary disclosures signal credibility and provide

better information to the investor community for predicting the firm's future cash flows and earnings (Gelb 2000; Lang and Lundholm 1996). As a result, reduced information costs may compensate investors for a decline in near term earnings in terms of lower bid-ask spreads and higher trading volume (Healy and Palepu 2001; Leuz and Verrechia 2000). The Security and Exchange Commission (SEC) is quite active in tracking and recording investment practices that are not transparent and are meant to boost the firm's near term valuation at the expense of the firm's fundamentals. There is also evidence that as and when such R&D and marketing practices are uncovered, analysts pick them up from the websites of SEC, and downgrade the stock of the focal firm, which invariably leads to negative investor reactions (e.g., Tipton, Bharadwaj, and Robertson 2009). Thus, this essay emphasizes the need for corporate governance practices that prevent managerial decisions such as strategic emphasis from being influenced by the stock market.

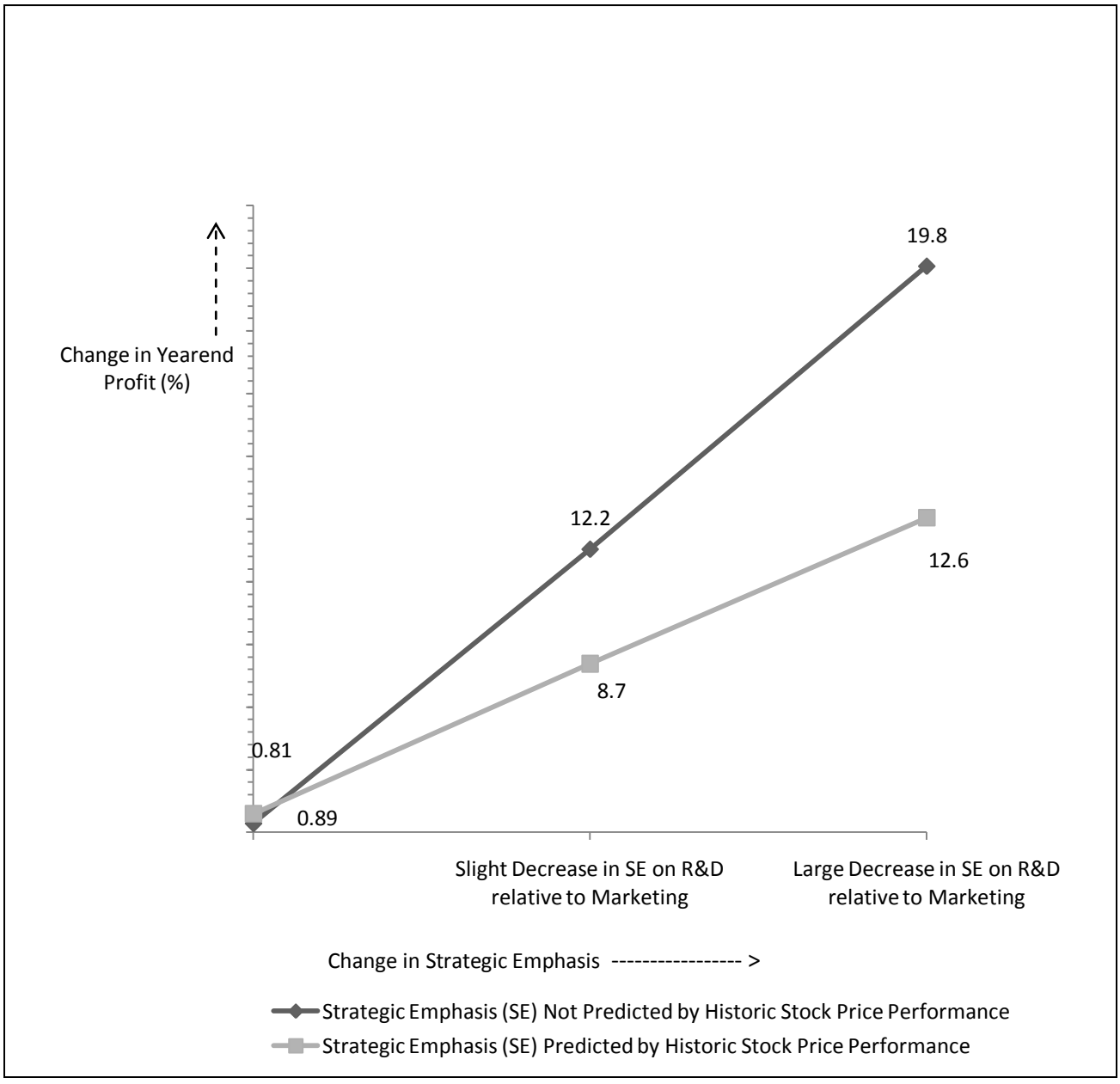
Figure 2-1
Impact of Historic Stock Returns (HSR) and Historic Stock Volatility (HSV) on Strategic Emphasis



Notes:

1. Vertical axis represents strategic emphasis, which (a) in the upward direction signifies increase in strategic emphasis on R&D relative to marketing OR decrease in strategic emphasis on marketing relative to R&D, and (b) in the downward direction signifies decrease in strategic emphasis on R&D relative to marketing OR increase in strategic emphasis on marketing relative to R&D.
2. Low / High HSV is calculated at one standard deviation below/above the mean of HSV.

Figure 2-2
Predicted Change in Yearend Profit as Strategic Emphasis (SE) on R&D relative to Marketing Decreases



Notes:

For the horizontal axis, I take the absolute values of the decreases in strategic emphasis on R&D relative to marketing.

Table 2-1
Descriptive Statistics

	Mean (Standard deviation)	SE	HSR	HSV	FS	FLEV	IC	HP	NCF	CFV	IO	NPR	PR
SE	-.19 (27.02)												
HSR	.26 (48.27)	-.23*											
HSV	9.07 (5.94)	.11	.26*										
FS	203.52 (63.28)	.18	.02	.14									
FLEV	.36 (5.84)	.04	.14*	.17	.23								
IC	.93 (.37)	.22*	.16	-.14**	-.18	-.11							
HP	.21 (.44)	.26	.17*	-.19*	.21	.06	-.18						
NOCF	781.86 (259.8)	.04	.26	.05	.18*	.09	.26	.04					
CFV	203.51 (94.33)	.14	.06	.08	.20	-.23**	.08	-.13	.15				
IO	.41 (.37)	.09	-.17	.02	.08	-.04	.03	.11	.02	.22			
NPR	.09 (81.52)	-.31**	.18*	.06	.27*	.03	.17	-.09	-.12	.10	.02		
PR	268.35 (193.86)	-.24*	.05	-.16	.19	-.03	.02	.30*	.08	-.02	.03	.28	

Notes: SE = strategic emphasis, HSR=historic stock returns, HSV = historic stock volatility, FS = firm size ($mn), FLEV = leverage, HP = high performers relative to industry average of stock returns, IC = industry concentration, NOCF = net operational cash flow ($mn), CFV = cash flow variability, IO = beneficial ownership of shares, NPR = no. of new products commercialized in a year/sales, PR = yearend earnings ($mn)
*** $p < .01$, ** $p < .05$, * $p < .10$

Table 2-2
Influence of Historic Stock Price Performance on Strategic Emphasis (SE)

	Hypotheses	Model 1 Main Effects	Model 2 Main Effects and Control Variables	Model 3 Main Effects, Interaction Effects and Control Variables
		DV is ΔSE		
Lagged Strategic Emphasis		1.01** (0.66,1.35)	0.95** (0.55,1.40)	0.98** (0.54,1.42)
Historic Stock Returns (HSR)	H1	-1.10** (-1.65,-0.55)	-1.25** (-1.87,-0.62)	-1.25 ** (-1.87,0.63)
Historic Stock Volatility (HSV)		0.16* (0.07,0.24)	0.15 (-0.04,0.30)	.09 (-0.13,0.32)
HSR * HSV	H2			0.37** (0.18,0.56)
Firm Size (FS)			1.15 (-0.31,2.61)	1.19 (-0.16,2.54)
Industry Concentration (IC)			1.16** (0.60,1.72)	1.18 ** (0.61,1.75)
High Performers (HP)			0.14 (-0.04,0.32)	0.15 (-0.03,0.35)
Net Operational Cash Flow (NOCF)			0.41** (0.29,0.53)	0.42** (0.30,0.54)
Cash Flow Variability (CFV)			-0.64** (-0.96,-0.32)	-0.63** (-0.84,-0.42)
Institutional Ownership of Shares (IO)			0.19 (-0.06,0.44)	0.18 (-0.05,0.43)
Leverage (FLEV)			0.34 (-0.14,0.84)	0.34 (-0.13,0.84)
New Product Ratio (NPR)			-.80** (-1.19,-0.39)	-.77** (-1.13,-0.41)
Arellano-Bond test for AR(2) in first differences		z = -.48 Pr > z = .62	z = -.48 Pr > z = .61	z = -.46 Pr > z = .62
Pseudo R sq		.17	.30	.35

Note:

a) All results are posterior means of sample level coefficients.
b) DV is dependent variable.
c) ** 0 does not lie in the 95% confidence interval, * 0 does not lie in the 90% confidence interval.
d) All variables are first differenced.
e) I also estimate interactions between historic stock price performance and several control variables. The only statistically significant interactions are three way interactions between (a) HSR, HSV, and firm size (b = 1.78 **), and (b) HSR, HSV, and industry concentration (b = 0.31*).

Table 2-3
Influence of Strategic Emphasis (SE) on Yearend Earnings under Different Scenarios

	Scenario 1 Strategic Emphasis (Driven by Historic Stock Price Performance) Influences Yearend Earnings	Scenario 2 Strategic Emphasis (Not Driven by Historic Stock Price Performance) Influences Yearend Earnings
	Equation 7 (DV is ΔPROF)	Equation 8 (DV is ΔPROF)
Lagged ΔPROF	11.87** (6.04,17.25)	11.85** (6.49,17.21)
Predicted $\Delta\widehat{SE}$	**-0.61**** **(-0.91,-0.31)**	
ΔSE from Data		**-0.93**** **(-1.36,-0.51)**
Firm Size (FS)	0.40* (0.21,0.63)	0.40* (0.16,0.64)
Industry Concentration (IC)	0.03 (-0.03,0.04)	.06 (-0.02,0.14)
Net Operational Cash Flow (NOCF)	0.21* (0.10.0.31)	0.22* (0.09,0.35)
Firm Leverage (FLEV)	-0.07 (-0.10,0.01)	-0.08 (-0.15,0.02)
Liquidity (LIQ)	0.005 (-0.11,0.12)	0.004 (-0.09,0.10)
Arellano-Bond test for AR(2) in first differences	z = .51 Pr > z = .39	z = .52 Pr > z = .41
Pseudo R sq	.45	.42

Note:

a) All results are posterior means of sample level coefficients.
b) DV is dependent variable.
c) PROF is yearend earnings.
d) ** 0 does not lie in the 95% confidence interval, * 0 does not lie in the 90% confidence interval.
e) All variables are first differenced.
f) Bold coefficients indicate that a decrease in strategic emphasis on R&D relative to marketing increases yearend earnings.

CHAPTER 3

Influence of Analyst Earnings Forecasts on Marketing and R&D Budgets: Implications for Long Term Firm Risk

In this essay, I study how the motivation to meet or beat analyst earnings forecasts influences managers to reduce organization wide marketing and R&D budgets. I also investigate the consequences of such budgetary reductions for a firm's long term risk.

Security analysts set short term quarterly and annual earnings forecasts for firms. Literature refers to the goal of meeting or beating analyst forecasts as avoiding negative earnings surprises (Matsumoto 2002; Libby and Tan 1999). Managers[8] may have various incentives for avoiding negative earnings surprises. When earnings do not meet analyst forecasts, investors question managerial competency and downgrade stock prices (e.g., Barth, Kasznik, and McNichols 2001). Furthermore, when earnings do not meet analyst forecasts, managerial job security as well as yearend performance related compensation such as bonuses suffer (e.g., Farrell and Whidbee 2003; Matsunaga and Park 2001). In addition, analyst forecasts are often based on managerial expectations of firm performance (e.g., Ruland, Tung and George 1990). Therefore, once managers announce their earnings expectations to analysts, which in turn leads to announcements of analyst forecasts, managers may be bound to meet such forecasts in order to avoid investor initiated litigations (e.g., Kasznik 1999).

When managers realize that earnings from production related activities are falling short of analyst forecasts, they may find it difficult to justify marketing and R&D costs. This is because the short term financial payoffs of these functions are much less pronounced than the long term payoffs (e.g., Ataman et al. 2010; Lodish and Mela 2007). The incentives to avoid negative earnings surprises

may be strong enough for managers to target marketing and R&D functions for budget cuts (e.g., Hess 2010, Graham et al 2005). Unscheduled cuts in marketing and R&D budgets can directly inflate earnings because they are reported as reduction in expenses. In accordance with literature (e.g., Roychowdhury 2006; Baber et al 1991; Bushee 1998), I refer to unscheduled cuts in marketing and R&D budgets for the purpose of earnings inflation as '**Re**al **A**ctivity **M**anipulations' (**REAM**).

Research shows that REAM is a myopic practice because by curtailing marketing and R&D investments, firms sacrifice long term stock returns for boosts in immediate stock returns (e.g., Mizik 2010). Even temporary cuts in the form of REAM can make long term cash flows and revenue streams volatile, leading to loss in long term competitive advantage (e.g., Srivastava et al 1998). There is a lot of concern in the business press about REAM (e.g., Hess 2010). Reputed companies such as Toyota have been known to compromise investments in product quality and channel governance procedures for speeding up sales and reducing costs (Wakabayashi 2010). However, empirical academic research about REAM and the implications of REAM is scarce. Also, the metrics for long term consequences of REAM such as firm risk are unclear. The lack of metrics is an additional incentive for managers to justify REAM (e.g., Srinivasan, Pauwels, Silva-Risso and Hanssens 2009). Therefore, in this essay, I investigate three questions. Are marketing and R&D budgets adversely affected due to analyst forecasts, i.e., what is the extent of REAM in response to analyst forecasts? What factors increase or decrease REAM due to analyst forecasts? How does REAM affect firm risk over the long term?

In order to answer the first two questions, I need a theory, which can account for two factors. First, as managerial incentives explain the motivations for earnings management, the theory should account for managerial incentives to respond to analyst forecasts. Second, accounting for managerial incentives is not enough because incentives can only explain why managers may want to inflate earnings. Managerial incentives cannot specifically predict why managers ignore the costs

associated with REAM when they have other potentially less costly options for earnings management such as accounting manipulations (e.g., reporting unrealized but potential revenues and cash flows, which investors cannot detect) and expectations management (managers disclose private information to analysts in order to make analyst forecasts realistic). The immediate costs of all three earnings management strategies are minimal. Accounting manipulations and REAM are equally likely to be undetected by investors (e.g., Lev 2003), and expectations management can be beneficial because it makes analyst forecasts realistic and achievable (e.g., Baik and Jiang 2006). However unlike the other strategies, REAM can cause potential harm to cash flows and revenues beyond a year (e.g., Hess 2010; Mizik 2010). Thus, the theory should be able to explain why managers ignore the overall costs associated with REAM.

Problem solving theory predicts that a strategy will be chosen based on whether individuals consider the strategy to be appropriate for a focal goal (means-end analysis) or as appropriate for a schema of goals related to the focal goal (schema-driven analysis). If individuals focus on a specific goal and there are no costs associated with using the strategy for the focal goal, then the strategy is deemed appropriate. If individuals consider a schema of goals, one of which is the focal goal, then the strategy is not deemed appropriate if it achieves the focal goal but compromises other goals (for a review of problem solving literature see Davidson and Sternberg 2003). Avoiding negative earnings surprises is a near term focal goal for managers, and REAM is a solution or a strategy for achieving the near term goal. Problem solving theory predicts that the extent of REAM will depend on whether managers assess the appropriateness of REAM exclusively for the near term goal (a means-end analysis of solution) or for a schema of goals related to the near term goal such as how avoiding immediate negative earnings surprises will affect future earnings and cash flows (schema-driven analysis of solution).

Problem solving theory suggests three factors that explain how incentives influence whether managers will focus only on the immediate goal or on a schema of related goals: goal importance, time pressure and expertise. Goal importance refers to the incentive attached to achieving a specific goal in hand (e.g., Sanchez and Levine 1989). I conceptualize goal importance in terms of the extent of analyst forecasts. As analyst forecasts increase, not only do the rewards for meeting such forecasts increase but the penalties for not being able to do so also increase (e.g., Kasznik and McNichols 2002). Thus, the importance of the immediate goal of avoiding negative earnings surprises increases with the extent of analyst forecasts. Time pressure refers to the incentive to focus on a limited time frame and therefore goals within the time frame (e.g., Karau and Kelly 1992). As performance bonuses are awarded at the end of limited time frames, managers may focus only on what they have to attain within such limited time frames. Time pressure may also be influenced by past performance because poorly performing firms are under pressure to show immediate performance improvement. Finally, expertise of the problem solver refers to the tendency of individuals to use schemas while assessing the appropriateness of a proposed strategy (e.g., Chi et al. 1985). Experience in fields related to marketing contributes to managerial understanding of the short and long term payoffs of marketing and innovation assets. Therefore, such experience may activate schemas about short and long term costs of REAM while assessing whether REAM is appropriate for avoiding negative earnings surprises.

After making theoretical predictions about how analyst forecasts influence REAM, I assess REAM's long term effect on two components of firm risk, which are highlighted by marketing literature (e.g., Rego et al 2009; Tuli and Bharadwaj 2009). These components are idiosyncratic risk (i.e., stock returns volatility) and downside systematic risk (i.e. sensitivity of stock returns to stock market downturns). The results show that REAM increases idiosyncratic risk and downside systematic risk over four years following the budget cuts. The key takeaway for managers is that

although REAM in a year may seem like a temporary cut in real activities, REAM can make cash flows and revenues unpredictable over the subsequent four years, which investors penalize in terms of volatile stock returns over the four years. If a stock market downturn occurs (may be due to an economic recession), firms will be especially vulnerable to losses if they engaged in REAM in previous years.

Results indicate that well performing firms are as likely as poorly performing firms to increase firm risk by engaging in REAM in response to analyst forecasts. Results also show that organizations with more experience at managing marketing and innovation assets do not engage in REAM as much as organizations with less experience. Furthermore, as the marketing related experience of the executive team increases, the extent of REAM in response to analyst forecasts decreases. Thus, experience in fields related to marketing is valuable for preventing the misuse of real activities and should be fostered at all levels in organizations. Results also point to the necessity of restructuring annual bonus plans.

I organize the rest of the essay as follows. After a discussion of the importance of analyst forecasts in setting investor expectations of organizational earnings, and the importance of such forecasts for firms, I describe problem solving theory and hypotheses based on problem solving theory. I then describe my data, variable operationalizations and the random effects Bayesian estimation method followed by results. I wrap up the research with a discussion of contributions and managerial implications.

CONCEPTUAL FRAMEWORK

Analyst Forecasts and the Importance of Avoiding Negative Earnings Surprises

In this research, I refer to analyst forecasts in the plural because managers are known to respond to the mean level of analyst forecasts rather than to the forecast of a single analyst (e.g., Bartov, Givoly and Hayes 2002; Kasznik and McNichols 2002). Analyst forecasts are defined as the

extent of earnings expected by analysts that is unexplained by prior organizational earnings. In other words, the extent of analyst forecasts is conceptualized as the degree of optimism among analysts about yearend earnings. Research shows that the level of optimism is a systematic component and perhaps the most pervasive component of analyst forecasts (Easton et al. 2002).

In general, analyst forecasts or the degree of optimism among analysts increases over the forecast horizon (DeBondt and Thaler 1990). Thus, yearend earnings forecasts are mostly optimistic forecasts as compared to quarterly earnings forecasts. The level of optimism has economic significance because investors partially depend on analyst forecasts for setting expectations (e.g., Barber et al 2001). Having set optimistic expectations, investors penalize firms for not being able to meet analyst forecasts (e.g., Bartov, Givoly, and Hayn 2002). For example, prior to their earnings disclosure on December 8th, 1997, Oracle's stock was trading at a price 45 times its earnings, which was consistent with investors having optimistic expectations of earnings growth. Immediately after reporting earnings per share of 19 cents, up 4% from prior year levels, but four cents below analyst forecasts, the Oracle stock dropped 29% in one day and lost about $9 billion in firm value (e.g., Skinner and Sloan 2002). Evidence for such investor reactions to reported earnings has remained consistent over the years. For example, more recently, Brocade Communications posted a yearend profit (its second in a row after three consecutive losses). However its stock price sank 9.5% as the numbers fell short of analyst expectations (WSJ.com, February 2010). Thus, for managers, analyst forecasts are important benchmarks to attain.

Numerous explanations exist for the level of optimism among analysts. The level of optimism may be due to analyst over reaction to information (e.g., Abarbanell and Bernard 1992) or due to general herding behavior among analysts (e.g., Clement and Tse 2005). The level of optimism may be intentional due to analyst affiliation to biased brokerage houses (e.g., O'Brian and Bhushan 1990) that foster intentions to motivate stock trades (e.g., Eames, Glover and Kennedy 2002) and to

maintain investment banking businesses (e.g., Dugar and Nathan 1995). Scholars also identify psychological biases as contributing to the degree of optimism among analysts. For example, experiments show that analysts make more optimistic forecasts when company information is provided as scenarios rather than as lists (e.g., Sedor 2002). Irrespective of the incentives of analysts or the biases among analysts, research shows that analyst forecasts have become vital earnings thresholds for managers. Managers are motivated to meet such earnings thresholds for reasons such as increased stock valuations attached to avoiding negative earnings surprises (e.g., Bartov et al 2002; Kasznik and McNichols 2002; Brown and Caylor 2005), and penalties for posting negative earnings surprises such as litigation costs (e.g., Kasznik 1999), loss of reputation (e.g., Graham et al 2005), and negative stock valuations (e.g., Skinner and Sloan 2002). However, for the purpose of this research, where the aim is to study organizational behavior in response to analyst forecasts and the subsequent consequences, the motivations behind analyst forecasts is not of primary concern.

Problem Solving Theory

Anderson (1985) observed, "All cognitive activities are fundamentally problem solving in nature. The basic argument… is that human cognition is always purposeful and directed to achieving goals" (pg. 199-200). Analyst forecasts may be conceptualized as problems for managers to solve because managers have to find a solution for the goal of avoiding negative earnings surprises. The basis for drawing a parallel between problem solving research (that is based on human cognition) and organizational decision making is the view that organizational decision making is the result of both human cognitive capacity and the structural influences of organizations on human cognitive capacity (Ocasio 1997; Simon 1947, 1979). Indeed, organization decision making is not only considered to be an outcome of the shared cognition of the top management team (e.g., Hambrick and Mason 1984) but also an outcome of the shared cognition of all organizational members (e.g., Daft and Weick 1984). Such a parallel between human cognition and organizational decision making

allows the problem solving approach to be applied to a variety of organization decision making contexts such as creating the ability to convert ideas to products (e.g., Chandy et al. 2006), creating knowledge generation capabilities (e.g., Nickerson and Zenger 2004), and selecting marketing management support systems (e.g., Wierenga, van Bruggen, and Staelin 1999). Thus, my use of problem solving theory in order to predict the extent to which REAM will be used to solve the problem of 'reacting to analyst forecasts and avoiding negative earnings surprises' has a legitimate precedence in organizational literature.

Sweller (1988) describes two approaches of problem solving. First, the means-end analysis is a backward driven mechanism in the sense that achievement of the goal assumes more importance than the solution used to achieve the goal. The means-end analysis is also utilitarian because the appropriateness of a solution depends only on whether it helps achieve the immediate goal, and the consequences of the solution for other related goals are not deemed important (Chi, Glaser, and Rees 1985; Metcalfe and Wiebe 1987). In the current research context, if managers employ a means-end approach to understand how REAM is appropriate for avoiding negative earnings surprises, they are likely to find REAM favorable because it can directly inflate earnings. By employing a means-end analysis, managers are likely to ignore the long term effects of REAM on organizational viability and shareholder value.

Second, the schema-driven analysis applies inter-relationships with events, objects, situations as well as sequences of events and situations in order to assess the appropriateness of a solution (e.g., Sweller 1988). This approach is considered to be forward working because typically the immediate goal is considered as a part of a schema of associated goals and events. The appropriateness of a solution is assessed in terms of the degree to which the solution is likely to affect the entire space around the immediate goal (Marshall 1995). Therefore, when managers use a schema-driven analysis to assess the extent of REAM as a response to analyst forecasts, they are

likely to recognize that although negative earnings surprises will be avoided, REAM will incrementally hurt the fundamental drivers of organizational revenues and cash flows: marketing assets and R&D related assets. The appreciation of the broader organizational impact of REAM should lessen the extent to which managers will use REAM to avoid negative earnings surprises.

Hypotheses

Three components of problem solving theory predict whether managers will assess REAM as a means to an end (means-end) or as a strategy that can affect multiple organizational goals (schema-driven). These components are goal importance, time pressure and expertise.

Goal Importance

Goal importance refers to the incentives attached to achieving the specific goal in hand (e.g., Sanchez and Levine 1989). As the incentives to achieve a goal increases, managerial focus on the specific goal will increase and their focus on other goals will decrease. The exclusive focus on a specific goal activates a means-end approach, i.e., managers should find a solution appropriate as long as the solution solves the specific goal. Managers will not be concerned about the effect of the solution on other goals.

In the research context, the goal refers to avoiding negative earnings forecasts. As analyst forecasts increase and become optimistic, firms that are able to avoid negative earnings surprises send signals of high expected future performance, which investors reward with high abnormal returns (Bartov et al. 2002). On the flip side, as negative earnings surprises increase, firms suffer penalties in terms of negative abnormal returns and general pessimism about their stocks (Barth, Eliott, and Finn 1999). Thus, as analyst forecasts increase, managerial incentives to achieve the goal of avoiding negative earnings surprises also increases, i.e., goal importance increases.

As analyst forecasts increase the importance of achieving the goal of avoiding negative earnings surprises, managers should focus exclusively on the goal, and assess REAM favorably as

long as it directly inflates immediate earnings. Managers will pay less attention to schemas or associations of REAM with other organizational goals. Consequently, as analyst forecasts increase, the extent of REAM should increase.

H1. Increase in analyst forecasts lead to increases in REAM.

Time Pressure

Time pressure is defined as the value attached to solving problems within a limited time. As the incentives attached to solving a problem within a time frame increase (e.g., Karau and Kelly 1992), the pressure to solve the problem within the time frame increases. Consequently, if there are incentives to achieving goals within a time frame, managers should focus more on goals within the time frame rather than beyond the time frame. Time pressure may be induced by the bonus component of managerial compensation because bonus is an incentive for performance within a limited time frame such as a year (Baber, Kang, and Kumar 1999; Gaver and Gaver 1998). Research shows that bonuses tend to increase management incentives to focus exclusively on short term yearend performance goals (Fisher and Govindarajan 1992; Veliyath 2002). Thus, greater the level of bonuses, greater is the managerial incentive to focus on goals that have to be achieved by the end of the year such as avoiding negative earnings surprises.

Time pressure (i.e., the pressure to achieve goals within a limited time) can also be induced by organizational past performance. The current performance of firms is more scrutinized by creditors as well as investors when firms have performed badly than when past performance has met stakeholder expectations. As past performance decreases, threats of corporate takeover increases if organizations are not able to meet creditors' near term financial expectations (e.g., Agrawal and Knoeber 1996), and improve near term stock returns (e.g., Zuckerman 2000). When short term performance expectations are not met, the threat of management turnover is also more likely in poorly performing firms than in well performing firms (e.g., Puffer and Weintrop 1991).

Consequently, as past performance decreases, managerial pressure to achieve short term performance targets should increase.

As time pressure increases (due to increasing bonuses or due to decreasing past firm performance), the focus on short term organizational goals increases and the focus on long term organizational goals decreases. Thus, as time pressure increases, managers are likely to favorably assess REAM as a response to analyst forecasts simply because REAM is a means to the specific short term organizational goal of avoiding negative earnings surprises. As time pressure increases, managers are not likely to use a schema-driven analysis in response to analyst forecasts; i.e., they are likely to ignore the consequences of REAM for a schema of organizational goals such as long term customer value or cash flows. Therefore, as time pressure increases, the extent of REAM in response to analyst forecasts should increase. This leads to the following hypotheses.

H2a. As the bonus component of management compensation increases, the positive relationship between analyst forecasts and REAM increases.
H2b. As past firm performance decreases, the positive relationship between analyst forecasts and REAM increases.

Expertise

Expertise is the ability of the problem solver to analyze solutions from multiple aspects (e.g., Chi et al 1985). Factors that increase expertise enable the problem solver to assess a solution not only in terms of the specific problem in hand, but also in terms of other problems related to the focal problem (Marshall 1995; Sweller 1988). As expertise increases, problem solvers are not likely to use a solution if it meets one goal but compromises other associated goals.

I conceptualize expertise as TMT (top management team) marketing related experience and organization marketing related experience. TMT marketing related experience is defined as the experience within the current top management team in fields related to marketing such as sales, customer relationship management, brand management, and innovation management. Managers with marketing related experience are likely to understand and appreciate that resources provide

optimal value when nurtured and maintained over a prolonged period of time (e.g., Srivastava, Shervani, and Fahey 1998). Managers with marketing related experience are likely to understand how corporate strategy may affect customer perceptions, which in turn sustains firm value over time (e.g., Boyd, Chandy, and Cunha Jr. Forthcoming; Nath and Mahajan 2008) Thus, TMT marketing related experience increases management expertise at considering not only short term and long term implications of any strategy but also how different organization goals are connected to the goals of serving the customer.

Organization marketing related experience is defined as the extent of firm wide experience at managing intangible assets. Intangible assets are resources and capabilities, whose immediate financial payoffs are not evident but which deliver financial payoffs over a prolonged period of time. Marketing and R&D related assets such as brands, customer satisfaction, trust among channel partners, and products, create the bulk of intangible assets in firms (e.g., Srivastava et al 1998). As firms build up intangible assets, they gather experience at managing assets that have more long term financial payoffs than short term financial payoffs. Furthermore, as firms stock up on intangible assets, they are also likely to develop a market oriented view of the firm, which facilitates understanding of how strategic investments affect channels, interfirm alliances, and customers (Pelham and Wilson 1996; Slater and Narver 1995). As marketing related experience of an organization increases, most managers (with or without specific marketing related personal experience) should understand how strategic investments like marketing and R&D work. Consequently, managerial willingness for activities that compromise such investments should decrease.

In summary, as expertise is derived from marketing related experience, expertise should evoke schemas of how REAM may compromise functions that create and sustain customers over time. Therefore, as expertise increases (due to TMT marketing related experience and due to

organization marketing related experience), managers are likely to consider not just whether REAM serves as a means to a short term goal of avoiding negative earnings surprises, but how REAM may affect other organizational goals. Consequently, as expertise increases, managerial willingness to use REAM as a response to analyst forecasts may decrease. This leads to the following hypotheses.

H3a. As TMT marketing related experience increases, the positive relationship between analyst forecasts and REAM decreases.
H3b. As organization marketing related experience increases, the positive relationship between analyst forecasts and REAM decreases.

Consequences of REAM for Long Term Firm Risk

REAM in response to analyst forecasts is designed to inflate immediate earnings and avoid negative earnings surprises. In order to show managers that REAM can have long term performance effects, scholars have mapped the long term effects of marketing and innovation related investments on firm value. For example, Mizik (2010) uses a time series approach to show that the negative effects of unscheduled advertising and R&D cuts on abnormal returns persist over multiple years. Such evidence suggests that cut backs in customer centric activities should eventually lead to loss in customer equity and vulnerability to competition (e.g., Vargo and Lusch 2004), which could increase firm risk. Although firm risk is as important a component of performance as firm value (Gruca and Rego 2005; McAlister, Srinivasan, and Kim 2007; Rego, Billett, and Morgan 2009; Tuli and Bharadwaj 2009), literature on the consequences of marketing and innovation related investments on long term firm risk is scarce. In this essay, I investigate whether REAM increases both idiosyncratic risk and downside systematic risk in the long term.

Idiosyncratic Risk

Idiosyncratic risk on an average accounts for approximately 80% of the variation in stock returns (e.g., Goyal and Santa-Clara 2003; Gaspar and Massa 2006). Idiosyncratic risk reflects uncertainties in future revenue streams and cash flow cycles (e.g., Clayton, Hartzell, and Rosenberg 2005). Managers are sensitive to idiosyncratic risk because the underlying vagaries in cash flow cycles

and revenue streams make financial planning difficult (e.g., Irvine and Pontiff 2009), and can put firm survival at risk (e.g., Grinblatt and Titman 1998).

REAM may increase idiosyncratic risk over time for its effect on future revenue streams and cash flows. Unplanned reductions in R&D investments can delay product development cycles, reduce speed of product launches, and create unpredictable future revenue streams (see Kessler and Chakrabarti 1996). REAM in the form of reductions in customer centric investments lowers customer loyalty (e.g., Bell, Auh, and Smalley 2005), which makes customer demand unpredictable. As a result, REAM may gradually lead to unpredictable production cycles and inventory management (e.g., Bharadwaj, Bharadwaj, and Bendoly 2007), all of which jeopardize cash flows. Overall, REAM should make investors increasingly uncertain about organizational financial performance. In sum,

H4. REAM increases idiosyncratic risk in the long term.

Downside Systematic Risk

Some studies suggest that REAM may also increase downside systematic risk over time. Systematic risk, in general, refers to the extent to which stock returns are sensitive to movements in the entire economy or market (Sharpe 1964). Although systematic risk, as measured by the capital asset pricing model (CAPM), does not distinguish between upside systematic risk (the extent to which stock returns rise with upturns in the entire market) and downside systematic risk (the extent to which stock returns fall with downturns in the entire market), research shows an asymmetry between upside and downside risk (Bekaert and Wu 2000; Hong, Tu, and Zhou 2006). Empirical research in the management field shows that decisions makers are primarily concerned with the downside of risk, i.e. the extent to which stock returns fall with market downturns (Baird and Thomas 1990; Reuer and Leiblein 2000). Downside systematic risk is increasingly being recognized in the marketing literature because managers are interested in understanding whether investments in

customer centric investments insulate firms from market downturns (e.g., Rego et al. 2009; Tuli and Bharadwaj 2009).

REAM may affect downside systematic risk over time for multiple reasons. Temporary reductions in value communication activities such as advertising may snowball into increases in price sensitivity, and therefore decreases in customer loyalty over the long term (e.g., Mela, Gupta, and Lehmann 1997). Reductions in value creation activities such as customer service delivery may snowball into widespread customer dissatisfaction (Mittal, Kamakura, and Govind 2004). Temporary reductions in other value creation activities such as stalled R&D projects and diversion of resources meant for R&D, may reduce organizational speed of response to changing customer demands (Kessler and Chakrabarti 1996). In summary, over time REAM creates customer dissatisfaction, which accelerates customer switching behavior and therefore earnings decline during market downturns. More formally,

H5. REAM increases downside systematic risk in the long term.

METHODOLOGY

Data

Since marketing and R&D budgets are primarily affected by REAM, I require a sampling frame of industries in which there is variance in both R&D and marketing budgets. In manufacturing industries, R&D and marketing form important components of the value chain. In addition, from a generalizability perspective, manufacturing industries represent a broad range of firms with varying marketing and R&D budgets. For example, an industry like electronic components has higher average R&D budgets and lower average marketing budgets than the fast moving consumer goods industry. Therefore, manufacturing industries represents an appropriate sampling frame.

I collect data from five sources: COMPUSTAT, CRSP (Centre for Research in Security Prices), EXECOMP, I/B/E/S, and 10-K reports from 1995 to 2008. COMPUSTAT provides annual data on accounting variables, R&D expenses, and sales general and administrative expenses (SG&A). CRSP provides data on stock prices. EXECOMP provides data on top management compensation plans. I/B/E/S summarizes security analyst forecasts for yearend earnings per share (EPS), and also provides details of analyst forecasts. 10-K reports listed with the Security and Exchange Commission provide short biographies of top management teams. I collected complete data for 2864 firms from COMSTAT, CRSP and I/B/E/S. Due to a large number of missing data in EXECOMP, after matching firms and time periods with COMPUSTAT, CRSP and I/B/E/S, the set of firms with complete data reduces to 2140. A final matching of this data with 10-K reports yields a sample of 731 firms across twelve industries. The total number of firm-year observations is 11,734. I report the descriptive statistics in Table 3-1.

Variable Operationalization and Estimation Method

Dependent Variables: Real Activity Manipulation (REAM)

REAM has two components. The first component is the portion of the annual marketing budget that is unscheduled or unexplained by prior period budgets. The second component is the portion of the annual R&D budget that is unscheduled. I can measure the two components with the residuals from regressions of marketing (R&D) budgets on their prior period marketing (R&D) budgets. The negative sign of the respective residuals indicates unscheduled cuts in marketing and R&D budgets.

I use the residuals from the following equations as my dependent variables for REAM (e.g., Mizik 2010).

$$\frac{\text{Mktg}_{\text{ift}}}{\text{Sales}_{\text{ift}}} = \emptyset_{\text{mktg}} + \propto_{\text{ift}} \text{Mktg}_{\text{ift-1}}/\text{Sales}_{\text{ift-1}} + \varepsilon_{\text{mktg, ift}} \quad (1)$$

$$\frac{R\&D_{ift}}{Sales_{ift}} = \emptyset_{R\&D} + \beta_{ift} R\&D_{ift\text{-}1}/Sales_{ift\text{-}1} + \varepsilon_{R\&D,\,ift} \quad (2)$$

where,

i = 1, 2…I industries,

f = 1, 2,….F_i firms in industry *i*,

t = 1, 2,….T_{if} refers to the observation year of firm *f* in industry *i*,

$Mktg_{ift}$ refers to the annual marketing budget, which is calculated as $SG\&A_{ift}$-$R\&D_{ift}$ (e.g., Dutta et al 1999),

$R\&D_{ift}$ refers to the annual research and development budget,

Sales refers to the net sales,

$\varepsilon_{mktg,ift}$ measures the unscheduled portion of marketing budget in year *t*,

$\varepsilon_{R\&D,\,ift}$ measures the unscheduled portion of R&D budget in year *t,*

Decreasing values of $\varepsilon_{mktg,\,ift}$ and $\varepsilon_{R\&D,\,ift}$ indicate unscheduled reductions in marketing and R&D budgets,

$\emptyset_{mktg}$, $\emptyset_{R\&D}$ are intercept terms.

$\propto_{ift}$ and β_{ift} are coefficients.

I estimate equations 1 and 2 simultaneously using a random effects Bayesian method. With this method, the dependent variables in the two equations are allowed to co-vary using a multivariate normal distribution. The coefficients $\propto_{ift}$ and β_{ift} each follow a hierarchical structure such that coefficients are allowed to vary by time, firm and industry.[9]

Dependent Variables: Long Term Firm Risk

In this research, I look at two dimensions of firm risk: idiosyncratic risk and downside systematic risk.

Idiosyncratic Risk (IR). Idiosyncratic risk in year *t* is measured as the standard deviation of residuals of the Fama-French 3 factor model. I present the details of the Fama-French 3 factor model below. For the purpose of assessing the effect of REAM on long term idiosyncratic risk, I look at how idiosyncratic risk at time *t* is influenced by REAM in prior periods (e.g., REAM at *t-1*, *t-2*, *t-3* and *t-4*).

The Fama–French 3 factor model is described in equation 3.

$$(R_{fd} - R_{f_rd}) = \alpha_f + \beta_{mkt,f}(R_{mkt,d} - R_{f_rd}) + \beta_{sf}SMB_d + \beta_{hf}HML_d + \beta_{mom,f}MOM_d + e_{fd} \quad (3)$$

where,

R_{fd} is daily stock price return of firm *f*,

R_{dm} is the daily risk free return,

$R_{mkt,d}$ is the daily return on a value- weighted market portfolio,

SMB_d is the Fama-French size portfolio on day *d*,

HML_d is the Fama-French market - to- book ratio portfolio on day *d*,

MOM_d is the momentum factor.

Downside Systematic Risk (dnSR). For downside systematic risk, I estimate equation 3 for only stock market downturns (e.g., Ang, Chen, and Xing 2006). Stock market downturns can be identified from the negative difference between the market return and the risk free return, i.e., $(R_{mkt,d} - R_{f_rd})$ is negative. I am able to identify negative values of $(R_{mkt,d} - R_{f_rd})$ from the Fama-French Portfolio and Factors database. I obtain downside systematic risk ($\beta_{dnmkt,f}$) from the coefficient of $(R_{mkt,d} - R_{f_rd})$ in equation 3. For the purpose of assessing the effect of REAM on long term downside systematic risk, I look at how downside systematic risk at time *t* is influenced by REAM in prior periods (e.g., REAM at *t-1*, *t-2*, *t-3* and *t-4*).

Independent Variables

Analyst Forecasts: In the accounting literature, the degree of optimism among analysts for end of time *t* is measured as the difference between realized earnings at end of time *t* and the mean analyst forecasts for end of time *t* (e.g., Das, Levine and Sivaramakrishnan 1998; Butler and Lang 1991). A negative difference indicates that analysts were optimistic about the firm for time *t*. Thus, the measure of optimism as used in the accounting literature is calculated post-hoc. For this research, I cannot use such a post-hoc difference measure because conceptually (1) managers look at analyst forecasts first, and then make decisions about the extent of REAM, and (2) if the realized earnings are being manipulated, then using such earnings to infer optimism will not be an accurate reflection of optimism.

Instead, I need a measure of analyst forecasts that managers may a priori see and use for strategic decisions. Since analyst forecasts are defined as the degree of optimism among analysts about firm yearend earnings, I use the portion of mean analyst earnings forecast for end of year *t* that is unexplained by the previous period's realized earnings. All positive values of the unexplained portion should indicate optimism among analysts. All negative values of the unexplained portion should indicate pessimism among analysts about firm future performance.

In order to calculate analyst forecasts, I follow two steps. First, I use prior period (*t-1*) realized earnings to predict the earnings of year *t* as shown in equation 4.

$$EPS_{ift} = \emptyset_{EPS} + \theta_{ift} EPS_{ift-1} + \varepsilon_{ift} \quad (4)$$

Second, I take the predicted earnings ($\widehat{EPS}_{ift}$) from equation 4, and calculate the difference between mean analyst forecast for yearend *t* and the predicted earnings for *t* (i.e., mean analyst forecast for $EPS_{ift} - \widehat{EPS}_{ift}$). Since the hypotheses are framed in terms of analyst forecasts that reflect degrees of optimism, in the estimation procedure I use only the firm-year observations in which analyst forecasts are optimistic (i.e., $EPS_{ift} - \widehat{EPS}_{ift} > 0$). There are 5018 such observations.

Bonus Component of Top Management Compensation. The annual dollar value of the bonus for executives in the top management team is listed in EXECOMP. I use the ratio of bonus to total annual compensation (which includes salary, bonus, restricted stock grants, all other payouts, and value of option grants).

Past Performance. I measure past performance in terms of stock returns relative to industry stock returns. Firms that outperform industry stock returns are considered to perform better than firms that underperform (e.g., Markovitch et al 2005). I calculate the measure in two steps. First, I take the difference between the firm's stock returns at *t-1* and the industry average stock return at *t-1*. Stock return of firm *f* at time *t-1* is measured as $(SP_{ft-1} - SP_{ft-2} + Dividend_{ft-1})/SP_{ft-2}$, where SP denotes stock price. For industry average, I take the average of stock returns across all the firms in the industry at time *t-1*. Since I conceptualize H2a in terms of decreasing past performance, I multiply the relative stock returns by (-1). Thus, past performance is a continuous variable, which in the positive direction indicates decreasing past performance, and in the negative direction indicates increasing past performance.

TMT Marketing Related Experience. The 10-K report provides short biographies of executives of the top management team. The following is a biography of an executive officer of Dell described in the 10-K report published at the end of fiscal year 2008.

"*Bradley R. Anderson* — Mr. Anderson joined us in July 2005 and serves as Senior Vice President, Business Product Group. In this role, he is responsible for worldwide development and marketing of our enterprise products, including servers, networking, and storage systems. Prior to joining Dell, Mr. Anderson was Senior Vice President and General Manager of the Industry Standard Servers business at Hewlett-Packard Company ("HP"), where he was responsible for HP's server solutions and marketing. Previously, he was Vice President of Server, Storage, and Infrastructure for HP, where he led the team responsible for server, storage, peripheral, and infrastructure product management. Before joining HP in 1996, Mr. Anderson held management positions at Cray Research. He has been involved in field marketing, sales and corporate marketing since he started his career in 1989. Mr. Anderson earned a bachelor of science in Petroleum Engineering from Texas A&M University and a Master of Business Administration from Harvard University. He serves on the Texas A&M Look College of Engineering Advisory Council."

The marketing related experience of Bradley Anderson for year 2008 is calculated as (2008-1989). I calculate the total marketing experience for all executive officers in firm *f* at time *t* who possess experience in areas such as product management, sales, brand management and innovation management.

Organization Marketing Related Experience. Marketing and innovation activities create intangible assets. Thus, firms that possess high levels of such intangible assets should have greater experience at managing marketing and innovation activities than firms with low levels of intangible assets. Therefore, I measure organization marketing related experience at *t* by the degree of intangible assets adjusted for firm size at the end of *t-1*, i.e., the average of $\frac{\text{R\&D}_{\text{ift-1}}}{\text{Sales}_{\text{ift-1}}}$ and $\frac{\text{SG\&A}_{\text{ift-1}} - \text{R\&D}_{\text{ift-1}}}{\text{Sales}_{\text{ift-1}}}$. I use a lagged value of the construct because it captures organization marketing related experience that helps in decision making at time *t*.

Controls when REAM is Dependent Variable

Unscheduled marketing and R&D budget cuts may be influenced by factors other than analyst forecasts. Firms may decide to adjust their advertising and R&D budgets based on the number of new products scheduled to be released in a year. It is possible that in anticipation of upcoming new product launches, firms may increase their marketing expenses more than the baseline expense, and reduce R&D expenses to less than the corresponding baseline expense. In order to control for the number of new products, I read 10K reports to calculate the number new products released in a year and adjust it for firm size (measured as sales). Next, working capital could also determine organizational expenses because it determines the liquidity of organizational assets – an important source of internal finance (e.g., Fazzari and Peterson 1993). I control for working capital. In order to control for effects on REAM due to time and industry characteristics, I use year specific dummy variables and industry specific dummy variables respectively.

I also control for the variance in analyst forecasts because increasing variance reflects uncertainty among analysts (e.g., Healy and Palepu 2001). If analysts are uncertain, then investors may not consider analyst forecasts as accurate. Therefore, it is possible that firms may not be penalized by investors if firms report negative earnings surprises. Next, managers may not increase REAM if they use other earnings management strategies such as accounting manipulations (also referred to as discretionary accruals) in order to avoid negative earnings surprises. I apply the sequential regression method used by Dechow et al (1995) and Bergstresser and Philippon (2006) to calculate discretionary accruals.[10] I adjust the measure for firm size by dividing discretionary accruals by sales. Furthermore, if managers disclose information to analysts in order to revise analyst forecasts downwards (e.g., Soffer, Thiagarajan, and Walther 2000), then managers may not have to increase REAM. I use a dummy variable to control for downward revisions of earnings forecasts towards the end of the year. This variable take a value of 1 if the difference between 'the first mean analyst forecasts for *t* made right after annual earnings for *t-1* are reported' and 'the last mean analyst forecasts for *t* made just before annual earnings for *t* are reported' is positive, and 0 otherwise. Positive differences indicate downwards earnings forecast revisions.

Controls when Idiosyncratic Risk and Downside Systematic Risk are Dependent Variables

When idiosyncratic risk and downside systematic risk are used as dependent variables (for the effect of REAM on firm risk), in order to identify control variables, I refer to the marketing literature that uses firm risk as dependent variables (e.g., McAlister et al 2007; Rego et al 2009; Tuli and Bharadwaj 2009). The control variables are total assets (I use the logged value to normalize the variable), leverage (long term debt/long term debt + market capitalization), dividend payout (cash dividends/market capitalization), liquidity (current assets/current liabilities), return on assets (income before extraordinary items/total assets), industry and time specific dummy variables.

Estimation Procedures

The estimation procedure involves four regressions. Two regressions are for the effect of analyst forecasts on unscheduled changes in marketing and R&D budgets respectively, and two regressions are for the effects of REAM on long term idiosyncratic risk and downside systematic risk respectively. For tests of hypotheses, a multivariate random effects Bayesian estimation procedure is useful for two reasons. First, multiple equations can be estimated simultaneously by allowing the dependent variables to be part of a multivariate normal distribution. Second, by assigning the coefficients a hierarchical distribution across time, firm and industries, I can incorporate heterogeneity in the estimation.

Therefore, I estimate the following four equations with a multivariate random effects Bayesian estimation method.

$$\boldsymbol{\varepsilon_{Mktg,\,ift}} = \gamma_{0,Mktg} + \gamma_{Mktg,1ift}\varepsilon_{Mktg,ift-1} + \gamma_{Mktg,2ift}\,AF_{ift} + \gamma_{Mktg,3ift}AF_{ift}{*}\,AF_{ift} + \gamma_{Mktg,4ift}BON_{ift} + \gamma_{Mktg,5ift}PP_{ift} + \gamma_{Mktg,6ift}UME_{ift} + \gamma_{Mktg,7ift}OME_{ift} + \gamma_{Mktg,8ift}BON_{ift}{*}\,AF_{ift} + \gamma_{Mktg,9ift}PP_{ift}{*}\,AF_{ift} + \gamma_{Mktg,10ift}UME_{ift}{*}\,AF_{ift} + \gamma_{Mktg,11ift}OME_{ift}{*}\,AF_{ift} + \sum_{k=1}^{k=K_{MR}}\gamma_{Mktg,control,\,kift}\,Control_{kift} + \epsilon_{Mktg,ift} \quad (5)$$

$$\boldsymbol{\varepsilon_{R\&D,ift}} = \gamma_{0,R\&D} + \gamma_{R\&D,1ift}\varepsilon_{R\&D,ift-1} + \gamma_{R\&D,2ift}\,AF_{ift} + \gamma_{R\&D,3ift}AF_{ift}{*}\,AF_{ift} + \gamma_{R\&D,4ift}BON_{ift} + \gamma_{R\&D,5ift}PP_{ift} + \gamma_{R\&D,6ift}UME_{ift} + \gamma_{R\&D,7ift}OME_{ift} + \gamma_{R\&D,8ift}BON_{ift}{*}\,AF_{ift} + \gamma_{R\&D,9ift}PP_{ift}{*}\,AF_{ift} + \gamma_{R\&D,10ift}UME_{ift}{*}\,AF_{ift} + \gamma_{R\&D,11ift}OME_{ift}{*}\,AF_{ift} + \sum_{k=1}^{k=K_{RD}}\gamma_{R\&D,control,kift}\,Control_{REAM,kift} + \epsilon_{R\&D,\,ift} \quad (6)$$

$$\mathbf{IR_{ift}} = \gamma_{IR,0} + \sum_{j=0}^{4}\beta_{IR,ift-j}REAM_{ift-j} + \sum_{k=1}^{k=K_{IR}}\gamma_{IR,\,k,ift}\,Control_{IR,ift} + \epsilon_{IR,\,ift} \quad (7)$$

$$\mathbf{dnSR_{ift}} = \gamma_{dnSR,0} + \sum_{j=0}^{4}\beta_{dnSR,ift-j}REAM_{ift-j} + \sum_{k=1}^{k=K_{dnSR}}\gamma_{dbSR,k,ift}\,Control_{dnSR,k,ift} + \epsilon_{dnSR,\,ift} \quad (8)$$

where,

i =1, 2,….I industries,

f = 1, 2,….F_i firms in industry i,

t = 1, 2,…T_{if} years of firm f in industry i,

k = 1, 2….K control variables,

AF_{ift} refers to analyst forecasts,

$REAM_{ift}$ is a dummy variable that is assigned a value of 1 when at time *t*, three things happen: (a) Realized EPS_{ift}- Analyst forecast $EPS_{ift} \geq 0$, i.e., the firm meets or beats earnings forecasts at time *t*, (b) $\varepsilon_{Mktg,ift} < 0$, i.e., there is an unscheduled marketing budget cut, and (c) $\varepsilon_{R\&DR,ift} < 0$, i.e., there is an unscheduled R&D budget cut**.** The assumption behind such an operationalization is that if the firm manages to avoid negative earnings surprise, and simultaneously makes unscheduled marketing and R&D cuts, then the cuts are made for earnings inflation. If one of these three conditions is not met, $REAM_{ift}$ is assigned a value 0. A similar operationalization of REAM is used by Mizik (2010). The author identifies REAM in a year when a firm shows unexpected positive earnings and makes unscheduled marketing and R&D budget cuts simultaneously.

IR_{ift} is idiosyncratic risk,

$dnSR_{ift}$ is downside systematic risk,

BON_{ift} is bonus component of top management team,

PP_{ift} is past performance of firm,

UME_{ift} is upper echelon marketing related experience,

OME_{ift} is organization marketing related experience,

Control refers to all control variables,

$\gamma_{0,Mktg}$, $\gamma_{0,R\&D}$, $\gamma_{0,IR}$, $\gamma_{0,dnSR}$ are intercepts.

$\epsilon_{Mktg,ift}$, $\epsilon_{R\&D,ift}$, $\epsilon_{IR,ift}$, $\epsilon_{dnSR,ift}$ are randomly distributed errors.

Equations 5 and 6 test for the influence of analyst forecasts (AF) on marketing residuals ($\varepsilon_{Mktg,ift}$) and R&D residuals ($\varepsilon_{R\&D,ift}$) respectively. In these equations, I test for both the linear effect as well as the non-linear effect of analyst forecasts in order to account for a possible presence

of a threshold beyond which the effect of analyst forecasts intensifies or disappears. Furthermore, a two way effect between analyst forecasts and a different construct may sometimes be confounded with a non-linear effect if analyst forecasts is correlated with the different construct (e.g., Ganzach 1998). Therefore, testing simultaneously for a non-linear effect of analyst forecasts as well as a two way effect of analyst forecasts with another construct lends validity to the coefficients of two way effects. In equations 7 and 8 respectively, I test how idiosyncratic risk (IR) and downside systematic risk (dnSR) at time *t* are affected if the firm engaged in REAM at time periods *t-4*, *t-3*, *t-2*, *t-1* and *t*. I am able to look at only four prior periods due to data constraints.

I allow the four dependent variables in equations 5, 6, 7 and 8 to co vary by assigning them a multi-variate normal distribution. Furthermore, I allow coefficients of all independent variables to vary by time, firm and industry so that the model incorporates heterogeneity. In order to incorporate heterogeneity, I assume a multi-variate normal hierarchical prior structure for coefficients. For example, the coefficients of all independent variables of interest (N=11) in equation 5 are distributed multivariate normal [$\gamma_{\mathrm{Mktg,nift}} \sim \mathrm{N_N}(\overline{b_{\mathrm{Mktg,nif}}}, V^{-1})$], and are drawn from respective firm level distributions. The means of the firm level distributions are distributed multivariate normal $\overline{b_{\mathrm{Mktg,nif}}} \sim \mathrm{N_N}(\overline{\overline{b_{\mathrm{Mktg,ni}}}}, C^{-1})$ such that $\overline{\overline{b_{\mathrm{Mktg,ni}}}}$ represents means of industry level distributions, which in turn are assigned the following multivariate normal prior $\overline{\overline{b_{\mathrm{Mktg,ni}}}} \sim \mathrm{N_N}(\widetilde{b_{\mathrm{Mktg,n}}}, \tau^{-1})$. Finally, $\widetilde{b_{\mathrm{Mktg,n}}} \sim \mathrm{N_N}(0, \varphi^{-1})$. The precisions (V, C, τ) are each assigned non-informative priors with Wishart form of distribution. φ is a precision matrix in which the off diagonals are set as 1.0 X 10^{-4} and the diagonal values are set as 1.0 X 10^{-6} (for a diffuse prior specification).

RESULTS

Model Selection

The overall model comprises four equations (equations 5, 6, 7, 8). I refer to the overall model with only main effects as the main effect model. I refer to the overall model with main effects and interaction effects as the interaction model. I use Markov Chain Monte Carlo methods, where I discard the first 25000 draws for burn-in and use 10000 additional draws to characterize the posterior distributions of the parameters. I assess convergence across two chains of iterations with the Gelman-Rubin statistic (Brooks and Gelman 1998).[11] I also assess the predictive validity of the two overall models in the following way. I deleted the last firm year randomly from among the 731 firms in each of the four equations, following which I estimated the main effect model and the interaction model using the modified data. For each model, I calculated the root mean square errors (RMSE) for the predicted values of the deleted observations. I find that the interaction model has a lower root mean squared error than the main effect model (main effect model: 11.36, interaction model: 8.19). Therefore, for tests of hypotheses, I report the results from the interaction model only.

Effect of Analyst Forecasts on REAM

I report the coefficients and their respective confidence intervals in Table 3-2. I denote the coefficient as b and report statistical significance with ** if 0 does not lie within the 95% confidence interval, and * if 0 does not lie within the 90% confidence interval. H1 states that increase in analyst forecasts will lead to increase in REAM, i.e., analyst forecasts should have a negative relationship with unscheduled changes in marketing and R&D budgets. The results support H1 ($b_{Mktg,AF}$= -0.15**, $b_{R\&D,AF}$ = -0.34**). In H2a, I expect the extent of REAM in response to analyst forecasts to increase as the bonus component of top management compensation increases. The coefficient for the two way effect between analyst forecasts and bonus is positive and significant for both marketing and R&D ($b_{Mktg,AF*BON}$= 0.23**, $b_{R\&D,AF*BON}$ = 0.29**). This result indicates that the

negative effect of analyst forecasts on unscheduled changes in marketing and R&D expenses increases as the bonus component of top management compensation increases. Thus, H2a is supported.

H2b suggests a positive interaction between analyst forecasts and past performance. Since past performance is measured as the product of (-1) and stock returns relative to industry, a positive two way effect should be interpreted as the following. Under decreasing past performance, the negative effect of analyst forecasts on unscheduled changes in marketing and R&D should increase. The results do not show a positive effect, instead they reveal a negative and statistically significant coefficient for both marketing and R&D ($b_{Mktg,AF*PP}$= - 0.13*, $b_{R\&D,AF*PP}$ = -0.17*). This negative coefficient implies that as past performance decreases, firms are not more but less likely to increase REAM in response to analyst forecasts. As past performance is a continuous variable, the result can also be interpreted as: well performing firms are more likely than poorly performing firms to increase REAM in response to analyst forecasts.

In H3a, the predicted direction for the coefficient of interaction between analyst forecasts and TMT marketing related experience is negative. This is because TMT marketing related experience should reduce the extent to which analyst forecasts negatively influence unscheduled changes in marketing and R&D budgets. For TMT marketing related experience, the results support H3a because the two way effects are negative and statistically significant ($b_{Mktg,AF*UME}$= - 0.19*, $b_{R\&D,AF*UME}$ = -0.61*).

Similar to H3a, for H3b I expect a negative two way effect between analyst forecasts and organization marketing related experience. Results support H3b because the two way effects are negative and statistically significant ($b_{Mktg,AF*OME}$= - 0.38**, $b_{R\&D,AF*OME}$ = -0.74**). Thus, organization marketing related experience reduces the extent to which analyst forecasts negatively influence unscheduled changes in marketing and R&D budgets.

Additional Analysis. Analyst forecasts are available on a quarterly basis too. I test the robustness of my model using quarterly instead of annual analyst forecasts. I re-analyze equations 5 and 6 using 4th quarter analyst forecasts as the primary independent construct of interest and 4th quarter marketing and R&D residuals as the respective dependent variables. I focus on the 4th quarter because of two reasons. First, the bonus variable is an annual measure and not a quarterly measure. Thus, this variable will not vary by fiscal quarters in a year. However, the effect of bonus may be heightened towards the end of the year due to pressure to achieve an annual performance level that will yield the bonus. Second, a cursory analysis of the data reveals that the number of firms making unscheduled cuts in marketing and R&D budgets in the fourth quarter is significantly greater than in the first three quarters (see Figure 3-1). Furthermore, the average magnitude of unscheduled cuts in marketing and R&D budgets in the fourth quarter is also significantly higher than previous quarters (see Figure 3-2). The prevalence and intensity of such cuts in the fourth quarter should help capture the phenomenon of REAM more accurately than other quarters.

I measure quarterly analyst forecasts in the same manner as annual analyst forecasts except that the predicted EPS_{ift} for the end of quarter 4 (I refer to the model in equation 4) is estimated using the EPS_{ift} from the 4th quarter in the previous year. Similarly, marketing (R&D) residuals are obtained from a regression of the marketing (R&D) budget in quarter 4 on the marketing (R&D) budget in the same quarter of the previous year. The results are shown in Table 3-3. All results are robust to this alternate specification ($b_{Mktg,AF}$= -0.24**, $b_{R\&D,AF}$ = -0.37**; $b_{Mktg,AF*BON}$= 0.29*, $b_{R\&D,AF*BON}$ = 0.38*; $b_{Mktg,AF*PP}$= - 0.09, $b_{R\&D,AF*PP}$ = -0.12*; $b_{Mktg,AF*UME}$= - 0.24*, $b_{R\&D,AF*UME}$ = -0.31*; $b_{Mktg,AF*OME}$= - 0.18**, $b_{R\&D,AF*OME}$ = -0.26**).

REAM and Long Term Firm Risk

From equations 7 and 8 respectively, I am able to estimate how idiosyncratic risk (IR) and downside systematic risk (dnSR) of firm *f* at time *t* is influenced by any REAM that the firm may have engaged in time periods *t*, *t-1*, *t-2*, *t-3* and *t-4*. All results are described in Table 3-4, Panel A.

H4 suggests that REAM increases idiosyncratic risk in the long term. Consequently, from equation 7, I expect to see idiosyncratic risk of firm *f* at time *t* to be positively influenced (i.e., increase in risk) by any REAM the firm may have engaged in periods prior to *t*. H4 is supported because the coefficients of REAM are positive and statistically significant from *t-1* to *t-4* ($b_{\text{REAM at t}}$ =-0.08, $b_{\text{REAM at t-1}}$ =0.09*, $b_{\text{REAM at t-2}}$ = 0.11*, $b_{\text{REAM at t-3}}$ = 0.24*, $b_{\text{REAM at t-4}}$ = 0.29**). From these results, it seems that REAM four periods back has the maximum effect on idiosyncratic risk. In other words, REAM four periods back can increase idiosyncratic risk by 29%. Thus, investors become increasingly uncertain about organizational stock returns over time as the adverse effects of REAM on cash flows and revenues are fully realized.

H5 proposes that REAM increases downside systematic risk in the long term. From equation 8, I expect to see downside systematic risk of firm *f* at time *t* to be positively influenced (i.e., increase in risk) by any REAM the firm may have engaged in periods prior to *t*. REAM at all past periods *t-1*, *t-2*, *t-3*, and *t-4* increase the downside systematic risk of the firm at time *t* ($b_{\text{REAM at t}}$ = -0.06, $\text{mean}_{\text{REAM at t-1}}$ = 0.07*, $\text{mean}_{\text{REAM at t-2}}$ = 0.18**, $\text{mean}_{\text{REAM at t-3}}$ = 0.29**, $\text{mean}_{\text{REAM at t-4}}$ = 0.34**). REAM four periods back can increase downside systematic risk by 34%.

Additional Analysis. For the purpose of avoiding negative earnings surprises, firms may make unscheduled cuts in **only** marketing budgets or **only** R&D budgets instead of in both marketing and R&D budgets. In order to accommodate such possibilities, I re-define REAM for two different scenarios and separately test for the long term effects of REAM on firm risk in the two scenarios.

In scenario 1, firms avoid negative earnings surprises by making unscheduled cuts in only marketing budgets. Therefore, $REAM_{ift}$ takes a value of 1 if

Realized EPS_{ift}- Analyst forecast $EPS_{ift} \geq 0$, and $\varepsilon_{Mktg,ift} < 0$. $REAM_{ift}$ takes a value of 0 otherwise[12]. The results for the effects of REAM are listed in Table 3-3 Panel B. In terms of idiosyncratic risk, the effects of REAM in prior periods on idiosyncratic risk at *t* are all positive ($b_{REAM\ at\ t}$= -0.06, $b_{REAM\ at\ t-1}$ = 0.06*, $b_{REAM\ at\ t-2}$ = 0.07*, $b_{REAM\ at\ t-3}$ = 0.12*, $b_{REAM\ at\ t-4}$ = 0.17*). Also, the effects of REAM in prior periods on downside systematic risk at time *t* are positive ($b_{REAM\ at\ t-1}$= -0.03, $b_{REAM\ at\ t-1}$ = 0.07*, $b_{REAM\ at\ t-2}$ = 0.15*, $b_{REAM\ at\ t-3}$ = 0.26**, $b_{REAM\ at\ t-4}$ = 0.28*).

In scenario 2, firms avoid negative earnings surprises by making unscheduled cuts in only R&D budgets. Therefore, $REAM_{ift}$ takes a value of 1 if Realized EPS_{ift}- Analyst forecast $EPS_{ift} \geq 0$, and $\varepsilon_{R\&D,\ ift} < 0$. $REAM_{ift}$ takes a value of 0 otherwise.[13] I report results in Table 3-3 Panel C. For idiosyncratic risk, REAM at periods *t-3* and *t-4* significantly increasing idiosyncratic risk at time *t* ($b_{REAM\ at\ t}$= -0.03, $b_{REAM\ at\ t-1}$ = 0.03, $mean_{REAM\ at\ t-2}$ = 0.06, $mean_{REAM\ at\ t-3}$ = 0.22**, $mean_{REAM\ at\ t-4}$ = 0.24**). REAM in prior periods also increase downside systematic risk ($b_{REAM\ at\ t}$= -0.01, $b_{REAM\ at\ t-1}$= 0.09*, $mean_{REAM\ at\ t-2}$= 0.19*, $mean_{REAM\ at\ t-3}$= 0.25**, $mean_{REAM\ at\ t-4}$= 0.27**).

Overall, the long term performance effects of REAM on firm risk are robust to alternate specifications of REAM.

DISCUSSION

"Many businesses are hooked on quick fixes and phantom solutions. Short-term goals dominate the U.S. and British capital markets, for example, and actively hinder the possibility of real growth." (Hess 2010)

The aim of this research is twofold. The first aim is to study how managers reduce marketing and R&D budgets (REAM) in order to report yearend earnings that meet or beat analyst forecasts. Whether and to what extent managers are compromising marketing and R&D budgets in response to analyst forecasts is of concern to corporate stakeholders because such actions can jeopardize cash flow generating activities. Therefore, the second aim of this research is to study multiple ways in which REAM may be harmful to firm viability. In particular, I investigate how unscheduled cuts in marketing and R&D budgets in response to analyst forecasts affect idiosyncratic risk and downside systematic risk in the long term.

Results show that as analyst forecasts become higher, the response to such forecasts in terms of unscheduled cuts in marketing and R&D budgets (REAM) is stronger. Optimism about future earnings often makes analysts set high earnings targets that are more than the firm's baseline earnings. Such optimism does result in REAM. A count of instances of REAM in the research sample of manufacturing industries reveals that in any five year cycle, an average firm engages in REAM in response to analyst forecasts approximately twice. Results suggest that investors are not able to identify REAM in real time. However, investor uncertainty about expected stock returns begins to increase when REAM begins to adversely affect cash flows a year after the unscheduled budget cuts. Results show that REAM at a specific time can increase stock return volatility up to 29% within four years.

Results show that REAM not only incrementally increases idiosyncratic risk or stock return volatility, but also affects downside systematic risk. Industry downturns happen unexpectedly. For example, the 'dot com bubble burst' in the early 2000s (e.g., Ofek and Richardson 2003) or the 'housing bubble burst' in 2007 (e.g., Coleman, LaCour-Little and Vandell 2008) happened unexpectedly and the aftereffects of such shocks de-stabilized consumer demand in several industries. REAM can reduce firm resilience to such market downturns. Even a temporary REAM

under normal market conditions can gradually de-stabilize consumer demand to the extent that a market downturn four years later can be particularly damaging. Results show that by engaging in REAM, organizational sensitivity to market downturns can increase by 34% in four years.

The research sample of manufacturing industries is heterogeneous in terms of the relative importance of marketing and R&D. For example, the apparel industry may not be as adversely impacted by unscheduled cuts in R&D budgets as the semi-conductor industry. Conversely, it is possible that the semi-conductor industry, being technologically intensive may not be as adversely affected by unscheduled cuts in marketing budgets as the apparel industry. Thus, the effects of REAM on firm risk may be different according to the technological intensity of the industry. In order to discern how different industries are affected by REAM in response to analyst forecasts, I divide the data into a high technology group and a low technology group (e.g. Chan, Martin, and Kensinger 1990; Mizik and Jacobson 2003). The high technology group comprises electronics, semi-conductors, computers and office equipment, telecommunications, instruments and pharmaceuticals. The low technology group comprises textile, apparel, food and tobacco, paper and forest, furniture and fixture, and building materials. Although, there are no significant differences in the effect of analyst forecasts on REAM, there is a marked difference in the severity of the effects of REAM on long term idiosyncratic risk and downside systematic risk.

When REAM is identified by the use of unscheduled cuts in both marketing and R&D budgets, the adverse effects of REAM at time periods *t-4*, *t-3*, *t-2*, *t-1* on idiosyncratic risk at time *t* are significantly greater for high technology industries than for low technology industries (see Figure 3-3 rectangles). I find similar differences for downside systematic risk between the two industry groups (see Figure 3-4 rectangles). When REAM is identified by the use of unscheduled cuts in only R&D budgets, the magnitude of adverse effects of REAM is greater in high technology firms than in low technology firms for both idiosyncratic risk (see Figure 3-3 cones) and downside systematic risk

(see Figure 3-4 cones). That high technology firms should be more severely affected by unscheduled R&D budget cuts than low technology firms is no surprise, given that R&D is the core competence of high technology firms.

However, when REAM is identified by the use of unscheduled cuts in only marketing budgets, I find that the adverse effects of REAM on long term idiosyncratic risk are not significantly lesser for high technology firms than for low technology firms (see Figure 3-3 cylinders). I find similar evidence for downside systematic risk (see Figure 3-4 cylinders). High technology firms are as affected by unscheduled marketing budget cuts as are low technology industries. This result corroborates the view that marketing and technology are indeed complementary (e.g., John, Weiss, and Dutta 1999), and in the long run, investors do not spare high technology firms for giving short shrift to marketing.

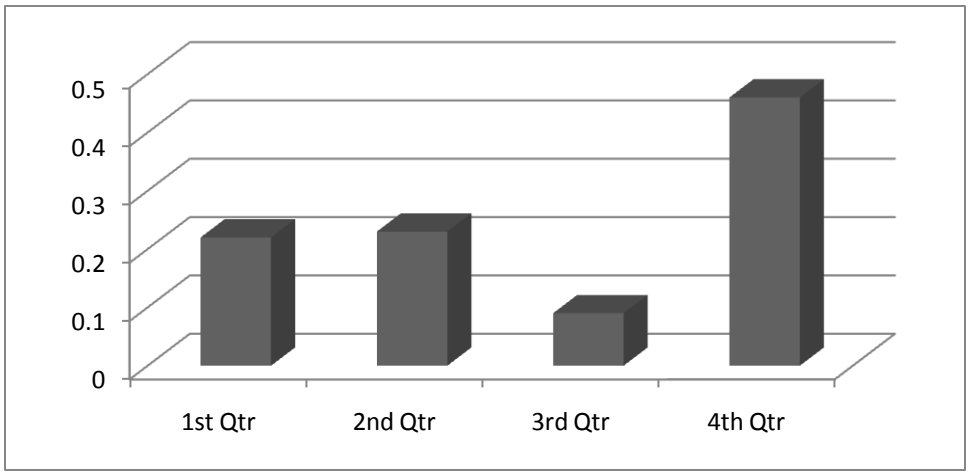
Are There Ways to Reduce REAM in Response to Analyst Forecasts?

The application of problem solving theory to the context of REAM indicates three specific factors, which firms may incorporate in order to reduce REAM in response to analyst forecasts. First, marketing related experience within the top management team can reduce the degree of REAM considerably. Marketing related experience refers to experience in activities connected to customer relationships and innovation. The number of Chief Marketing Officers (CMO) within the top management team has increased over the years (e.g., Kerin 2005), perhaps to ensure that firms are able to properly understand the role of marketing and R&D capabilities, even though the financial payoffs from such assets are not easily verifiable. Positive investor responses upon CMO appointment speak to the fact that investors value marketing related experience within the top management team as a source of sustainable shareholder value (e.g., Nath and Mahajan 2008). Thus, firms may benefit by nominating more individuals with marketing related experience to the top management team.

Second, firms that accumulate intangible assets such as innovations and customer relationships should be able to understand that unscheduled budgetary cuts in marketing and innovation related assets negatively influence long term organizational goals. These firms as compared to firms with lower levels of intangible assets are less likely to engage in REAM and therefore, less likely to increase the riskiness of their cash and revenue potential. This result has implications for firms in the acquisition market. For the acquiring firm, a preferable acquisition target is a firm with accumulated stocks of intangible assets. Not only are the intangible assets themselves of value, but such acquisitions may bring in marketing related experience that can prevent the merged entity from misusing real activities. Perhaps that is why, when firms with stocks of intangible assets such as product capital are acquired, investors reward the acquiring firms with long term abnormal returns (e.g., Sorescu et al. 2007).

Third, top management annual bonuses increase salience of yearend goals such as avoiding negative earnings surprises. With shortening top management tenures (Charan 2005; Kaplan 2008), a compensation scheme with short term incentives can distract managers from appreciating the effects of REAM on long term risk. The bonus component of top management compensation may perhaps be gradually substituted with non-cash based long term incentives such as restricted stock options (e.g., Meulbroek 2001). Restricted stock options may prevent short term managerial behavior because of taxation procedures while vesting, and there are forfeiture penalties in the event of employment termination prior to the expiration of the restriction period. In summary, this essay not only suggests multiple ways of reducing the probability of REAM in response to analyst forecasts, but also encourages future research in corporate governance practices that can minimize the occurrence of REAM.

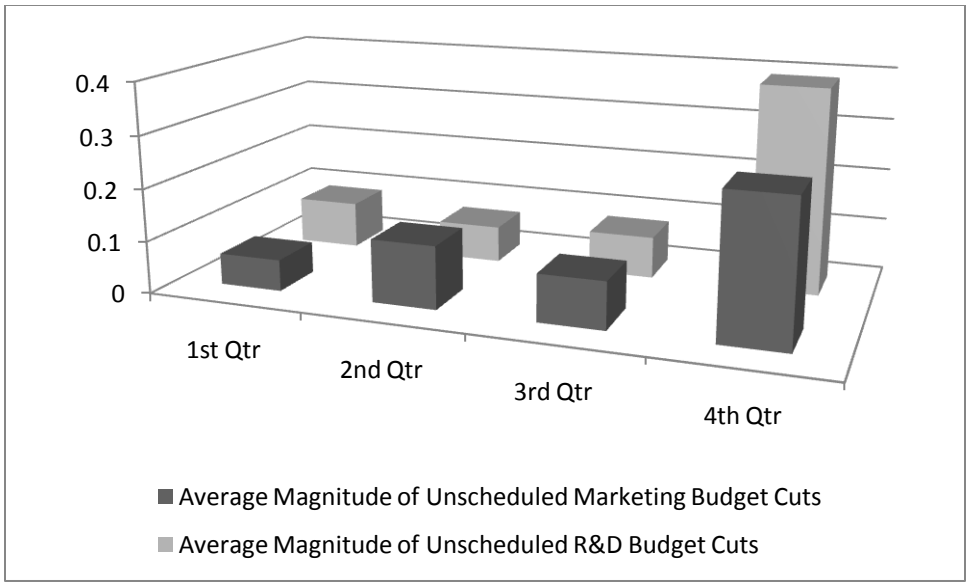
Figure 3-1
Proportion of Firms that make Unscheduled Cuts in Marketing and R&D Budgets



Note:

(a) Qtr is a Fiscal Quarter
(b) I calculate the proportion for quarter t of each fiscal year, and then compute the average across all years.

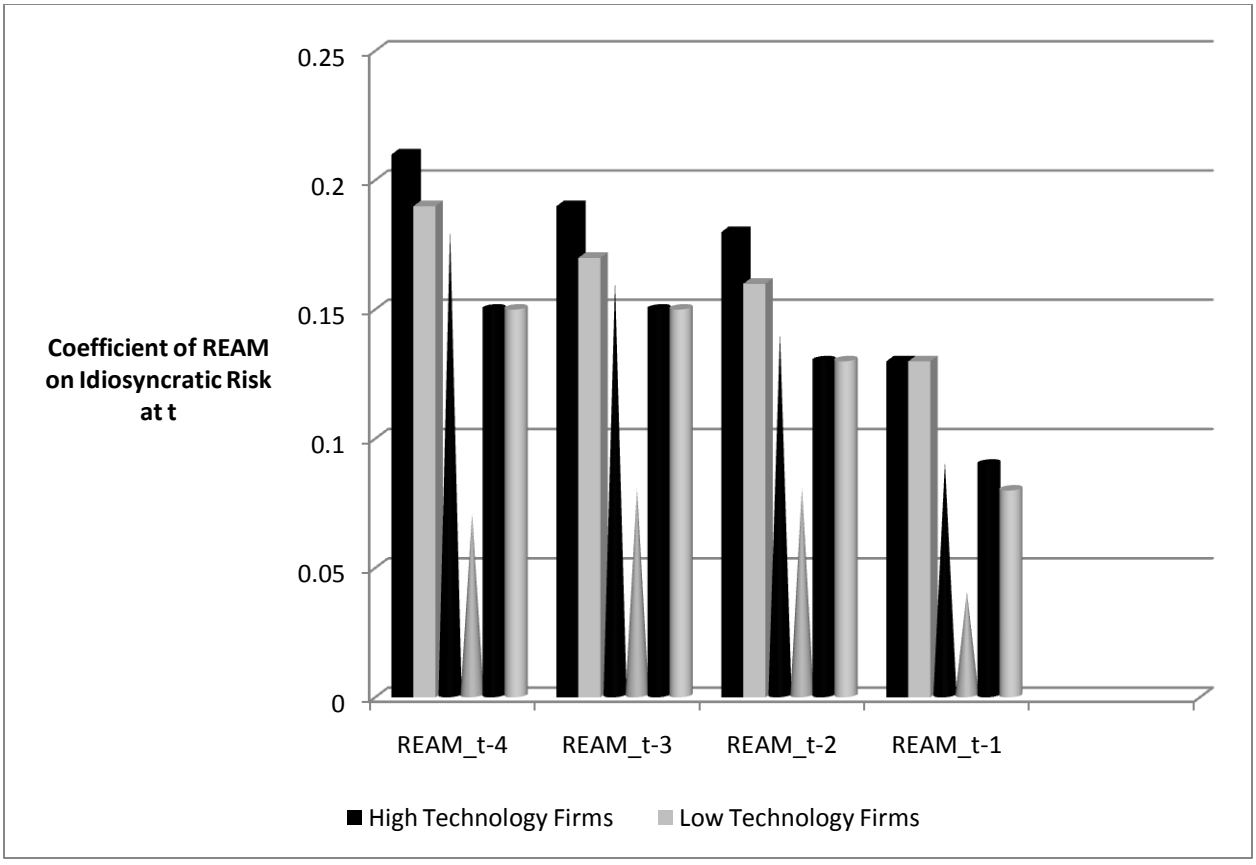
Figure 3-2
Average Magnitude of Unscheduled Cuts in Marketing and R&D Budgets over all FirmYears



Note:

(a) Qtr is a Fiscal Quarter

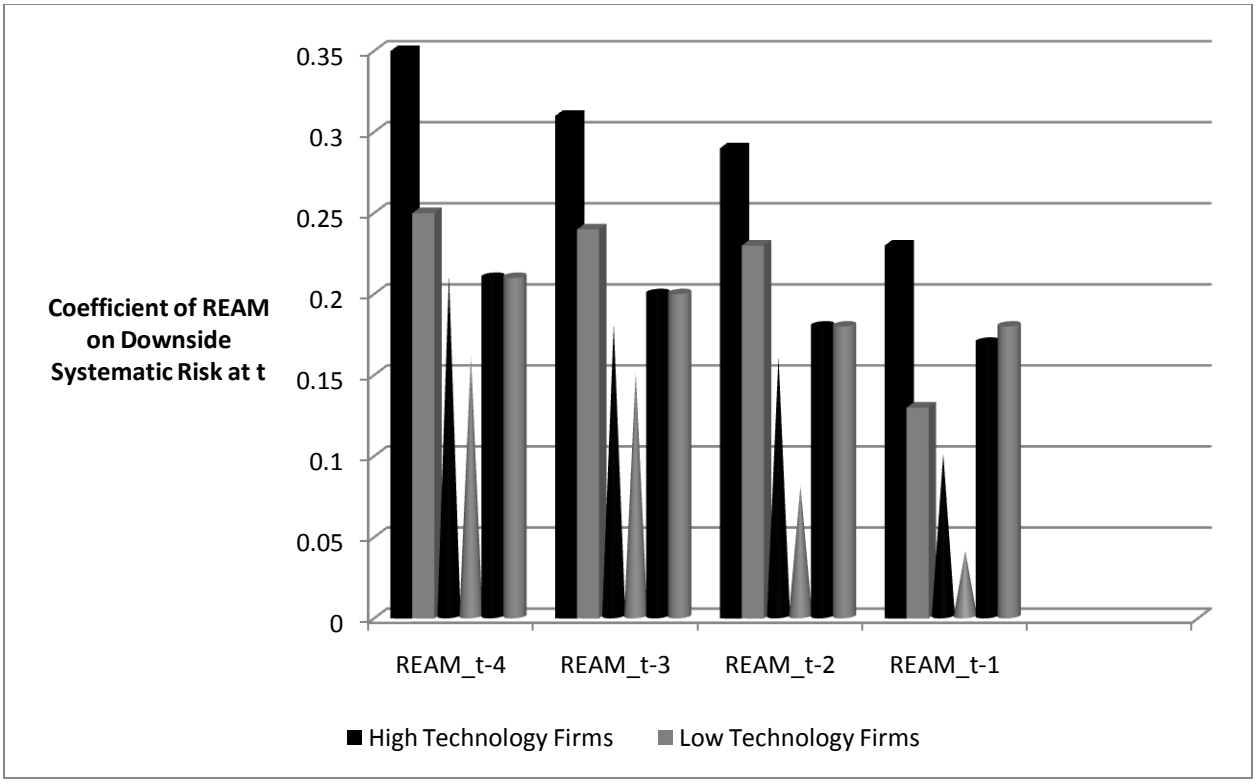
Figure 3-3
Effects of REAM in Prior Periods on Current Idiosyncratic Risk



Note:

(a) REAM is real activity manipulation.
(b) All coefficients are positive. A positive coefficient indicates for example, REAM at period t-4 increases idiosyncratic risk at period t.
(c) Rectangles: REAM occurs when firms (1) avoid negative earnings surprise (2) make unscheduled cuts in both marketing and R&D budgets.
(d) Cones: REAM occurs when firms (1) avoid negative earnings surprise (2) make unscheduled cuts in only
(e) R&D budgets.
(f) Cylinders: REAM occurs when firms (1) avoid negative earnings surprise (2) make unscheduled cuts in only marketing budgets.

Figure 3-4
Effects of REAM in Prior Periods on Current Downside Systematic Risk



Note:

(a) REAM is real activity manipulation.
(b) All coefficients are positive. A positive coefficient indicates for example, REAM at period t-4 increases downside systematic risk at period t.
(c) Rectangles: REAM occurs when firms (1) avoid negative earnings surprise (2) make unscheduled cuts in both marketing and R&D budgets.
(d) Cones: REAM occurs when firms (1) avoid negative earnings surprise (2) make unscheduled cuts in only
(e) R&D budgets.
(f) Cylinders: REAM occurs when firms (1) avoid negative earnings surprise (2) make unscheduled cuts in only marketing budgets.

Table 3-1
Descriptive Statistics

	AF	MR	RDR	BON	PP	UME	OME	IR	DS	DA	EM	VA	NP	WC	ROA	LQ	DP	TA	NA
AF																			
MR	.16																		
RDR	-.17*	.04																	
BON	.05	-.03	-.07																
PP	.18*	.12	.12	-.03															
UME	.06	.01	.01	.06	.02														
OME	.15*	.01	-.01	.03	.13	.00													
IR	.16	.09	.03	.03	.14*	-.01	-.10												
DS	.08	-.17**	-0.05	.01	.02	.01	-.13*	.04											
DA	.15	-.05	-.02	.17*	.12	.01	.01	.01	-.02										
EM	.02	.01	.01	.03	.13	.09	.01	-.01	.01	-.13									
VA	.06	-.02	-.01	.00	-.05	.02	.18**	.19	.08	.01	.01								
NP	.06	.31**	-.16	.12	-.10	.01	.19	.01	.04	.01	-.02	.04							
WC	.22*	.13	.08	.01	-.18	.00	-.01	.03	.03	-.01	.00	.12	.04						
ROA	.02	.01	.01	.37**	-.01	.07	.03	-.52**	-.47**	-.01	.01	.13	.07	.07					
LQ	-.03	.00	.02	-.03	.02	-.02	.14*	.08	.11	.09	.02	.15	-.02	-.02	-.03				
DP	.01	-.05	-.02	.01	-.04	.09	.01	.04	.02	.01	.02	.16*	.01	.03	.38**	.01			
TA	.39**	.09	.03	.17*	.16	.06	.19	.27*	.12	-.02	.01	.03	.13	.19	.05	-.05	.01		
NA	.02	.05	.01	.01	.03	-.11	.00	-.01	.03	.03	-.02	-.07	.05	.10	.01	.21*	-.02	.52**	
Mean	.52	.03	-1.73	.13	.08	6.80	.18	.28	.93	0.07	.61	.18	.03	.04	.03	.16	.02	4.02	5.18
S.D.	1.04	61.87	7.92	19.02	12.43	49.13	10.05	1.29	.61	89.14	.92	.94	12.85	7.01	13.48	1.53	.29	12.05	6.22

Notes. AF is analyst forecast (ratio), MR is residual of equation 1, RDR is residual of equation 2, BON is bonus component of top management team (ratio), PP is past performance (ratio), UME is TMT marketing related experience (years), organization marketing related experience (ratio), IR is idiosyncratic risk, DS is downside systematic risk, DA is discretionary accruals (ratio), EM is expectation management (ratio), VF is variance in analyst forecast, NP is no. of new products (ratio), WC is working capital (x10^7 $mn), ROA is return on assets (ratio), LQ is liquidity (ratio), DP is dividend payout (ratio), TA is logged total assets ($bn), NA is number of analysts.

Table 3-2
Effect of Annual Analyst Forecasts on Unscheduled Changes in Marketing and R&D Budgets

	Hypothesis	DV is $\varepsilon_{Mktg,ift}$		DV is $\varepsilon_{R\&D,ift}$	
		Main Effect Model	Interaction Model	Main Effect Model	Interaction Model
Intercept		0.48** (0.23, 0.71)	0.47** (0.24, 0.70)	1.36** (0.79, 1.93)	1.36** (0.79, 1.95)
$\varepsilon_{Mktg,ift-1}$		-0.65* (-1.02,-0.25)	-0.68** (-1.02,-0.34)		
$\varepsilon_{R\&D,ift-1}$				-0.85* (-1.36-0.34)	-0.73* (-1.16,-0.30)
Analyst Forecasts (AF)	H1	-0.15* (-0.23,-0.08)	-0.15* (-0.23,0.07)	-0.34** (-0.49,-0.19)	-0.34** (-0.45,-0.20)
AF * AF		0.13 (-0.15,0.41)	0.14 (-0.14, 0.28)	0.71 (-1.14,2.56)	0.65 (-1.19,2.49)
Bonus (BON)		-0.03 (-1.02,0.97)	-0.03 (-1.02,0.98)	-0.09 (-0.54,0.34)	-0.09 (-0.54,0.33)
AF * BON	H2a		0.23** (0.06,0.37)		0.29** (0.13,0.44)
Past Performance (PP)		0.09 (-0.13.0.32)	0.07 (-0.03,0.18)	0.15 (-0.09,0.39)	0.17 (-0.07,0.41)
AF * PP	H2b		-0.13* (-0.19,-0.07)		-0.17* (-0.26,-0.09)
TMT Marketing Related Experience (UME)		0.45 (-0.03,0.93)	0.45 (-0.02,0.92)	0.31 (0.02,0.60)	0.31 (0.01,0.61)
AF * UME	H3a		-0.19* (-0.29,-0.09)		-0.61** (-0.90,-0.32)
Organization Marketing Related Experience (OME)		0.21 (-0.20,0.65)	0.19 (-0.21,0.56)	0.37 (-0.11,0.85)	0.36 (-0.12,0.84)
AF * OME	H3b		-0.38** (-0.57,-0.18)		-0.74** (-1.09,-0.38)
Discretionary Accruals		0.17* (0.07,0.27)	0.16* (0.07,0.25)	0.12* (0.05,0.19)	0.12* (0.05,0.19)
Working Capital		0.19* (0.07,0.31)	0.19* (0.08,0.31)	0.48 (-0.03,0.99)	0.37 (-0.14,0.88)
Variance in Analyst Forecast		0.06 (-0.32,0.44)	0.08 (-0.14,0.30)	0.27 (-0.95,1.49)	0.28 (-0.94,0.15)
New Products		0.50** (0.28,0.73)	0.51** (0.29,0.73)	-0.17* (-0.26,-0.08)	-0.17* (-0.25,-0.08)
Expectation Management		0.18 (-1.93,2.17)	0.11 (-1.87,2.03)	0.06 (-0.41,0.53)	0.06 (-0.41,0.53)
Number of Analysts		-0.02 (-0.19,0.15)	-0.02 (-0.19,0.15)	-0.01 (-0.13,0.12)	-0.01 (-0.13,0.12)
Pseudo R sq		0.44	0.49	0.43	0.52

Note. (a) $\varepsilon_{Mktg,ift}$ is the unscheduled change in marketing budget (b) $\varepsilon_{R\&D,ift}$ is the unscheduled change in R&D budget c) Negative main effect coefficient indicates that when independent variable increases, unscheduled changes in R&D and marketing budgets move towards negative values; i.e., increase in independent variable leads to increase in REAM (d) ** 0 does not lie in the 95% confidence interval, * 0 does not lie in the 90% confidence interval.

Table 3-3
Effect of Quarterly Analyst Forecasts on Unscheduled Changes in Marketing and R&D Budgets

			DV is $\varepsilon_{Mktg,ift}$		DV is $\varepsilon_{R\&D,ift}$	
			Main Effects	Main Effects and Interactions	Main Effects	Main Effects and Interactions
	Intercept		0.68** (0.37,0.99)	0.68** (0.36,0.99)	1.06** (0.61,1.51)	1.06** (0.59,1.53)
	$\varepsilon_{Mktg,ift-1}$		-0.61** (-0.92,-0.30)	-0.61** (-0.92,-0.30)		
	$\varepsilon_{R\&D,ift-1}$				-1.12* (-1.88,-0.49)	-1.13* (-1.89,-0.48)
Goal Importance	Analyst Forecasts (AF)	H1	-0.24** (-0.37,-0.11)	-0.24** (-0.37,-0.11)	-0.38** (-0.58,-0.08)	-0.37** (-0.58,-0.06)
	AF * AF		-0.17 (-0.03,0.37)	-0.18 (-0.02.0.38)	-0.22 (-0.02,0.46)	-0.28* (-1.00,-0.36)
Time Pressure	Bonus (BON)		-0.14 (-0.07, 0.35)	-0.50* (-0.78,-0.22)	-0.53* (-0.81,-0.25)	-0.55* (-0.86.-0.24)
	AF * BON	H2a		0.29* (0.12,0.46)		0.38* (0.27,0.49)
	Past Performance (PP)		0.22 (-0.09,0.53)	0.24 (-0.11,0.35)	0.28 (-0.13,0.42)	0.26 (-0.12,0.40)
	AF * PP	H2b		-0.09 (-1.53,1.56)		-0.12* (-0.19,-0.05)
Expertise	TMT Marketing Related Experience (UME)		0.35 (-0.35,1.05)	0.35 (-0.32,1.07)	0.12 (-0.03,0.21)	0.12 (-0.04,0.29)
	AF * UME	H3a		-0.24* (-0.37,-0.11)		-0.31* (-0.47,-0.16)
	Organization Marketing Related Experience (OME)		0.08 (-0.55,0.71)	0.08 (-0.58,0.74)	0.62 (-0.01,1.26)	0.61 (-0.10,1.31)
	AF * OME	H3b		-0.18** (-0.27,-0.08)		-0.26** (-0.40,-0.12)
Control Variables	Discretionary Accruals		0.07 (-0.01,0.16)	0.06 (-0.02,0.17)	0.11* (0.05,0.19)	0.10* (0.04,0.16)
	Working Capital		0.14* (0.06,0.21)	0.14* (0.06,0.22)	0.37 (-1.03,1.79)	0.38 (-1.03,1.79)
	Variance in Analyst Forecast		0.02 (-0.12,0.16)	0.02 (-0.13,0.18)	0.04 (-0.09,0.17)	0.02 (-0.09,0.09)
	New Products		0.51** (0.28,0.73)	0.51** (0.29,0.73)	-0.37* (-0.26,-0.08)	-0.37* (-0.56,-0.16)
	Expectation Management		0.02 (-1.23,1.24)	0.03 (-1.23,1.24)	0.05 (-0.41,0.53)	0.05 (-0.41,0.53)
	Number of Analysts		-0.04 (-0.18,0.16)	-0.04 (-0.18,0.116)	-0.05 (-0.43,0.42)	-0.06 (-0.43,0.42)
	Pseudo R sq		0.46	0.50	0.45	0.53

Note. (a) $\varepsilon_{Mktg,ift}$ is the unscheduled change in marketing budget (b) $\varepsilon_{R\&D,ift}$ is the unscheduled change in R&D budget c) Negative main effect coefficient indicates that when independent variable increases, unscheduled changes in R&D and marketing budgets move towards negative values; i.e., increase in independent variable leads to increase in REAM (d) ** 0 does not lie in the 95% confidence interval, * 0 does not lie in the 90% confidence interval.

Table 3-4

Effect of REAM on Long Term Idiosyncratic Risk and Downside Systematic Risk

Panel A: REAM = 1 when (Realized EPS_{ift} - Analyst forecast EPS_{ift}) ≥ 0 and $\varepsilon_{Mktg,ift} < 0$ and $\varepsilon_{R\&D,ift} < 0$; else REAM = 0						
Hypothesis	N = 4182	**DV: Idiosyncratic $Risk_t$**		Hypothesis	**DV: Downside Systematic $Risk_t$**	
		Estimate	C.I.		Estimate	C.I.
	Intercept	0.73**	0.37,1.09		1.04**	0.63,1.45
	REAM at t	-0.08	-0.16, 0.01		-0.06	-0.10,0.03
H4	**REAM at t-1**	0.09*	0.04,0.15	H5	0.07*	0.03.0.11
	REAM at t-2	0.11*	0.05,0.17		0.18**	0.08,0.27
	REAM at t-3	0.24*	0.11,0.38		0.29**	0.15,0.44
	REAM at t-4	0.29**	0.15,0.43		0.34**	0.15,0.53
	Pseudo R sq	0.311			0.363	
Panel B: REAM= 1 when (Realized EPS_{ift} - Analyst forecast EPS_{ift}) ≥ 0 and $\varepsilon_{Mktg,ift} < 0$; else REAM = 0						
	N = 3668	**DV: Idiosyncratic $Risk_t$**			**DV: Downside Systematic $Risk_t$**	
	Intercept	0.81**	0.48,1.13		1.15**	0.66,1.64
	REAM at t	-0.06	-0.12,0.01		-0.03	-0.08,0.02
H4	**REAM at t-1**	0.06*	0.02,0.11	H5	0.07*	0.03,0.13
	REAM at t-2	0.07*	0.02,0.10		0.15*	0.08,0.22
	REAM at t-3	0.12*	0.05,0.19		0.26**	0.17,0.35
	REAM at t-4	0.17*	0.08,0.26		0.28*	0.17,0.39
	Pseudo R sq	0.281			0.339	
Panel C: REAM = 1 when (Realized EPS_{ift} - Analyst forecast EPS_{ift}) ≥ 0 and $\varepsilon_{R\&D,ift} < 0$; else REAM = 0						
	N = 4703	**DV: Idiosyncratic $Risk_t$**			**DV: Downside Systematic $Risk_t$**	
	Intercept	1.29**	0.68,0.19		0.98**	0.53,1.43
	REAM at t	-0.03	-0.29,-0.09		-0.01	-0.04,0.05
H4	**REAM at t-1**	0.03	-0.07,0.02	H5	0.09*	0.03,0.14
	REAM at t-2	0.06	-0.02,0.13		0.19*	0.14,0.25
	REAM at t-3	0.22**	0.03,0.13		0.25**	0.18,0.32
	REAM at t-4	0.24**	0.05,0.22		0.27**	0.18,0.35
	Pseudo R sq	0.282			0.317	

Notes.

(1) DV is dependent variable

(2) REAM is a dummy variable indicating real activity manipulation.

(3) In Panel A, REAM indicates that in order to avoid negative earnings surprise, firms make unscheduled cuts in both Marketing and R&D budgets; in Panel B, REAM indicates that in order to avoid negative earnings surprise, firms make unscheduled cuts in only Marketing budgets; in Panel C, REAM indicates that in order to avoid negative earnings surprise, firms make unscheduled cuts in only R&D budgets

(4) $\varepsilon_{Mktg,\ ift} < 0$ is unscheduled cut in marketing budget, $\varepsilon_{R\&D,\ ift} < 0$ is unscheduled cut in R&D budget

(5) (Realized EPS_{ift} - Analyst forecast EPS_{ift}) ≥ 0 means that the firm *f* in industry *i* at time *t* has avoided negative earnings surprise

(6) ** 0 does not lie in the 95% confidence interval (C.I.), * 0 does not lie in the 90% confidence interval (C.I.)

(7) All regressions are run with control variables. The control variables are total assets, return on assets, dividend payout, liquidity, leverage, industry and time dummy variables.

ENDNOTES

[1] I recognize that there can be multiple ways of increasing the strategic emphasis on R&D relative to marketing. However, following prior literature on strategic emphasis (e.g., Mizik and Jacobson 2003; Swaminathan, Murshed, and Hulland 2008), I do not distinguish between scenarios in which an increase in strategic emphasis on R&D relative to marketing is due to (1) an increase in R&D budgets, but a decrease in marketing budgets, or (2) no change in R&D budgets, but a decrease in marketing budgets, or (3) decrease (increase) in both R&D and marketing budgets, but the extent of decrease (increase) in R&D budgets is less (more) than the corresponding decrease (increase) in marketing budgets. Similarly, I do not distinguish between the multiple scenarios that can be interpreted as a decrease in strategic emphasis on R&D relative to marketing. However, I do examine alternate operationalizations of strategic emphasis, all of which provide consistent results.

[2] This example suggests a possible causal association and not an actual causal association between historic stock returns and strategic emphasis on R&D relative to marketing.

[3] By managers, I refer to the top management team, which typically makes strategic decisions that impact the entire organization. In the rest of the chapter, managers may be interpreted as the individuals comprising the top management team.

[4] Difference scores may be considered unreliable estimates of the overall theoretical construct due to two main reasons (Peter, Churchill Jr., and Brown 1993). First, the reliability of the difference score may be compromised due to the high correlation between the components of the difference score. Second, the difference score may be spuriously correlated with other variables because the difference score may actually reflect only one of the underlying components, and does not capture enough of the variation in the second component. The strategic emphasis construct is robust to all such concerns. The correlation between the % change in R&D budget (mean = .09, s.d. = 13.52) and % change in marketing budget (mean = .11, s.d. = 12.79) is .31. In addition, the correlation between strategic emphasis and % change in R&D budget is .33 and that between strategic emphasis and % change in marketing budget is -.25; given that the absolute values of the correlations are not significantly different from one another, the strategic emphasis construct does not reflect the variation in the change in any one particular function.

[5] $NOCF_{ft}$ is measured as Income before Extraordinary $Items_{ft-1}$ + $Depreciation_{ft-1}$ – $Taxes_{ft-1}$. CFV_{ft} is measured as Variance in $NOCF_{ft}$ over four quarters in year t-1. I measure leverage as $\frac{\text{Total Debt}_{ft-1}}{\text{Total Assets}_{ft-1}}$.

[6] As per the guidelines of Arrellano and Bond (1991), I use a AR (2) test to verify that the data is not auto-regressive in the second order (i.e., since sequential error terms in equation 6 will be correlated due to the first differenced form of the equation; for error correlation, I need to test for the null hypothesis that alternate error terms in equation 6 are not correlated). As shown in Table 2, the null hypothesis is not falsified (Model 1: $z = -.48$, $p > .62$; Model 2: $z = -.48$, $p > .61$; Model 3: $z = -.46$, $p > .62$).

[7] I mean center all independent variables before multiplying them to create interactions terms. The mean centering provides meaning to the main effects in the presence of interaction terms, where the main effects now are the effect of the explanatory variable on the dependent variable when the interaction variable is at its mean value of zero.

[8] As the top management team makes decisions regarding marketing and R&D budgets, in this essay the word 'managers' actually refers to top managers.

[9] The assumptions for the prior parameters are as follows. $\propto_{ift} \sim N(\mu_{if}, \delta)$ such that the coefficients for each observation are drawn from firm level distributions. μ_{if} which are firm level coefficients are drawn from industry level distributions such that $\mu_{if} \sim N(\pi_i, \tau)$. Finally, π_i are drawn from an aggregate distribution represented as $\pi_i \sim N(\bar{\pi}, \varphi)$ where $\bar{\pi} \sim N(0, .00001)$. The variances ($\delta$, τ, φ) are each assigned inverse-gamma distributed priors. β_{ift} follows a similar hierarchical structure. The intercept $\emptyset_{mktg}$ is distributed normally. $\emptyset_{mktg} \sim N(\overline{\emptyset_{mktg}}, \omega)$ and $\overline{\emptyset_{mktg}} \sim N(0, .00001)$. ω follows an inverse gamma distribution. $\emptyset_{R\&D}$ follows a similar distribution.

[10] $TA_{ift} = \alpha_0 + \alpha_1 \left(\frac{1}{\text{Total Assets}_{ift-1}}\right) + \alpha_2 \left(\text{Sales}_{ift} - \text{Sales}_{ift-1}\right) + \alpha_3 (\text{Gross plant, property and equipment}_{ift}) + \varepsilon_{ift}$

Where, TA refers to total accruals. The predicted coefficients are used in the next equation.

$NDA_{ift} = \hat{\alpha}_0 + \hat{\alpha}_1 \left(\frac{1}{\text{Total Assets}_{ift-1}}\right) + \hat{\alpha}_2 \left(\text{Sales}_{ift} - \text{Sales}_{ift-1}\right) + \hat{\alpha}_3 (\text{Gross plant, property and equipment}_{ift}) + \epsilon_{ift}$

where, NDAs refers to non discretionary accruals.

Finally, Discretionary $\text{Accruals}_{ift} = TA_{ift} - NDA_{ift}$.

[11] I mean center all independent variables before multiplying them to create interactions terms. The mean centering provides meaning to the main effects in the presence of interaction terms, where the main effects now are the effect of the explanatory variable on the dependent variable when the interaction variable is at its mean value of zero.

[12] For the purpose of testing whether REAM in prior periods increase firm risk in scenario1, I create a sample in which firms avoid negative earnings surprises by making unscheduled cuts in only marketing. I delete observations in which firms avoid negative earnings surprises by way of unscheduled cuts in only R&D or by way of unscheduled cuts in both marketing and R&D. I estimate equations 7 and 8 on the remaining sample of 3668 observations.

[13] For testing effects of REAM in scenario 2, all observations in which firms avoid negative earnings surprises by way of unscheduled cuts in only marketing or by way of unscheduled cuts in both marketing and R&D are deleted. I estimate equations 7 and 8 on the remaining sample of 4703 observations.

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APPENDIX

The estimation model in equation 6 in chapter 2 is represented as

$$\Delta SE_{ft} = \beta_{1f}\Delta\widehat{SE}_{ft-1} + \sum_{k=2}^{K}\beta_{kf}\Delta X_{kft} + \sum_{1}^{T}\varphi_t \Delta Yr_t + \Delta\varepsilon_{ft}$$

We pool the first two terms of the right hand side together, and replace the first differenced notations in the equation in the following manner.

$$Y_{ft} = Z_{ft}^{'}b_f + D_{ft}{}^{'}\gamma + \in_{ft}$$

such that,

$Y_{ft} = \Delta SE_{ft}$

$Z_{ft}^{'} = [\Delta\widehat{SE}_{ft-1}, \Delta X_{1ft,} \Delta X_{2ft,} \dots\dots\dots, \Delta X_{Kft}]$, a (1 X K) vector of independent variables that have random effect coefficients.

$b_f^{'} = [\beta_{1f}, \beta_{2f}, \dots\dots\dots \beta_{Kf}]$, a (1 X K) vector of firm level random effect coefficients.

$D_{ft}{}^{'} = [\Delta Yr_1, \Delta Yr_2, \dots\dots\dots, \Delta Yr_{T-4}]$, a (1 X T) vector of year specific variables for any firm observation year.

$\gamma^{'} = [\varphi_1, \varphi_2, \dots\dots\dots\dots\dots\dots, \varphi_{T-4}]$, a (1 X T) vector of fixed effect coefficients related to time dummy variables.

The prior structure on γ is specified as follows: $\gamma \sim N_{T-1}(\bar{\gamma}, (1/\alpha)Q^{-1})$

Where, $\bar{\gamma}^{'}$ is a (1 X T-1) vector of 0s, and Q^{-1} is a precision matrix in which off diagonals are set to 0 and the diagonal values are set to 1.0 X 10^{-6} (in order to specify a diffuse prior).

$\in_{ft} = \Delta\varepsilon_{ft}$, such that $\in_{ft} \sim N(0, \sigma^2)$

The likelihood of observing the data given the unknown parameters is:

$$L(Y_{ft} | b_f, \sigma^{-2}, \gamma, \bar{b}, V^{-1}, \bar{\bar{b}}, C^{-1}) = \prod_{f=1}^{F}\prod_{t=1}^{T_f}[(1/2\pi\sigma^2)\, exp\{-.5(Y_{ft} - Z_{ft}^{'}b_f - D_{ft}{}^{'}\gamma)/\sigma)^2\}]$$

Where T_f is the number of observation years for firm *f*, F is the total number of firms in the sample.

The joint posterior can be represented as:

$h(\, b_f, \sigma^{-2}, \gamma, \bar{b}, V^{-1}, \bar{\bar{b}}, C^{-1} | Y_{ft}) \quad \propto$

$L(Y_{ft} |\, b_f, \sigma^{-2}, \gamma, \bar{b}, V^{-1}, \bar{\bar{b}}, C^{-1}) h(b_f |\, \bar{b}, V^{-1}) h(\sigma^{-2}) h(\gamma) h(\bar{b} \mid \bar{\bar{b}}, C^{-1}) h(\bar{\bar{b}})\; h(V^{-1}) h(C^{-1})$

<u>In the Gibbs sampling algorithm, the Markov chain is constructed by updating samples iteratively from following set of full conditional densities.</u>

1. Generate posterior $h(b_f |\, \sigma^{-2}, \gamma, \bar{b}, V^{-1}) \;\propto\; exp\,\{-.5(b_f - \hat{b})' B^{-1}(b_f - \hat{b})\}$

Where, $\hat{b} \;=\; B\{(\alpha V)^{-1}\bar{b} + \;\sigma^{-2} \sum_{f=1}^{F} \sum_{t=1}^{T_f} (Z_{ft}(Y_{ft} - D_{ft}{}'\gamma))\}$

and $B \;=\; \{(\alpha V)^{-1} + \;\sigma^{-2} \sum_{f=1}^{F} \sum_{t=1}^{T_f} Z_{ft} Z_{ft}'\}^{-1}$

2. Generate posterior

$h(\sigma^{-2} | b_f, \gamma) \;\propto\; Gamma\,(e + 1/4\,,\; .5(\sum_{f=1}^{F} \sum_{t=1}^{T_f} (Y_{ft} - \; Z_{ft}' b_f - \; D_{ft}{}'\gamma)^2) + 1/f\,)$

3. Generate posterior $h(\gamma | b_f, \sigma^{-2}) \;\propto\; exp\{(\gamma - \hat{\gamma})' R^{-1}(\gamma - \hat{\gamma})\}$

Where, $\hat{\gamma} = \; R((\alpha Q)^{-1}\bar{\gamma} + \;\sigma^{-2} \sum_{f=1}^{F} \sum_{t=1}^{T_f} (Y_{ft} - Z_{ft}' b_f)^2$

and, $R = \; [(\alpha Q)^{-1} + \;\sigma^{-2} \sum_{f=1}^{F} \sum_{t=1}^{T_f} D_{ft} D_{ft}']^{-1}$

4. Generate posterior $h(\bar{b} |\, b_f,\; \bar{\bar{b}}) \;\propto\; exp\{-.5\;(\bar{b} - \; \tilde{b})' \tilde{B}^{-1}(\bar{b} - \; \tilde{b})\}$

Where, $\tilde{b} \;= C\,\bar{\bar{b}} \;+\; FV\,\ddot{b}$

$\ddot{b}'$ is a vector of (1 X K) dimension comprising $(\sum_{f=1}^{F} \bar{b}_{1f}\,, \sum_{f=1}^{F} \bar{b}_{2f}\,, \ldots\ldots\ldots\,, \sum_{f=1}^{F} \bar{b}_{Kf})$

and, $\tilde{B} \;=\; W^{-1},$ and $W \;=\; C + FV$

5. Generate posterior $h(V^{-1} |\, b_f\,) \;\propto\; Wishart\,(\rho + F, G)$

Where, $G \;=\; (\rho I \;+\; \sum_{f=1}^{F} b_f b_f')^{-1}$

∂ is set as the number of random effect coefficients in the estimation model, and I is the identity matrix of (K X K) dimension (e.g.,Ansari, Mela, and Neslin 2008).

6. Generate posterior $h(\bar{\bar{b}}|\bar{b}) \propto exp\{(\bar{\bar{b}} - \hat{\bar{b}})' \hat{\bar{B}}^{-1} (\bar{\bar{b}} - \hat{\bar{b}})\}$

Where, $\hat{\bar{b}} = \tau m + C\,\bar{b}$

and, $\hat{\bar{B}} = U^{-1}$, and $U = \tau + C$

7. Generate posterior $h(C^{-1}|\bar{b}) \propto Wishart\,(\partial + 1,\ H)$

Where, $H = (\partial I + \bar{b}\bar{b}')^{-1}$

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