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# Multidimensional Brand Equity and Asymmetric Risk

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**Multidimensional Brand Equity and Asymmetric Risk**

**Abstract**

The authors investigate the extent to which central customer-based brand equity dimensions (Differentiation, Relevance, Esteem, Knowledge, and Energy) influence a firm's systematic risk (i.e., beta) during both market upturns and downturns. The results demonstrate that aggregating upside and downside beta or different dimensions of brand equity masks the true associations which can be seen only in the disaggregate analyses. The authors find that Relevance and Knowledge play roles as stabilizers, showing negative relationships with both upside gains and downside risk, while Esteem plays the role of protector, showing a negative relationship with only downside losses and not influencing upside gains; Energy acts as a booster, being positively associated with a firm's potential gains in a period of market growth without increasing the firm's expected losses during a bad market. The positive relationship of Energy with aggregate risk could be misleading as it hides the beneficial effect of Energy as a booster. The authors also find that Relevance is the most important consideration when people make choices in bad market situations, while Energy becomes the most crucial deciding factor in good market situations. Taking advantage of the multidimensional constructs of brand equity while allowing for the asymmetrical characteristics of risk enables managers to capture the differential role of each brand equity dimension in influencing firm risks, which leads to more sophisticated strategic decisions regarding risk management. In addition to general brand strategy, the authors provide tailored brand strategies to firms from different industries or with different financial characteristics.

*Key words: multidimensional customer-based brand equity, updated Young and Rubicam's Brand Asset Valuator, systematic risk, downside losses, upside gains, asymmetries in risk*

## 1. Introduction

The value of a firm, as depicted by shareholder value, depends not only on cash flow, but also on the firm's risk, and thereby, the cost of capital used to discount future results. According to the Capital Asset Pricing Model (CAPM), total risk can be decomposed into systematic (market-wide) and unsystematic (firm-specific) risk. Unsystematic risk can be eliminated through diversification. Thus, a risk premium is only attached to systematic risk, i.e., a firm's "beta" or the extent to which a firm's returns co-vary with market-wide returns. Therefore, marketing strategies that are associated with lower beta enhance a firm's value, apart from their effect on cash flow.

Because of the centrality of risk in affecting firm valuation, some recent work (e.g., Singh, Faircloth, & Nejadmalayeri, 2005; McAlister, Srinivasan, & Kim, 2007; Tuli & Bharadwaj, 2009), has investigated the relationship between marketing variables and a firm's beta. These studies are based on the perspective that market-based intangible assets (i.e., brand equity) created by strategic activities such as advertising or R&D programs will influence a firm's performance and decrease the firm's risk. That is, brand equity acts as a barrier to competition, increases customer loyalty, and as a result, decreases the covariance between the firm's stock return and market return, thereby lowering the firm's CAPM beta. There are several approaches to measuring brand equity, but customer-based brand equity has shown to significantly affect a firm's risk (e.g., Rego, Billett, & Morgan, 2009; Johansson, Dimofte, & Mazvancheryl, 2012). Previous studies have mainly focused on the effects of aggregate-level customer-based brand equity to assess firm performance. However, since customer-based brand equity reflects everything about customer cognition regarding the brand such as "thoughts, feelings, experiences, images, perceptions, beliefs, and attitudes" (Keller & Lehmann, 2003, p.

28), brand equity is embodied in multiple dimensions. Because some dimensions reflect different aspects of brand equity that do not move in lockstep with each other, an aggregate measure of brand equity will not fully depict the properties of brand equity. To mitigate this concern, our study allows for the fact that customer-based brand equity is multidimensional, and that different dimensions of brand equity can have different effects on risk.

We adopt not only the disaggregate level of brand equity but also the disaggregate analysis of risk. A recent stream of research has extended the CAPM, allowing for the possibility of asymmetries in beta. Namely, a firm's downside beta or losses (i.e., the extent to which a firm's stock co-varies with the market during downturns) may be different from the firm's upside potential or gains[1] (i.e., the extent to which a firm's stock co-varies with the market in upturns). Upside gain represents potential growth in value that agents can expect by holding stocks with good volatility, while downside loss corresponds to the compensation that agents demand bearing downside risk. Therefore, all else being equal, (in particular, controlling for downside risk), firms that vary more strongly with the market during upturns than with downturns (i.e., the differential between upside and downside beta is positive) would be more attractive to investors. This is consistent with the idea of the prospect theory (Kahneman & Tversky, 1979), according to which investors are more sensitive to downside losses than to upside gains and thus, require a premium for holding assets that co-vary strongly with the market when it declines. While the CAPM beta has a substantial theoretical appeal, decomposing beta into upside gains and downside losses closely corresponds to how investors perceive risk and provides a platform for assessing how marketing activities might influence risk. Accordingly, we take into account the

[1] While beta is generally referred to as systematic risk, we use upside potential or gains instead of upside risk. Only downside beta is the true measure of risk because the higher the downside (upside) beta, the greater the downside loss (upside potential) of a stock.

asymmetric risk characteristics for our analyses as well as examine the differential between upside and downside beta. Web Appendix Table W1 provides a list of the literature that assess firm value using marketing and strategic variables.

## 2. The Multidimensionality of Brand Equity

Customer-based brand equity is a measure of a brand's power derived from customers' perceptions of the brand. Customers' perceptions include various aspects of mindset such as awareness, quality, and differentiation. To capture the customer's mindset, we use a variant of the updated Young and Rubicam's (Y&R) Brand Asset Valuator (BAV) framework because this model has been one of the most widely used approaches to measuring customer-based brand equity (Aaker, 1996; Keller, 1998). The updated Y&R BAV model measures a brand's overall health by assessing five of its core components, namely, Differentiation, Relevance, Esteem, Knowledge, and Energy (Mizik & Jacobson, 2008), which are obtained from surveys undertaken in the 4$^{th}$ quarter of the year since 2000. All Y&R measures are transformed into z-scores. Designed to be reflective of a brand's overall health, the original BAV Model (e.g., Agres & Dubitsky, 1996) was a four-dimensional model based on Differentiation, Relevance, Esteem, and Knowledge. More recent work (e.g., Fudge, 2005; Gerzema, Lebar, & Sussman, 2005; Mizik & Jacobson, 2008, 2009) has highlighted the advantages of adding an Energy construct to tap into the long-term capabilities of the brand.[2]

[2] In some applications, BrandAsset Consulting, a global strategic consultancy with expertise in corporations, uses a measure that combines Differentiation and Energy, which they label as Energized Differentiation. In other contexts, in particular, when differing relationships are uncovered, BrandAsset Consulting incorporates the approach of Mizik and Jacobson (2008) and makes use of Energy as an additional construct to the original BAV dimensions. For our analysis, we use the most general model, which allows for separate effects regarding each of the five brand components. As a part of the sensitivity analysis, we also factor analyze the brand components. The factor analysis was not advantageous because it combined brand components having differential effects on risk into the same factor.

Differentiation is the ability of a brand to stand apart from its competitors, reflecting how distinctive the brand is in the marketplace. Differentiation is a central component because this is where meaning, brand essence, and potential margins reside. The Differentiation measure is the average of the response proportion of "Yes" to two questions: whether respondents perceived the brand to be "unique" and "distinctive."

Relevance reflects the personal appropriateness of the brand to the customer. For a brand to be successful, it needs to stand for something that matters in the marketplace. Achieving brand relevance is about keeping the brand current and linked to customers' perceived needs. Differentiation alone is not sufficient for brand success, because it is Relevance that is more related to sales volume and market penetration. Respondents to the BAV survey were asked to rate a brand's relevance on a seven-point scale, ranging from 1 (not at all relevant) to 7 (extremely relevant). We use the population average score as our measure of Relevance.

Esteem gauges the levels of respect, deference, and regard a consumer holds for a given brand. Esteem reflects not only how well consumers respect the brand but also how well the brand fulfills its promises. While product quality is a central component of brand equity, Aaker (1996) noted that "Following the Y&R model, it is possible to combine perceived quality and leadership in an esteem dimension" (pp. 325-326). The BAV esteem metric averages the z-scores for each of the following four items: (1) a rating (on a seven-point scale) that indicated the respondent's "personal regard" for the brand; the proportion of respondents who indicated that (2) they believed the brand was of "high quality"; (3) they believed the brand was a "leader"; and (4) they believed the brand was "reliable."

Knowledge refers to the extent of the consumer's awareness of the brand and understanding of its identity. Awareness levels about the brand and what it stands for reflect the

intimacy that the consumer has with the brand. Knowledge represents the culmination of the consequences of brand-building and reflects the depth of experience that the consumer has with the brand. BAV respondents rated on a seven-point scale their familiarity with a brand, including their overall awareness of the brand and an understanding of what kind of product or service the brand represents.

Energy depicts the brand's ability to meet future customer needs and respond to new and changing conditions. A brand has value to customers because of its future capabilities as well as its ability to fulfill current-term needs. The BAV Energy measure is based on the average of the response proportion of "Yes" to two questions: whether the brand was innovative and dynamic. All Y&R pillar measures are converted to z-scores (i.e., standardized). Table 1 summarizes the BAV dimensions, measurements, and their roles.

**3. Systematic Risk Asymmetry**

The standard excess return market model, which encompasses the CAPM, can be expressed as:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{\text{CAPM}} \cdot (R_{mt} - R_{ft}) + \varepsilon_{it} \qquad (1)$$

where $R_{it}$ is the stock return of firm $i$ at time period $t$, $R_{ft}$ is the risk-free rate at time $t$, $R_{mt}$ is the market-wide return at time $t$, $\beta_i^{\text{CAPM}}$ is the systematic risk ("CAPM beta") of firm $i$, and $\alpha_i$ is the abnormal return ("alpha") of firm $i$. While research in finance over the past three decades has shown some empirical limitations to the CAPM perspective, the CAPM beta has been intensively used by practitioners (Graham & Harvey, 2001) and is still an important measure for "stocks' vulnerability to market downturns" (McAlister, Srinivasan, & Kim, 2007); thus, a significant amount of research has used systematic risk from the CAPM to assess a firm's risk.

An implicit assumption underlying Equation 1 is that $\beta_i^{CAPM}$ is the same in up markets as well as down markets, i.e., a firm's upside potential is the same as its downside risk. However, economists have argued that investors focus more on downside losses than upside gains (Roy, 1952; Markowitz, 1959), and thus, there is an asymmetry between upside potential and downside risk. Behavioral scientists have explained this phenomenon using loss aversion preference theory (Kahneman & Tversky, 1979; Gul 1991). Accordingly, Feunou, Jahan-Parvar, & Okou (2018) decompose a firm's risk into upside and downside risk, assuming that investors like "good" risk which increases upside gains, whereas they avoid "bad" risk which increases downside losses. This assumption can be tested by allowing for a differential market response depending on whether the market-wide return minus risk-free rate is positive or negative[3]. Therefore, we set up the following model:

$$R_{it} - R_{ft} = S \cdot \alpha_i^{up} + (1\text{-}S) \cdot \alpha_i^{down} + \beta_i^{up} \cdot S \cdot (R_{mt} - R_{ft}) + \beta_i^{down} \cdot (1 - S) \cdot (R_{mt} - R_{ft}) + \varepsilon_{it} \quad (2)$$

$S$ is a categorical variable equal to 1 if $R_{mt} - R_{ft} > 0$ and 0 otherwise. Under the null hypothesis of the symmetrical market response, $\beta_i^{up} = \beta_i^{down} = \beta_i^{CAPM}$ or equivalently, $\beta_i^{up} - \beta_i^{down} = 0$. Prior studies have provided evidence of substantive asymmetries in beta, for example, by sorting stocks into quintiles based on risk characteristics and assessing the average returns for each quintile. Ang, Chen, and Xing (2006) confirm the widely accepted view that downside risk has (requires) a positive premium. The lowest downside risk quintile has the lowest average return (2.71%), and the highest downside risk quintile has the highest average return (14.49%). They also report average returns for stocks sorted by the difference between upside potential and

[3] According to Harlow and Rao's (1989) general model of defining downside risk, an upside condition is when market return (i.e. $R_{mt}$) is greater than a target rate of return. Various target rates have been used in prior studies such as average market excess return, risk-free rate, and zero. In this study, we use a risk-free rate as a target rate, following prior research in marketing (e.g. Luo & Bhattacharya, 2009; Tuli & Bharadwaj, 2009).

downside risks and show that stocks in the lowest $\beta_i^{up} - \beta_i^{down}$ grouping earned, on average, 11.4% per annum in excess of the risk-free rate. Conversely, stocks in the highest $\beta_i^{up} - \beta_i^{down}$ grouping earned on average 3.6% per annum in excess of the risk-free rate. Therefore, while the downside beta has a positive market risk premium, the upside minus downside beta has a negative market risk premium.

Because beta is asymmetric, and this asymmetry affects the return premium, a more complete understanding of a firm's risk characteristics requires an assessment of both its downside losses and upside gains. We have taken this approach in our assessment of the effect of brand equity on firm risk.

## 4. The Effect of Brand Attributes on Risk

The differential effect that brand perceptions have on consumer responses to the marketing of the brand can be theorized and shown empirically to influence a range of financial performance outcomes such as market share, price premium, market capitalization, profitability, and risk. Despite its theoretical appeal, there are limited and sometimes conflicting theories regarding the relationship between brand equity dimensions and a firm's risk. We construct several conjectures regarding the relationship of brand attributes to systematic risk, especially asymmetric systematic risk.

### 4.1. Differentiation

Several studies in marketing have noted that brand differentiation decreases a firm's risk since compared to a non-differentiated brand, the differentiation of a firm's products makes them less substitutable and less sensitive to pressures to lower their price (Allenby & Rossi, 1991), which protects the firm from market changes (Mela, Gupta, & Lehmann, 1997; McAlister, Srinivasan, & Kim, 2007). Because of its insulated position in the marketplace, we do not expect

a brand that stands apart from its competitors to experience high volatility compared to a non-differentiated brand (Rego, Billet, & Morgan, 2009; Sivakumar & Raj, 1997). Accordingly, differentiation will be negatively associated with a firm's systematic risk.

**4.2. Relevance**

Brand relevance, because of its impact on market penetration, is one of the key factors that drive the success of a firm in sales, profits, and market position (Gerzema, Lebar, & Rivers, 2009; Aaker, 2010). Mizik and Jacobson (2008), for example, find that there is a positive relationship between brand relevance and a firm's stock return. Many brands lose their market share when they become irrelevant (Aaker, 2010). As a result, regardless of the market situation, people do not purchase brands that are less important and necessary for them. This property makes a brand with high relevance hold a prominent position even when the market turns down and encounter less expected loss compared to brands with less importance. That is, brands with high relevance will be less sensitive to changes in market situations. Therefore, Relevance will be negatively related to a firm's risk.

**4.3. Esteem**

Esteem combines consumers' perceived quality, leadership, reliability, and high regard for a brand. Several studies suggest that high perceived quality and reliability of a product or service increases customer satisfaction and loyalty, and as a result improves financial performance (Buzzell & Gale, 1987; Das et al., 2000; Fornell, 1992; Kordupleski, Rust, & Zahorik, 1993). These studies indicate a negative association between Esteem and risk.

**4.4 Knowledge**

There is substantial empirical evidence that investors tend to "buy what they know." For example, French and Poterba (1991) document that investors overweight their portfolios with

domestic stocks (a "home-country" bias). Research also has suggested that the same type of familiarity bias applies within a country for more visible company stocks (Grullon, Kanatas, & Weston, 2004; Huberman, 2001; Frieder & Subrahmanyam, 2005). That is, investors are likely to invest more heavily in companies with high visibility. Consumers also take into account familiarity when they make a purchase decision. Consumers show more favorable attitudes toward domestic products (Verlegh, 2007) and are inclined to choose products based on their past experiences with similar products (Herstatt & von Hippel, 1992; Song et al., 2018). As such, consumer knowledge about the brand impacts the ownership base and the market liquidity of the firm's stock, and thus, the risk of the stock. A high level of brand knowledge reduces customers' search costs, generates customer loyalty, and thereby induces repeat purchases (Berthon, Hulbert, & Pitt, 1999; Keller, 2003; Hoyer & Brown 1990), leading to a lower level of risk (Rego, Billett, & Morgan, 2009). Accordingly, we expect negative relation between Knowledge and a firm's risk.

**4.5. Energy**

A significant number of studies suggest that market-based assets such as brand equity through R&D enhance a firm's financial performance (Roberts, 2001; Chan, Lakonishok, & Sougiannis, 2001; Mizik & Jacobson, 2003; Pakes, 1985). Previous literature also indicates that R&D investments improve firm outcomes in long-term sales growth, market share, and market value during both economic growth periods and recessions (Morbey & Dugal, 1992). This is because R&D creates innovativeness and perceptions of product superiority and drives brand dynamism, which allows a firm to properly cope with changes in market situations (Miller & Bromiley, 1990). Also, Chaney, Devinney, and Winer (1991) suggest that stockholders expect future benefits and excess returns from a firm with high innovativeness. These properties protect

the firm from the impact of market changes, leading to higher profitability (Mansfield et al., 1977) and lower systematic risk (McAlister, Srinivasan, & Kim, 2007). As a result, we expect Energy to have a negative association with risk.

**4.6. Brand Equity and Asymmetrical Systematic Risk**

Managers strive to find factors that decrease downside beta and increase or at least minimally decrease upside beta. The role of brand equity in reducing beta is likely to be more prominent in a bad market than in a good market. The literature on marketing and management has shown that during market downturns, customers become more price-conscious (Estelami, Lehmann, & Holden, 2001) and less loyal to a specific brand, turning instead to substitutes with lower prices (Latham & Braun, 2010). Therefore, retaining loyal customers by increasing the uniqueness of the brand, making the brand less substitutable, and decreasing its price sensitivity is crucial to reducing a firm's volatility, especially during downturn markets. Accordingly, Steenkamp and Fang (2011) suggest that managers should spend on strategic activities more in bad times than good times to insulate a firm from external market situations. Therefore, the risk-reducing effect of Differentiation is likely to be strengthened during market downturns.

We also expect that the effect of Esteem on a firm's volatility will be stronger during a downturn market. Previous studies have shown that brands with high perceived quality have less price elasticity (Ailawadi, Neslin, & Lehman, 2003; Allenby & Rossi, 1991). In particular, high perceived quality relative to competitors will increase customer satisfaction (Babakus, Bienstock, & Scotter, 2004). These properties protect the brand from high customer turnover, which decreases a firm's risk during market downturns.

Also, during market downturns, customers become more risk-averse (Rego, Billett, & Morgan, 2009) and reduce not only their consumption levels but also repeat purchases (Latham

& Braun, 2010), which decreases customer loyalty and increases a firm's downside risk. A high level of Relevance will mitigate this phenomenon because consumers tend to focus on those brands that "strike meaningful chords," particularly during market downturns. This generates customer loyalty to a highly relevant brand, protecting the brand from downward prospects. In addition to relevance, familiarity also plays an important role in reducing downside risk. Since people tend to be conservative and turn to safer purchases during market downturns, consumers choose familiar brands instead of unfamiliar ones. Investors would also perceive well-known brands as safer and thus prefer to hold stocks with high Knowledge when market situations turn downward.

For Energy, both industrial and academic research has emphasized the crucial role of innovation during unfavorable market periods (e.g., May, 2008; Roberts, 2003; Morbey & Dugal, 1992; Dugal & Morbey, 1995). Investing in innovation during a market downturn drives future excess returns and rapid recovery in profitability when the market upturns (May, 2008; Roberts, 2003), thereby giving a positive signal to shareholders (Chaney, Devinney, & Winer, 1991). In line with this reasoning, Latham and Braun (2010) show that introducing new product lines during a recession increases customer loyalty and avoids possible customer churn during downturns. Therefore, we expect the effect of Energy to be higher on downside losses than on upside gains.

## 5. Model

### 5.1. Estimation Procedure

The estimation procedure involves two steps: (1) estimating a firm's systematic risk and its potentially asymmetric components; and (2) estimating the association of a firm's risk with brand equity variables, a marketing expenditure variable, and financial control measures.

For each year, we estimate the firm's systematic risk ($\beta_{iy}^{\text{CAPM}}$) using the standard excess return model.

$$R_{idy} - R_{fdy} = \alpha_{iy} + \beta_{iy}^{\text{CAPM}} \cdot (R_{mdy} - R_{fdy}) + \varepsilon_{idy} \quad (3)$$

where $R_{idy}$ is the stock return of firm $i$, $R_{fdy}$ is the risk-free rate, and $R_{mdy}$ is the market-wide return, on day $d$ of year $y$, respectively. $\beta_{iy}^{\text{CAPM}}$ is the systematic risk of firm $i$ and $\alpha_{iy}$ is the abnormal return of firm $i$, in year $y$, respectively. We estimate upside gains ($\beta_{iy}^{\text{up}}$) and downside risks ($\beta_{iy}^{\text{down}}$), which allows us to form the upside minus downside risk differential (i.e., $\beta_{iy}^{\text{up}} - \beta_{iy}^{\text{down}}$) using Equation 4, a modification to the standard model.

$$R_{idy} - R_{fdy} = S \cdot \alpha_{iy}^{\text{up}} + (1 - S) \cdot \alpha_{iy}^{\text{down}} + \beta_{iy}^{\text{up}} \cdot S \cdot (R_{mdy} - R_{fdy}) + \beta_{iy}^{\text{down}} \cdot (1 - S) \cdot (R_{mdy} - R_{fdy}) + \varepsilon_{idy} \quad (4)$$

where $S$ is a categorical variable equal to 1 if $R_{mdy} - R_{fdy} > 0$; 0 otherwise. We use daily stock returns to get sufficient data for our model estimation.

Making use of the risk estimates obtained in the first estimation phase, we investigate which variables can predict a firm's risk by regressing the systematic risk on the brand equity dimensions. If there exist unobserved variables that are correlated with both brand equity dimensions and firm risk, the estimated coefficients will be biased and inconsistent without controlling for the unobservables. For example, unknown economic situation to the researcher could influence brand equity dimensions and a firm's risk. In order to deal with this issue, we use time invariant firm fixed effect model which partially resolves the problem (Nair, Manchanda, and Bhatia 2010; Germann, Ebbes, and Grewal 2015). We also include additional unobservables control factors that have been highlighted in past research. We use GDP growth and yearly dummy variables to capture, for example, differences in macroeconomic effects across time. We also create industry dummy variables following Barth, Cram, and Nelson's (2001) classification

to control for industry effects. We adopt a natural log of assets to reflect size effects, the book-to-market ratio for relative distress effects, liquidity as the convertibility of assets to cash, leverage, and SG&A expenditures scaled by sales as a control for marketing expenditures (e.g., Dutta, Narasimhan, & Rajiv, 1999; Boulding & Christen, 2008; Narasimhan, Rajiv, & Dutta, 2006) that may be correlated with brand dimensions.[4] We also include age dummies, profitability, profit volatility, and dividend pay dummies, following previous studies (e.g. Rego, Billett, & Morgan, 2009; Luo & Bhattacharya, 2009).

A Hausman (1978) specification test of each model that compares the random-effects model to the fixed-effects model rejects the null hypothesis of no fixed effects. We also check for the existence of time effects using a Wald test and a test of serial correlation of errors (Wooldridge, 2002) which suggest that there are significant time effects and a first-order serial correlation for all models. Based on these test results, we adopt a fixed-effect model with a serial correlation of errors as follows:

$$\text{Risk}_{iy} = \gamma_i + \gamma_1 \cdot \mathbf{BE}_{iy} + \gamma_2 \cdot z_{iy} + \gamma_3 \cdot \mathbf{FCV}_{iy\text{-}1} + \gamma_4 \cdot \mathbf{Y} + \gamma_5 \cdot \mathbf{I} + \varepsilon_{iy} \quad (5)$$

where $y$=year, $i$=firm, $\text{Risk}_{iy} = \beta_{iy}^{\text{CAPM}}$, $\beta_{iy}^{\text{up}}$, $\beta_{iy}^{\text{down}}$, or $\beta_{iy}^{\text{up}} - \beta_{iy}^{\text{down}}$, **BE**=Differentiation, Relevance, Esteem, Knowledge, or Energy, $z$=ln(SG&A/Sales), **FCV**=[ln(Total Assets), Profitability, Profit Volatility, ln(Book-to-Market Ratio), Leverage, Liquidity, Dividend Pay dummies, Age dummies], **Y**=[GDP growth rate, year dummies], **I**=Industry dummies, $\gamma_i$=fixed effect, and $\varepsilon_{iy} = \rho\varepsilon_{iy\text{-}1} + v_{iy}$, the serially correlated error term.

Another econometric issue in examining the relationship between brand equity and risk is simultaneity. One approach that we adopt to address the issue is based on theoretical ground.

[4] An advantage of using SG&A from COMPUSTAT is that it includes R&D expenditures, which have been posited to affect firm risk. The use of advertising instead of SG&A limits the number of firms available for analysis because many firms do not separately report advertising expenditures.

According to market asset theory, intangible asset (i.e. brand equity) created by marketing or strategic activities such as advertising or R&D influences firm value. There may exist a feedback effect where the increased or decreased firm value influences a firm's future activities and brand equity. While marketing/strategic activities, brand equity, and firm value interact with each other, this theory implies a sequence among those variables. That is, a firm's current brand equity can influence the current or future firm value or risk. However, future firm value or risk cannot cause a firm's current or past brand equity. Based on this theory, we include lagged brand equity to examine its relationship with current risk.

Another approach to control for the simultaneity is to use "exclusion restrictions." One of the references firms use when investing in brand equity is other similar sized firms' brand equity. Thus, other firms' brand equity in the same size group in the other industries could be correlated with the firm's brand equity but not influence the firm's risk. By using the average of the other firms' brand equity in the same size group in the other industries as an instrumental variable (IV), we address the potential simultaneity problem. In the instrument variable model, we divide the firms into four groups by their size and use brand equity measures of the firms with the same size cluster in other industries as instrumental variables. We explore the results of IV model comparing to our theory-based model.

**5.2. Data**

We combined our data from four different sources. The brand equity dimensions were obtained from the Y&R BAV database. Among the surveyed brands, we identified 156 publicly-traded mono-brand firms (i.e., firms that use a branded house strategy such that the vast majority of their business is aligned with a single brand name) for which complete accounting and stock market data are available for at least some of the 2000–2006 period. We end up with 771

observations in 15 industries available for analysis. The stock market data we utilize involve daily stock returns, stock price, and the number of shares outstanding from the CRSP database. Risk-free rates and market-wide returns are collected from the French's Data Library. The accounting data come from the COMPUSTAT data files. Descriptive statistics for the risk measures and independent variables are shown in Table 2. Consistent with previous findings, the mean for all three beta measures is approximately 1, although the upside minus downside beta differential is slightly negative (-.004).

Table 3 shows the number of days, which is used to estimate upside and downside betas across the years. Since the days between the upside market and downside market are balanced (the largest difference is 28 days in 2003 and 2004), firms are not overrepresented in market upturns (i.e., $R_{mdy} - R_{fdy} > 0$) versus market downturns (i.e., $R_{mdy} - R_{fdy} \leq 0$), and vice versa.

Figure 1 provides a graph of a firm's average upside versus downside beta. The two measures are significantly correlated, but some asymmetries exist in that some companies show a relatively high level of upside beta but a low level of downside beta (e.g., HP and Amazon) and vice versa (e.g., Napster and Oakley). Importantly, if the effects of brand equity dimensions on upside and downside beta are not the same, it can reveal some critical theoretical and managerial insights.

For individual firms, we construct a histogram of the average difference between upside and downside beta across the seven years (Figure 2). The distribution is centered around zero, but with firms exhibiting a fair amount of variations (e.g., Amazon has a positive average differential of 1.07, whereas Oakley has a negative average differential of -1.56).

Web Appendix Figure W1 provides examples of the evolution of the five brand dimensions over time. We see variations among brands, among dimensions, and over time. For

example, Microsoft ranks highest on Energy compared to its other brand dimensions. However, since 2000, it has experienced a rather substantial drop in its brand Energy rating. Yahoo displays a somewhat similar dynamic pattern for its brand dimensions, but the levels of its dimensions are all lower than those of Microsoft. Starbucks is high in Differentiation, and Kraft is high in Relevance. Eastman Kodak experienced declines for all its brand dimensions. Sears ranks low in both Differentiation and Energy. While Sears' brand Knowledge dimension has remained about the same over the 7 years, it has experienced a fall in Esteem. These different behaviors of each variable suggest that each dimension may have a differential effect on risk.

Web Appendix Figure W2 shows systematic risks over time for selected brands with high versus low brand equity. While we cannot find a common pattern in the samples, there are variations among brands and over time. For example, Safeway and California Pizza Kitchen show increasing patterns of CAPM beta, whereas Microsoft shows a decreasing pattern. Also, some brands such as Walmart and Johnson & Johnson have had stable risk patterns, and other brands (e.g., Qwest Communications, Playboy Enterprises) have shown more dynamic patterns.

Table 4 reports correlations between the variables in our study. For most brand equity dimensions, the correlations are small, though Relevance, Esteem, and Knowledge are highly correlated with each other. Therefore, to avoid multicollinearity, we include each pillar of brand equity in a separate model.

## 6. Results

### 6.1. The Effects of Brand Equity on Firm Risk

As a point of comparison, we begin our analysis by examining the effect of an aggregate measure of brand equity (formed as the average of the five-brand equity dimensions) on regular risk. Column I of Model 1 in Table 5 reports the results. Consistent with the traditional

perspective, we find that the aggregate measure of brand equity is negatively related to the CAPM beta ($\beta^{CAPM}$). Disaggregating beta into its upside and downside components allows us to better isolate the primary source of this association. As shown in Columns II and III of Table 5, brand equity is negatively related to both upside ($\beta^{up}$) and downside beta ($\beta^{down}$). However, only the coefficient of the downside is significant. The coefficient of the upside minus downside beta differential ($\beta^{up} - \beta^{down}$) is significant and positive, which shows that the negative relationship with downside risk is greater than its negative relationship with a firm's upside potential. This result is consistent with the loss aversion preference theory which suggests that investors or consumers tend to pay more attention to downside losses than upside gains.

Although these results are consistent with theory, the aggregate approach may hide the differential role of each component of brand equity because the results of Model 1 in Table 5 rest on the assumption that each of the five dimensions of brand equity has the same effect on risk. The results from Models 2~6 which are based on the disaggregated brand equity measures are largely consistent with our expectations. As shown in Column I of Model 3, Relevance is negatively associated with a firm's systematic risk ($\beta^{CAPM}$), reinforcing the traditional theory that a high level of relevance lowers risk by smoothing the fluctuation of the firm's stock return. Esteem is negatively related to a firm's regular risk ($\beta^{CAPM}$), suggesting that high perceived quality is positively associated with a firm's financial performance. Knowledge also has a significant and negative relationship with systematic risk ($\beta^{CAPM}$). This finding is consistent with the perspective that investors are inclined to hold stocks that they know. Disaggregate analyses of beta provide the source of those negative relationships. As shown in Columns II and III of Model 4 and 5, Esteem is negatively related to downside losses without decreasing upside gains. We also find that the coefficient of Esteem on the upside minus downside beta differential is

significantly positive, confirming that Esteem's negative relationship with downside risk is significantly greater than that with upside gain. Regarding Relevance and Knowledge, we find that these two pillars of brand equity are significantly and negatively associated with both upside gains and downside risks. In particular, as shown in Column IV of Model 3, Relevance has a positive and significant coefficient on the upside minus downside beta differential, which indicates that Relevance's negative relationship with beta is conspicuous in bad market situations. In contrast, Knowledge does not show a significant coefficient on the upside minus downside beta, indicating that the two betas are similar in magnitude. One plausible explanation is that knowledge attenuates loss aversion (Johnson, Gachter, & Herrmann, 2006), reducing investors' and consumers' behavioral asymmetries in upside gains versus downside losses. Our results imply that overall, the three components (Relevance, Esteem, Knowledge), would help firms improve their financial health. Unexpectedly, Differentiation does not show any significant relationship with upside or downside beta.

Energy also makes a firm favorable, but it does so in a different way. Inconsistent with our conjecture, we find that Energy has a statistically significant and positive relationship with CAPM risk. Although a large body of literature has focused on the benefits of innovation, a few studies have provided empirical evidence of a positive relationship between innovativeness and a firm's risk. Accordingly, high Energy seems to hurt a firm's financial performance, and studies have offered several explanations for this finding. For example, Chaney, Devinney, and Winer (1991) found that innovative behavior such as introducing new products is positively associated with market risk. One plausible explanation is that Energy creates perceptions of enhanced uncertainty, given that innovations like new product introduction are "naturally risky" (Chaney, Devinney, & Winer, 1991). However, our disaggregate analysis of risk offers a different

explanation. As shown in Columns II, III, and IV of model 6, Energy is positively associated with upside gains without increasing downside losses. Thus, high Energy is actually beneficial to a firm because it is positively associated with "good risk." These findings also emphasize the importance of examining individual dimensions of brand equity in addition to the aggregated measure.

While our analyses of the five pillars of brand equity show differential relationships with a firm's financial health, our results indicate that there are some commonalities among those components. To identify the correlations among the equity pillars, we conduct a factor analysis and extract two factors with the eigenvalue of greater than one. As shown in Figure 3, three components (Relevance, Esteem, and Knowledge) are highly correlated with Factor 1, and the other two components (Differentiation and Energy) are strongly correlated with Factor 2. As shown in Table 6, disaggregate risk analyses report that Factor 1 is negatively associated with both upside gain and downside risk. However, the positive coefficient of Factor 1 on the upside minus downside beta differential indicates that the negative relationship with downside loss is greater than the negative relationship with upside gain, which is beneficial to a firm. In contrast, Factor 2 is significantly and positively associated with upside gain without influencing downside risk. The positive coefficient of Factor 2 on the upside minus downside beta differential shows that Factor 2's positive relationship with upside gain is greater than that with downside risk in magnitude. Therefore, these two factors of brand equity dimensions contribute to firms in different ways.

On the other hand, as shown in Column III of Table 5, the negative coefficient of Relevance is significant and greater than those of the other brand equity dimensions. This result implicates that during a market downturn, the personal importance of a brand is most crucial to

risk reduction. That is, under bad market situations, investors or consumers pay more attention to what they need and what is important to them than to how unique/innovative the brand is or how much they know about the brand. During a period of an upturn in the market, however, the Relevance-concentration phenomenon is attenuated, and Energy becomes the most important factor (i.e., the highest coefficient in magnitude) that is associated with upside beta. This result suggests that people highly value the innovativeness of a brand when the market recovers. This reasoning is aligned with Shama's (1981) finding that people purchase only what they need rather than what they want under bad market situations. The findings from a recent *New York Times*/CBS News poll also support this observation, showing that almost half of Americans spend less on non-necessary products during market downturns (Cave, 2010). For a robustness check, we estimate an IV model (Table A1 in Appendix). The results are largely consistent with those of our main model.

**6.2 The Effects of Brand Equity across Industries**

To obtain additional insights into the relationships among the five dimensions of brand equity and a firm's risk, we explore the effects of each component on risk across industries. In this analysis, some industries are excluded due to the small number of observations. We use Barth, Cram, and Nelson's (2001) industry definition for this analysis (see also Rego, Billett, & Morgan, 2009).

The results in Table 7 suggest that firms from different industries benefit from different dimensions of brand equity. Relevance, Esteem, and Knowledge are important factors, showing negative associations with a firm's systematic risk in the food and pharmaceutical industry. In particular, these three components are negatively related only to downside risk without influencing upside potential. Thus, firms in these industries can benefit by emphasizing their

products' importance, perceived quality, and familiarity to their customers and investors rather than, for example, how dynamic and unique their brands are especially during bad times. For the retail industry, although Relevance, Esteem, Knowledge are still important dimensions, our results indicate that different strategies from those in the food and pharmaceutical industries should be adopted. In retail, Relevance, Esteem, and Knowledge are positively related to a firm's upside gains without influencing downside risks. These results suggest that managers in this industry should strive to achieve high personal relevance, perceived quality, and familiarity in good times compared to bad times. In the durable manufacturing industry, Differentiation, Relevance, Esteem, and Energy are all negatively related to both upside and downside beta. The coefficients of Differentiation and Energy on the upside minus downside beta differentials are significantly positive, which indicates that the negative association with downside loss is greater than that with upside gain. On the other hand, we do not find a statistically significant relationship between the other two components (Relevance and Esteem) and the upside minus downside beta differentials. These results imply that Relevance and Esteem can be used as stabilizers of a firm's volatility. For transportation, both Relevance and Esteem are negatively related to upside gains and downside losses. However, the insignificant coefficients of these two pillars on the upside minus downside beta differentials show that the relationships are similar in magnitude regardless of market situation. In the textiles, printing, and publishing industry, Relevance is the factor to focus on. Relevance is positively related to upside gain without hurting downside risks. In chemicals, Knowledge shows a negative relationship with a firm's systemic risk. However, this association is was primary attributed to its negative relationship with upside gains.

In the computer industry, we do not find a significant relationship between brand equity components and a firm's beta. In addition, we do not find a significant relationship between Energy and systematic beta in this industry, contrary to our expectation. One possible reason is that firms in the computer industry do not necessarily include high-tech companies in the current classification. For example, research, development, and testing labs are classified as being in the service industry, although Fama and French classify them as a high-tech industry. Thus, we reinvestigate the effect of each brand dimension on firm value using Fama and French's high-tech industry classification, which includes business equipment, computers, telephones, and television transmission. The results in Panel A of Table 8 reveal that Differentiation and Knowledge are negatively related to both upside gains and downside losses. However, there is no difference between these two relationships in magnitude. Relevance shows a positive relationship with upside gains without hurting downside risks, which results in its positive association with the upside minus downside beta differential. Energy is significantly and positively associated with a firm's systematic risk, but we do not find significant relationships between Energy and the disaggregate measures of beta. At first glance, Energy (Innovativeness and Dynamism) does not seem to be beneficial for reducing firm risk in the high-tech industry. However, our descriptive analyses reveal an interesting insight. First, R&D expenditures are much higher in the high-tech industry than in other industries ($1,297 million vs. $505 million), and the level of beta is much higher for the high-tech industry than for other industries (1.34 vs. 0.95), which implies that innovation is perceived as a risky endeavor in the high-tech industry. Second, the results in Panel B show that Energy is negatively associated with both upside potential and downside risk in low R&D firms whereas it is positively associated with both upside potential and downside risk in high R&D firms. Furthermore, as evidenced in Table 14,

Energy is beneficial to high R&D expenditure firms in general. These results indicate that while firms with high R&D spending in other industries benefit from innovative and dynamic brand image, firms with high R&D expenditures within the high-tech industry face the tradeoff between enhanced upside potential and higher downside risk, which results from innovative and dynamic brand equity.

**6.3 The Effects of Brand Equity for Sin Stocks**

Next, we examine the effect of brand equity for sin stocks such as firms in the tobacco, alcohol, and gambling industries (Blitz & Fabozzi, 2017) on systematic risk since investors require higher risk premiums for holding sin stocks than for other comparable stocks due to the inherent litigation risk in these industries (Hong & Kacperczyk, 2009; Blitz & Fabozzi, 2017). Accordingly, brand equity might behave differently for sin stocks than other stocks. Overall, the high brand equity of a firm that provides controversial goods does not improve its financial health. As shown in Column IV of Table 9[5], Esteem and Knowledge have negative coefficients on the upside minus downside beta differential, although both components are positively related to upside gains and downside risks. These results indicate that Esteem and Knowledge are more strongly associated with downside losses than with upside gains. Relevance is also positively related to both upside gains and downside losses, but the coefficient on the upside minus downside beta differential is not significant. In contrast, Differentiation benefits sin stock firms, as they are positively related to only upside gains.

The comparative analyses between sin versus non-sin stocks highlight the different role of brand equity in evaluating firm risk. In contrast to sin stocks, non-sin stocks benefit from strong brand equity. Relevance could be used as a stabilizer for non-sin stocks, as they show

[5] We exercise caution in interpreting the results due to the small sample size in the sin stock category.

negative relationships with both upside gains and downside losses. The positive coefficient of Relevance on the upside minus downside beta reveals that the negative association is greater in the downside market than in the upside one. Esteem and Knowledge show negative relations with only downside losses and do not hurt upside gains. Energy is positively related to both upside gains and downside losses for non-sin stocks, but the positive coefficient of Energy on the upside minus downside beta indicates that the positive relationship with upside potential is greater than that with downside risk.

**6.4 The Effects of Brand Equity by Size, Book-to-Market Ratio, and Beta**

To investigate how brand equity works differently for firms with various financial characteristics, we form portfolios based on their size, book-to-market ratio, and CAPM beta. Following Fama and French's criteria,[6] we use the 50$^{th}$ percentile as the size breakpoint, and the 30$^{th}$ (growth stock) and 70$^{th}$ (value stock) percentiles as book-to-market ratio breakpoints, respectively. We also use the 30$^{th}$ (low beta) and 70$^{th}$ (high beta) percentiles as beta breakpoints for our analyses.

The effects of brand equity on risk by size, book-to-market ratio, and beta are presented in Tables 10, 11, and 12, respectively. The results show that in most cases, Relevance, Esteem, and Knowledge are negatively related to both upside and downside risks for small, growth (i.e., low book-to-market), or unstable (i.e., high beta) stocks, whereas these dimensions show negative associations with only downside losses without hurting upside gains for big, value (i.e., high book-to-market), or stable (i.e., low beta) stocks. While these three components of brand equity are beneficial in both cases, our results imply that establishing these dimensions of brand equity would be more crucial for the large, value, and stable firms to enhance financial value. On

[6] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/six_portfolios.html

the other hand, Energy is positively associated with both upside gains and downside losses of large stocks but is negatively related to downside losses of small stocks. However, the insignificant coefficient of Energy on the upside minus downside differential tells that the two positive associations in large firms are similar in magnitude. Regarding book-to-market ratio, Energy has a positive relationship with only upside gains without influencing downside losses of value stocks, while it does not show any significant relationship for growth stocks. We also find that Energy has a negative relationship with upside gains of stocks with high beta. Differentiation is negatively associated with downside losses of small and value stocks, but positively related to upside gains of stable stocks.

**6.5 The Effects of Brand Equity by Advertising and R&D Expenditures**

Luo and Bhattacharya (2009) have emphasized the roles of strategic expenditures as levers that enhance the risk-reducing effects of corporate social performance. Following this argument, we investigate whether spending on strategic activities gives leverage to brand equity in its relationship with systematic risk. As before, we form portfolios on the strategic expenditures. We use the 50$^{th}$ percentile which is used to form the size portfolios in the Fama and French's model setting, since a firm's strategic spending is highly correlated with its size. For strategic spending, we use R&D and marketing (= SG&A - R&D) expenditures, also consistent with previous studies (e.g., Mizik, 2010). Table 13 reports the effect of each brand dimension for firms with low versus high marketing expenditures. In both cases, brand equity is largely associated with improved firm value. Relevance, Esteem, and Knowledge are negatively related to both upside gains and downside losses, which can be used to stabilize stock fluctuations for firms with low marketing expenditures. It is noticeable that Differentiation shows a negative relationship with downside risk without hurting upside gains for firms with low

marketing expenditures. These results suggest that firms with lower marketing spending should emphasize the uniqueness of their brand to improve financial value effectively. On the other hand, Relevance, Esteem, and Knowledge insulate firms with high marketing spending from downside risk without hurting upside gains, while Energy is positively related to both upside and downside beta to the same degree. These findings imply that establishing high personal importance, perceived quality, and familiarity would help firms with high marketing spending increase their financial health efficiently. Overall, the comparative analyses indicate that firms with higher advertising expenditures compared to firms with lower advertising expenditures, gain more benefits from strong brand equity.

Table 14 summarizes the relationships of each brand dimension with firms' systematic risks by R&D spending. Although brand equity is largely beneficial to both cases, each dimension of brand equity shows a different relationship with betas. For firms with low R&D spending, Relevance and Esteem are associated with upside gains without influencing downside losses, while Differentiation is negatively related to both upside potential and downside risk. For firms with high R&D expenditures, Relevance, Esteem, and Knowledge are negatively associated with downside risk without hurting upside gains. Energy is positively related to both upside gains and downside risk. However, the significant and positive coefficient of Energy on the upside minus downside beta indicates that the positive relationship with upside potential is greater than that with downside risk. While most brand dimensions contribute to improving firms' financial health in both cases, the comparative analyses imply that strong brand equity of firms with high R&D expenditures tend to be more beneficial. The results also suggest different brand strategies for firms with low and high R&D spending. Firms with low R&D investments should focus more on Relevance and Esteem when the market turns up but focus on

Differentiation when the market turns down. On the other hand, firms with high R&D investments should pay more attention to Energy under good market situations but to Relevance, Esteem, and Knowledge under bad market situation. The results imply that brand equity and R&D investment generate synergy; Knowledge insulates firms from market vulnerability and Energy boosts their upside gains during good market situation as firms invest more in R&D activities.

**6.6. The Effects of Brand Equity Before vs. After Market Downturn**

Although we break down a firm's systematic risk into upside gains and downside losses, the two components do not match the systematic risk during a period of economic growth versus decline. To examine whether the five dimensions of brand equity act differently under different economic situations, we divide the dataset into two based on market conditions. Because our sample period (2000-2006) does not include a formal economic recession (i.e., a decline in GDP), we use the year 2003 as a breakpoint based on the S&P 500 historical price (see Figure 4).

Table 15 presents estimated risks during market downturn (i.e., $\beta^{2000\text{-}2002}$ or downside risk) and upturn (i.e., $\beta^{2003\text{-}2006}$ or upside potential). Comparing the results in Table 15 with those in Table 5 which are based on Ang, Chen, and Xing's (2006) definition, we find that the effects of each brand dimension are largely similar in both results. That is, the two different approaches in defining upside versus downside market does not influence the results.

**7. Discussion and Conclusion**

Our research highlights the importance of disaggregate analyses of risk. The two components of CAPM risk (i.e., upside potential and downside risk) have different financial meanings. From a financial perspective, upside beta represents potential gains, whereas downside beta shows expected losses. According to the finance literature, the latter is actual risk

that investors should minimize, while the former is beneficial to investors. Our finding shows that the analysis with the decomposed risk components discloses a hidden story in the aggregate estimate of beta. In particular, allowing asymmetry in beta, the analysis of Energy reveals a novel insight that previous literature did not find. Noting the estimated positive effect of Energy on regular beta, one would conclude that innovativeness and dynamism increase a firm's risk overall. However, the analysis of upside and downside beta tells us that Energy is beneficial to a firm because it is positively associated with a firm's upside potential without increasing a firm's downside risk.

Our research also shows why it is critical to conduct disaggregate analyses of brand equity. An analysis aggregating all brand equity dimensions into a single measure masks the differential effects among the brand dimensions. The results of our study reveal the differential role of each brand equity component in its relation to a firm's risk. First, acting as stabilizers, Relevance and Knowledge are associated with lower CAPM risk, upside potential, and downside risk. That is, personal relevance and knowledge about a brand insulate the firm from the impact of market conditions, stabilizing fluctuations in the firm's revenue and stock price in both market upturns and downturns. In particular, the positive association of Relevance on the upside minus downside beta shows that the risk-reducing effect of Relevance is greater in a downturn market than an upturn market. Differentiation does not show significant relationships with risks. These results indicate that for stabilization purposes, managers should focus more on establishing strong Relevance and Knowledge rather than Differentiation of their brands. Second, functioning as a protector, Esteem is associated with lower downside risk as well as CAPM beta but does not hurt upside gains. This finding indicates that a firm with high perceived quality can avoid losses when the market turns down without hurting its potential gains. The significant positive

coefficient of Esteem on the upside minus downside risk differential reinforces this implication that high Esteem acts as a buffer that absorbs unfavorable external factors. Finally, Energy plays a role as a booster. Although Energy has been associated with a higher CAPM risk, the disaggregating risk analyses show that Energy is positively related to upside potential without increasing downside losses evidenced by the positive coefficient of Energy on the upside minus downside. Unexpectedly, Differentiation does not show a significant relationship with a firm's beta. This result implies that a brand should be not only distinct but also desired. According to Agres and Dubitsky (1996), although Differentiation is the first step in developing a successful brand, a brand cannot attract consumers if it is not appropriate to them (i.e. low Relevance). Thus, they suggest that managers should consider various aspects of brand equity when assessing firm value.

While our findings highlight the differential role of each brand dimension in relation with systematic beta, it is particularly noticeable that Esteem and Energy are complementary to each other under different market situations. We illustrate the different roles of Esteem and Energy with regard to firm risk by identifying a representative company in each of the following categories: high Esteem and high Energy, high Esteem and low Energy, low Esteem and high Energy, low Esteem and low Energy. First, Whirlpool Corporation whose Esteem and Energy are both high shows low downside risk and high upside potential compared to the industry average, supporting the view that high perceived quality insulates the firm from unfavorable market conditions, and high innovativeness/dynamism lifts its potential growth when the market turns up. On the other hand, General Mills, which has a high level of Esteem and a low level of Energy, exhibits low downside risks and upside potential, emphasizing Esteem's role as a protector. In contrast, Advanced Micro Devices with low Esteem and high Energy shows high

upside potential and downside risk, highlighting Energy's role as a booster. Finally, Steven Madden has low Esteem and Energy and shows high downside risk and low upside potential. These facts demonstrate how managers can utilize disaggregate brand equity dimensions to increase firm value. Table 16 summarizes these four firms' upside and downside betas and their industry averages.

Another noteworthy fact is that the characteristics of Energy determine the success of innovation. Innovativeness and brand dynamism create perceptions of product superiority, but also perceptions of enhanced uncertainty and risk. Innovativeness is commonly viewed as a "strategic option" to be exercised when the time is right (Luehrman 1998; Myers 1984), i.e., in favorable economic times when consumers are more willing to experiment with riskier but higher potential products. Thus, it is believed that high Energy firms particularly excel during the period of upturn markets. On the other hand, two different schools of thought exist with respect to the association between Energy and risk in downturn markets. One school of thought is that consumers are less open to innovation during a recession (Quelch 2008). Consumers want the reassurance and comfort of traditional brands and shun the risk associated with uncertain brands. The other school of thought suggests that the more people carefully reflect on their needs as a large number of firms "pull back," the more likely they will turn to innovative brands (Chakravorti 2009). Because of these two contrast thoughts, there are still ongoing debates on whether to invest in innovation or not during the downturn market.

Although our results highlight the benefit of Energy, further analyses show that not only timing but also relevance of innovation is an important factor to take into account. Among the firms in the top 15% of Energy, we choose the firms in the bottom 15 % of Relevance as a "low Relevance-high Energy" group and the firms in the top 15% of Relevance as a "high Relevance-

high Energy." Table 17 summarizes the average systematic, upside, and downside beta of firms with "low Relevance-high Energy" and "high Relevance-high Energy." We find that the firms with "high Relevance and high Energy" show lower systematic risk, higher potential growth, and lower downside loss compared to the firms with "low Relevance and high Energy." For example, Palm. Inc. in low Relevance-high Energy group shows lower potential growth but much higher downside risk than does Microsoft which belongs to the high Relevance-high Energy group. In fact, Palm, Inc. introduced the first smartphones, but its production ended in 2011 because of poor sales. This finding indicates that relevance matters in innovation, i.e., not all innovations are beneficial to firms. Thus, identifying customer relevance should precede investments in innovation.

While our findings shed light on the differential role of each component of brand equity in general, further analyses provide tailored brand strategies to the firms from different industries. For example, firms in the durable manufacturing industry can benefit from more broadly established brand equity across all dimensions, whereas firms in the textiles, printing, and publishing industry are advised to focus their efforts on developing Relevance. It is noticeable that brand equity generally does not help sin stocks (e.g. tobacco, gambling, and alcohol) improve their financial health but Differentiation, with a positive relationship with upside gains, contributes to the better financial health of sin stocks. In addition to the industry-specific brand strategies, our analysis shows that Relevance is an overarching brand component that firms in most industries need to focus on to achieve their financial goals. Analyses of firms by size, book-to-market ratio, and beta suggest that, in general, brand equity acts as a stabilizer for small, growth, and volatile firms but functions as a protector for big, value, and less volatile firms.

An asset with positive upside potential and negative downside risk is more attractive than an asset with negative upside potential and/or positive downside risk. However, our results show that there is no perfect brand equity component that increases upside gains and reduces downside losses simultaneously in all cases. Each dimension of brand equity behaves as a stabilizer, a protector, or a booster in different conditions. In this respect, our analysis encourages managers to evaluate the differential effects of the multiple dimensions of brand equity on each risk characteristic—i.e., upside potential and downside risk.

This study has a limitation in that we use firm-level data instead of individual-level data. While the Y&R BAV is one of the most visible approaches, its data do not include individual responses; thus, we are not able to examine the stability of the responses over time. Also, some industries have been excluded from our industry level analyses because of the limited number of observations. Future research should explore the differential role of each brand equity using long-panel data.

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**Table 1** Overview of brand dimensions used in the analyses

| BAV Dimension | Metrics | Scale | Measure | Dimension Underpinning |
|---|---|---|---|---|
| Differentiation | Unique<br>Distinctive | Yes/No<br>Yes/No | Average proportion of "Yes" over the two | The ability to stand apart from its competitors. A brand is based on a set of differentiating promises. |
| Relevance | Personal Relevance | 1-7 Scale | Average score | Personal importance and appropriateness, which depicts the extent to which the brand stands for something that actually matters in the marketplace and its "staying power." |
| Esteem | Personal Regard<br>Perceived High Quality<br>Leader<br>Reliable | 1-7 Scale<br>Yes/No<br>Yes/No<br>Yes/No | Average z-score for each of the four | The level of respect, deference, and regard a consumer holds toward a brand. Esteem reflects how well consumers respect the brand, as well as how well the brand fulfills its promises. |
| Knowledge | Familiarity with the Brand | 1-7 Scale | Average score | Familiarity a consumer has with a brand, which reflects a customer's intimacy with and deep understanding of a brand. |
| Energy | Innovative<br>Dynamic | Yes/No<br>Yes/No | Average proportion of "Yes" over the two | The ability to adapt to future customer needs and changing conditions, which reflects a brand's future capabilities. |

**Table 2** Descriptive statistics

| Variable | Mean | SD | 95% Confidence Interval | |
|---|---|---|---|---|
| Regular beta | 1.028 | 0.475 | 0.995 | 1.062 |
| Upside beta | 1.015 | 0.577 | 0.974 | 1.056 |
| Downside beta | 1.019 | 0.554 | 0.980 | 1.059 |
| Upside-Downside beta | -0.004 | 0.546 | -0.043 | 0.034 |
| Differentiation | 0.108 | 0.937 | 0.042 | 0.174 |
| Relevance | 0.169 | 0.983 | 0.100 | 0.239 |
| Esteem | 0.087 | 0.954 | 0.020 | 0.155 |
| Knowledge | -0.050 | 0.961 | -0.118 | 0.018 |
| Energy | 0.090 | 0.913 | 0.025 | 0.154 |
| SG&A/Sales | 0.280 | 0.139 | 0.270 | 0.290 |
| Return on Assets (ROA) | 0.066 | 0.115 | 0.057 | 0.074 |
| ROA variability | 0.040 | 0.072 | 0.035 | 0.045 |
| Size (Assets) | 17,220.77 | 29,083.95 | 15,164.61 | 19,276.94 |
| Leverage | 0.433 | 0.164 | 0.422 | 0.445 |
| Liquidity | 1.089 | 0.892 | 1.026 | 1.152 |
| Book-to-Market ratio | 5.274 | 11.255 | 4.478 | 6.070 |
| Dividend pay (dummy) | 0.660 | 0.474 | 0.627 | 0.694 |
| Age (dummy) | 0.508 | 0.500 | 0.473 | 0.544 |
| GDP growth rate | 2.752 | 0.993 | 2.681 | 2.822 |

**Table 3** Number of days in market upturns versus downturns*

| Year | Upside Market | Downside Market |
|---|---|---|
| 2000 | 121 | 131 |
| 2001 | 121 | 127 |
| 2002 | 119 | 133 |
| 2003 | 140 | 112 |
| 2004 | 140 | 112 |
| 2005 | 136 | 116 |
| 2006 | 139 | 112 |

Market upturns (downturns) are defined as the days when return on the market is greater (smaller) than that on a firm *i*.

**Table 4** Correlations of variables

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Systematic Risk | | | | | | | | | | | | | | | | | | |
| 2 | Upside Beta | .84*** | | | | | | | | | | | | | | | | | |
| 3 | Downside Beta | .78*** | .53*** | | | | | | | | | | | | | | | | |
| 4 | Upside-Downside | .10*** | .51*** | -.45*** | | | | | | | | | | | | | | | |
| 5 | Differentiation | .09** | .07** | .07* | -.01 | | | | | | | | | | | | | | |
| 6 | Relevance | -.35*** | -.24*** | -.32*** | .07** | .01 | | | | | | | | | | | | | |
| 7 | Esteem | -.29*** | -.19*** | -.27*** | .08** | .11*** | .84*** | | | | | | | | | | | | |
| 8 | Knowledge | -.25*** | -.18*** | -.22*** | .03 | .07** | .77*** | .75*** | | | | | | | | | | | |
| 9 | Energy | .30*** | .27*** | .18*** | .11*** | .29*** | .01 | .20*** | -.02 | | | | | | | | | | |
| 10 | SG&A/Sale | .15*** | .09*** | .17*** | -.08** | .09** | -.16*** | -.16*** | -.22*** | .15*** | | | | | | | | | |
| 11 | ROA | -.16*** | -.05 | -.18*** | .13*** | .10*** | .14*** | .14*** | .10*** | -.04 | -.06 | | | | | | | | |
| 12 | ROAV | .27*** | .21*** | .20*** | -.02 | -.04 | -.21*** | -.25*** | -.24*** | .08** | .22*** | -.30*** | | | | | | | |
| 13 | Size | -.15*** | -.08** | -.14*** | .06 | -.17*** | .19*** | .17*** | .19*** | .24*** | -.09*** | .06 | -.10*** | | | | | | |
| 14 | Leverage | -.22*** | -.20*** | -.16*** | -.05 | -.33*** | .23** | .25*** | .25*** | -.18*** | -.18*** | -.10*** | -.09*** | -.03 | | | | | |
| 15 | Liquidity | .30*** | .23** | .24*** | =.01 | .27** | -.26*** | -.23*** | -.28*** | .23*** | .33*** | .11*** | .12*** | -.22*** | -.63*** | | | | |
| 16 | Book-to-Market ratio | -.13*** | -.10** | -.13*** | .03 | -.04 | .14*** | .12*** | .12*** | -.02 | .09***** | .13*** | -.02 | -.03 | .28*** | -.08** | | | |
| 17 | Dividend | -.24*** | -.18*** | -.18*** | -.01 | -.19*** | .24*** | .35*** | .22*** | -.00 | -.11*** | .10*** | -.23*** | .28*** | .11*** | -.29*** | -.01 | | |
| 18 | Age | -.31*** | -.24*** | -.24*** | -.03 | -.34*** | .33*** | .39*** | .25*** | -.03 | -.18*** | .05 | -.18*** | .26*** | .28*** | -.38*** | .04 | .55*** | |
| 19 | GDP growth rate | -.06 | -.012*** | -.12*** | .13*** | -.10*** | -.01 | -.08*** | .05 | -.12*** | -.02 | .11*** | .00 | .04 | .00 | -.04 | .06* | .06* | .01 |

*$p$<.1 **$p$ <.05 ***$p$ <.01

**Table 5** Relationship between brand equity and systematic risks

| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
|---|---|---|---|---|---|---|---|---|---|
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | -.038(-2.14)** | .397 | -.004(-0.14) | .394 | -.093(-3.18) *** | .308 | .100(3.07)*** | .194 |
| Model 2 | l.Differentiation | .007(.66) | .398 | .017( 1.14) | .396 | -.016(-0.94) | .294 | .025(1.45) | .190 |
| Model 3 | l.Relevance | -.071(-8.36)*** | .449 | -.048(-3.22)*** | .410 | -.092(-6.44) *** | .349 | .048(2.91)*** | .210 |
| Model 4 | l.Esteem | -.036(-4.11)*** | .407 | .001( 0.10) | .395 | -.075(-4.62) *** | .329 | .077(4.19)*** | .226 |
| Model 5 | l.Knowledge | -.031(-3.45)*** | .413 | -.036(-2.14)** | .411 | -.038(-2.47) ** | .300 | .013(0.76) | .194 |
| Model 6 | l.Energy | .083(5.27)*** | .419 | .113( 5.04)*** | .410 | .003( 0.14) | .294 | .057(2.65)*** | .197 |

*$p$ <.1 **$p$ <.05 ***$p$ <.01. $t$-statistics are in parentheses. Control variables are not shown to save space. BE: Brand Equity. Number of obs.: 662

**Table 6** Relationship between linear combination of brand equity and systematic risks

| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
|---|---|---|---|---|---|---|---|---|---|
| Model | Variable | Est. (t stat) | $R^2$ | Est. (t stat) | $R^2$ | Est. (t stat) | $R^2$ | Est. (t stat) | $R^2$ |
| Two factor model | l.Factor 1 | -.062(-7.80)*** | .436 | -.039(-2.53)** | .411 | -.076(-5.17)*** | .329 | .039(2.34)** | .201 |
| | l.Factor 2 | .053(4.90)*** | | .042(3.04)*** | | .022(1.35) | | .049(2.67)*** | |

*$p$ <.1 **$p$ <.05 ***$p$ <.01. $t$-statistics are in parentheses. Control variables are not shown to save space. BE: Brand Equity.

**Table 7** Relationship between brand equity and systematic risk across industries

| Food | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | -.088(-1.91)* | .994 | .028(.29) | .976 | -.305(-4.09)*** | .981 | .339(2.77)*** | .572 |
| Model 2 | l.Differentiation | .023(1.09) | .993 | .069(1.61) | .971 | .004(.10) | .965 | .074(1.38) | .368 |
| Model 3 | l.Relevance | -.063(-3.30)*** | .995 | .012(.26) | .977 | -.158(-5.04)*** | .984 | .147(2.59)*** | .645 |
| Model 4 | l.Esteem | -.062(-2.84)*** | .995 | -.015(-.31) | .976 | -.115(-2.40)** | .975 | .054(.85) | .491 |
| Model 5 | l.Knowledge | -.079(-3.32)*** | .994 | .032(.59) | .978 | -.202(-5.09)*** | .986 | .203(2.97)*** | .683 |
| Model 6 | l.Energy | -.012(-0.47) | .993 | -.086(-1.78)* | .980 | -.032(-.62) | .966 | -.053(-.81) | .399 |
| Textiles, Printing, and Publishing | | | | | | | | | |
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | .051(.42) | .959 | .330(1.49) | .927 | .013(.07) | .930 | .163(.77) | .918 |
| Model 2 | l.Differentiation | -.011(-.26) | .967 | .014(.18) | .947 | -.033(-.53) | .934 | .034(.52) | .944 |
| Model 3 | l.Relevance | .070(.70) | .946 | .383(2.06)** | .920 | .097(.67) | .925 | .072(.37) | .929 |
| Model 4 | l.Esteem | .013(.19) | .955 | .144(1.02) | .915 | .002(.02) | .928 | .128(.91) | .961 |
| Model 5 | l.Knowledge | .075(1.17) | .954 | .031(.28) | .942 | .097(.99) | .919 | -.020(-.17) | .950 |
| Model 6 | l.Energy | -.032(-.47) | .965 | .173(1.31) | .961 | -.066(-.69) | .928 | .252(1.87)* | .932 |
| Chemicals | | | | | | | | | |
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | .041(.33) | .997 | -.079(-.28) | .986 | .262(.91) | .989 | -.261(-1.34) | .763 |
| Model 2 | l.Differentiation | .028(.73) | .997 | .094(1.01) | .992 | .032(.36) | .988 | -.015(-.21) | .811 |
| Model 3 | l.Relevance | .090(1.40) | .996 | .034(.22) | .981 | .212(1.35) | .991 | -.101(-.77) | .866 |
| Model 4 | l.Esteem | .042(1.20) | .996 | .010(.11) | .984 | .108(1.33) | .990 | -.085(-1.33) | .819 |
| Model 5 | l.Knowledge | -.125(-2.07)** | .997 | -.391(-2.58)*** | .991 | -.043(-.28) | .989 | -.343(-2.34)** | .820 |
| Model 6 | l.Energy | -.003(-.07) | .997 | -.064(-.49) | .986 | .078(.68) | .988 | -.176(-1.55) | .746 |
| Pharmaceutical | | | | | | | | | |
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | -.133(-2.49)** | .942 | -.020(-.30) | .993 | -.199(-3.28)*** | .925 | .162(2.67)*** | .982 |
| Model 2 | l.Differentiation | -.018(-.32) | .943 | .029(.53) | .983 | -.085(-1.30) | .876 | .124(1.96)** | .968 |
| Model 3 | l.Relevance | -.079(-2.85)*** | .917 | .002(.06) | .991 | -.121(-3.78)*** | .935 | .103(3.25)*** | .989 |
| Model 4 | l.Esteem | -.067(-3.22)*** | .952 | -.017(-.58) | .994 | -.106(-4.20)*** | .985 | .073(2.77)*** | .994 |
| Model 5 | l.Knowledge | -.079(-3.43)*** | .895 | -.019(-.62) | .994 | -.097(-3.69)*** | .912 | .068(2.51)** | .982 |
| Model 6 | l.Energy | .004(.07) | .899 | -.072(-1.10) | .979 | .075(.92) | .785 | -.113(-1.37) | .963 |

| Durable Manufacturing | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^{22}$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | -.232(-4.21)*** | .215 | -.303(-3.64)*** | .109 | -.251(-2.91)*** | .449 | .113(1.35) | .449 |
| Model 2 | l.Differentiation | -.128(-3.78)*** | .217 | -.108(-2.16)** | .103 | -.171(-3.39)*** | .466 | .130(2.73)*** | .573 |
| Model 3 | l.Relevance | -.128(-4.51)*** | .131 | -.183(-4.67)*** | .108 | -.076(-1.68)* | .405 | -.036(-.85) | .486 |
| Model 4 | l.Esteem | -.169(-4.26)*** | .305 | -.179(-3.55)*** | .159 | -.131(-2.22)** | .458 | -.042(-.98) | .476 |
| Model 5 | l.Knowledge | -.038(-1.19) | .177 | -.075(-1.57) | .097 | .005(.11) | .366 | -.041(-.86) | .490 |
| Model 6 | l.Energy | -.104(-2.73)*** | .212 | -.107(-1.74)* | .124 | -.203(-4.32)*** | .490 | .233(4.01)*** | .547 |
| Computer | | | | | | | | | |
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | -.012(-.15) | .527 | .059(.61) | .689 | -.096(-1.04) | .543 | .126(1.74)* | .539 |
| Model 2 | l.Differentiation | -.052(-1.29) | .553 | -.025(-.48) | .720 | -.098(-1.71) | .536 | .079(1.70)* | .494 |
| Model 3 | l.Relevance | .000( .01) | .537 | .022(.31) | .715 | .009(0.13) | .429 | -.019(-.29) | .445 |
| Model 4 | l.Esteem | -.018(-.43) | .511 | .061(1.03) | .676 | -.044(-.80) | .486 | .093(1.80)* | .512 |
| Model 5 | l.Knowledge | -.010(-.23) | .527 | -.005(-.09) | .698 | -.071(-1.27) | .502 | .069(1.38) | .506 |
| Model 6 | l.Energy | .039( 1.22) | .507 | .066(1.54) | .651 | -.017(-.38) | .402 | .060(1.60) | .540 |
| Transportation | | | | | | | | | |
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | -.057(-.35) | .895 | -.168(-.73) | .771 | .299(1.33) | .945 | -.136(-.36) | .823 |
| Model 2 | l.Differentiation | .000(.00) | .889 | -.022(-.24) | .775 | .243(2.19)** | .929 | -.172(-.97) | .805 |
| Model 3 | l.Relevance | -.299(-3.60)*** | .893 | -.232(-2.32)** | .768 | -.428(-3.17)*** | .952 | .196(1.17) | .831 |
| Model 4 | l.Esteem | -.223(-2.52)** | .882 | -.246(-2.78)*** | .776 | -.300(-2.07)** | .954 | .055(.35) | .832 |
| Model 5 | l.Knowledge | -.190(-1.74)* | .878 | -.276(-1.79)* | .771 | -.223(-1.44) | .940 | .190(.84) | .822 |
| Model 6 | l.Energy | .132(2.28)** | .881 | .107(1.21) | .779 | .384(4.03)*** | .923 | -.359(-2.42)** | .793 |
| Retail | | | | | | | | | |
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | .062(1.80)* | .643 | .207(3.86)*** | .582 | -.043(-.58) | .577 | .283(3.17)*** | .493 |
| Model 2 | l.Differentiation | .029(1.77)* | .635 | .003(.10) | .547 | .015(.52) | .574 | -.035(-1.00) | .453 |
| Model 3 | l.Relevance | .010(.64) | .640 | .116(4.39)*** | .599 | -.014(-.42) | .567 | .143(4.13)*** | .475 |
| Model 4 | l.Esteem | .028(1.65)* | .635 | .136(4.57)*** | .580 | -.068(-1.70)* | .575 | .250(4.93)*** | .486 |
| Model 5 | l.Knowledge | -.004(-.24) | .637 | .080(2.54)** | .558 | -.037(-.96) | .570 | .067(1.67)* | .454 |
| Model 6 | l.Energy | .052(2.48)** | .633 | .060(1.42) | .555 | -.042(-.90) | .589 | .155(2.71)*** | .503 |

*$p$ <.1 **$p$ <.05 ***$p$ <.01. $t$-statistics are in parentheses. Control variables are not shown to save space. BE: Brand Equity.

**Table 8** Relationship between brand equity and systematic risk in the high-tech industry

**A.** Overall relationship between brand equity and systematic risk

| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
|---|---|---|---|---|---|---|---|---|---|
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | -.026(-.43) | .626 | -.049(-.63) | .269 | -.139(-2.16)** | .686 | .059(1.00) | .323 |
| Model 2 | l.Differentiation | -.069(-2.14)** | .645 | -.128(-3.06)*** | .276 | -.094(-2.12)** | .681 | .014(.36) | .290 |
| Model 3 | l.Relevance | .066( 1.48) | .646 | .167(2.84)*** | .326 | -.052(-1.10) | .695 | .136(2.14)** | .407 |
| Model 4 | l.Esteem | -.017(-.42) | .606 | .092(1.62) | .283 | -.127(-3.01)*** | .679 | .093(1.63) | .352 |
| Model 5 | l.Knowledge | -.094(-3.11)*** | .640 | -.133(-2.93)*** | .284 | -.123(-3.58)*** | .665 | .013(.31) | .283 |
| Model 6 | l.Energy | .065( 2.14)** | .633 | .038(.94) | .280 | -.005(-.13) | .620 | .021(.78) | .291 |

**B.** Relationship between Energy and systematic risk by R&D expenditures

| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
|---|---|---|---|---|---|---|---|---|---|
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Low R&D expenditures | l.Energy | -.170(-3.93)*** | .990 | -.268(-5.06)*** | .980 | -.329(-5.76)*** | .966 | .080(.88) | .760 |
| High R&D expenditures | l.Energy | .098(3.45)*** | .726 | .110(2.01)** | .816 | .152(2.81)*** | .604 | -.093(-1.58) | .797 |

*$p$ <.1 **$p$ <.05 ***$p$ <.01. $t$-statistics are in parentheses. Control variables are not shown to save space. BE: Brand Equity

**Table 9** Relationship between brand equity and systematic risk for sin stocks

Sin Stock

| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
|---|---|---|---|---|---|---|---|---|---|
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | .383(5.32)*** | .999 | .929(3.43)*** | .998 | .468(1.15) | .999 | .294(.66) | .991 |
| Model 2 | l.Differentiation | .033(1.02) | .998 | .266(3.90)*** | .999 | .058(.52) | .999 | .171(1.71)* | .992 |
| Model 3 | l.Relevance | .129(1.65)* | .999 | .467(2.76)*** | .994 | .661(2.44)** | .998 | -.250(-1.45) | .989 |
| Model 4 | l.Esteem | .109(7.44)*** | .998 | .280(2.63)*** | .994 | .440(4.08)*** | .999 | -.219(-2.68)*** | .990 |
| Model 5 | l.Knowledge | .107(1.73)* | .996 | .330(1.87)* | .995 | .576(2.58)** | .999 | -.253(-2.04)** | .992 |
| Model 6 | l.Energy | .106(2.59)*** | .999 | -.042(-.25) | .996 | -.099(-.62) | .999 | .223(1.15) | .990 |

Non-sin Stock

| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
|---|---|---|---|---|---|---|---|---|---|
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | -.012(-.57) | .377 | .060(2.18)** | .375 | -.055(-1.77)* | .297 | .149(5.00)*** | .192 |
| Model 2 | l.Differentiation | .007(.62) | .380 | .015(1.00) | .378 | -.014(-.82) | .286 | .021(1.46) | .188 |
| Model 3 | l.Relevance | -.139(-13.81)*** | .434 | -.095(-5.52)*** | .392 | -.142(-8.89)*** | .341 | .078(5.26)*** | .207 |
| Model 4 | l.Esteem | -.077(-9.33)*** | .388 | .004(.24) | .376 | -.091(-5.23)*** | .320 | .101(6.46)*** | .226 |
| Model 5 | l.Knowledge | -.072(-6.61)*** | .394 | -.028(-1.54) | .391 | -.061(-3.64)*** | .290 | .039(2.28)** | .193 |
| Model 6 | l.Energy | .142(10.58)*** | .405 | .153(9.41)*** | .394 | .109(6.89)*** | .289 | .058(4.76)*** | .194 |

*$p$ <.1 **$p$ <.05 ***$p$ <.01. $t$-statistics are in parentheses. Control variables are not shown to save space. BE: Brand Equity.

**Table 10** Relationship between brand equity and systematic risk by size

| Small Firm | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | -.058(-1.88)* | .312 | -.104(-2.32)** | .454 | -.116(-3.32)*** | .245 | -.030(-.75) | .406 |
| Model 2 | l.Differentiation | .000(.03) | .311 | -.005(-.24) | .429 | -.035(-2.09)** | .244 | -.005(-.25) | .400 |
| Model 3 | l.Relevance | -.085(-4.96)*** | .332 | -.083(-3.05)*** | .457 | -.086(-3.48)*** | .250 | -.007(-.31) | .407 |
| Model 4 | l.Esteem | -.058(-3.32)*** | .321 | -.026(-.89) | .428 | -.082(-3.71)*** | .255 | .033(1.30) | .411 |
| Model 5 | l.Knowledge | -.036(-2.13)** | .312 | -.091(-3.46)*** | .472 | -.038(-1.62) | .240 | -.058(-2.68)*** | .437 |
| Model 6 | l.Energy | .069(2.77)*** | .322 | .058(1.95)* | .422 | -.076(-2.05)** | .240 | .081(1.88)* | .401 |
| Big Firm | | | | | | | | | |
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | .000( .00) | .541 | .069(1.39) | .543 | -.020(-.47) | .484 | .091(2.07)** | .271 |
| Model 2 | l.Differentiation | .013( .75) | .549 | .015(.48) | .543 | .023(.86) | .476 | .013(.47) | .262 |
| Model 3 | l.Relevance | -.035(-2.43)** | .573 | -.001(-.05) | .552 | -.052(-2.56)** | .495 | .050(2.26)** | .284 |
| Model 4 | l.Esteem | -.010(-.66) | .562 | .041(1.75)* | .553 | -.047(-2.25)** | .491 | .075(3.28)*** | .276 |
| Model 5 | l.Knowledge | -.037(-2.52)** | .561 | -.001(-.05) | .553 | -.064(-3.05)*** | .484 | .032(1.37) | .264 |
| Model 6 | l.Energy | .111( 5.09)*** | .565 | .151(4.87)*** | .535 | .081(2.45)** | .482 | .054(1.68)* | .251 |

*$p$ <.1 **$p$ <.05 ***$p$ <.01. $t$-statistics are in parentheses. Control variables are not shown to save space. BE: Brand Equity.

**Table 11** relationship between brand equity and systematic risk by book-to-market ratio

| Growth Stock (Low Book-to-Market) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | -.185(-4.03)*** | .850 | -.220(-2.75)*** | .771 | -.132(-2.10)** | .726 | .071(.99) | .573 |
| Model 2 | l.Differentiation | -.028(-1.15) | .851 | -.049(-1.18) | .780 | .018(0.46) | .722 | .025(.66) | .553 |
| Model 3 | l.Relevance | -.137(-5.14)*** | .839 | -.138(-3.13)*** | .762 | -.121(-3.19)*** | .704 | -.001(-.03) | .570 |
| Model 4 | l.Esteem | -.095(-3.67)*** | .840 | -.092(-2.25)** | .765 | -.090(-2.81)*** | .701 | .017(.48) | .569 |
| Model 5 | l.Knowledge | -.125(-4.19)*** | .848 | -.135(-3.54)*** | .771 | -.077(-2.01)** | .710 | -.039(-1.08) | .552 |
| Model 6 | l.Energy | .053(1.64) | .841 | .064(1.31) | .762 | .059(1.34) | .706 | .094(3.13)*** | .583 |
| Value Stock (High Book-to-Market) | | | | | | | | | |
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | -.122(-4.22)*** | .520 | -.083(-1.73)* | .428 | -.224(-4.73)*** | .432 | .058(1.02) | .465 |
| Model 2 | l.Differentiation | -.022(-1.18) | .521 | -.033(-1.21) | .429 | -.114(-3.17)*** | .385 | .042(1.18) | .446 |
| Model 3 | l.Relevance | -.075(-4.60)*** | .528 | -.044(-1.72)* | .426 | -.128(-4.74)*** | .439 | .032(1.00) | .462 |
| Model 4 | l.Esteem | -.082(-4.51)*** | .522 | -.025(-1.01) | .427 | -.162(-5.48)*** | .467 | .068(2.07)** | .497 |
| Model 5 | l.Knowledge | -.061(-3.93)*** | .524 | -.059(-2.19)** | .424 | -.096(-3.58)*** | .433 | -.022(-.75) | .470 |
| Model 6 | l.Energy | .042(1.93)* | .539 | .078(2.71)*** | .426 | -.042(-1.31) | .391 | .093(2.26)** | .452 |

*$p$ <.1 **$p$ <.05 ***$p$ <.01. $t$-statistics are in parentheses. Control variables are not shown to save space. BE: Brand Equity.

**Table 12** Relationship between brand equity and systematic risk by beta

| Low Beta | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | -.026(-1.63) | .808 | .069(1.72)* | .699 | -.057(-1.59) | .441 | .119(2.81)*** | .666 |
| Model 2 | l.Differentiation | .017(1.55) | .827 | .064(2.77)*** | .744 | .022(1.03) | .410 | .054(2.32)** | .670 |
| Model 3 | l.Relevance | -.023(-2.80)*** | .812 | .016(.74) | .681 | -.040(-2.38)** | .459 | .053(2.02)** | .639 |
| Model 4 | l.Esteem | -.022(-2.48)** | .815 | -.004(-.19) | .684 | -.037(-2.16)** | .450 | .007(.25) | .638 |
| Model 5 | l.Knowledge | -.027(-3.20)*** | .811 | .008(.36) | .680 | -.051(-2.58)*** | .480 | .049(1.86)* | .649 |
| Model 6 | l.Energy | .023(1.60) | .827 | .024(.73) | .704 | -.006(-.20) | .418 | .119(2.81)*** | .640 |
| High Beta | | | | | | | | | |
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | .015(.28) | .500 | -.242(-3.34)*** | .355 | -.025(-.25) | .465 | -.107(-1.32) | .359 |
| Model 2 | l.Differentiation | .046(2.60)*** | .503 | .023(.80) | .355 | .038(1.22) | .461 | -.020(-.67) | .364 |
| Model 3 | l.Relevance | -.087(-3.99)*** | .508 | -.112(-3.00)*** | .349 | -.106(-1.99)** | .461 | .023(.48) | .359 |
| Model 4 | l.Esteem | -.062(-2.05)** | .528 | -.096(-2.05)** | .361 | -.286(-5.05)*** | .492 | .175(3.09)*** | .370 |
| Model 5 | l.Knowledge | -.040(-1.59) | .512 | -.027(-.71) | .350 | -.129(-2.66)*** | .469 | .044(1.14) | .370 |
| Model 6 | l.Energy | .029(1.24) | .494 | -.096(-3.44)*** | .362 | .046(1.12) | .465 | -.091(-2.99)*** | .358 |

*$p$ <.1 **$p$ <.05 ***$p$ <.01. $t$-statistics are in parentheses. Control variables are not shown to save space. BE: Brand Equity.

**Table 13** Relationship between brand equity and systematic risk by marketing expenditures

| | | Low Marketing Expenditures | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | -.132(-3.53)*** | .353 | -.193(-4.72)*** | .476 | -.245(-5.15)*** | .249 | .058(1.17) | .367 |
| Model 2 | l.Differentiation | .001(.05) | .339 | -.026(-1.20) | .430 | -.078(-3.08)*** | .213 | .035(1.41) | .372 |
| Model 3 | l.Relevance | -.157(-7.97)*** | .394 | -.129(-4.79)*** | .490 | -.181(-6.24)*** | .293 | .034(1.21) | .372 |
| Model 4 | l.Esteem | -.137(-6.27)*** | .367 | -.079(-3.12)*** | .446 | -.189(-6.35)*** | .268 | .133(3.86)*** | .395 |
| Model 5 | l.Knowledge | -.080(-4.16)*** | .344 | -.129(-5.46)*** | .496 | -.071(-2.66)*** | .207 | -.021(-.67) | .384 |
| Model 6 | l.Energy | .052(2.32)** | .337 | .009(.28) | .424 | -.047(-1.53) | .199 | .057(1.59) | .374 |
| | | High Marketing Expenditures | | | | | | | |
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | .050(1.39) | .611 | .102(2.00)** | .529 | .063(1.54) | .470 | .064(1.32) | .283 |
| Model 2 | l.Differentiation | .055(3.36)*** | .635 | .018(0.58) | .525 | .081(3.56)*** | .480 | -.053(-2.00)** | .258 |
| Model 3 | l.Relevance | -.035(-2.86)*** | .619 | .030(1.16) | .513 | -.055(-2.95)*** | .481 | .059(2.57)** | .282 |
| Model 4 | l.Esteem | -.019(-1.33) | .614 | .038(1.44) | .519 | -.040(-1.98)** | .473 | .066(2.69)*** | .282 |
| Model 5 | l.Knowledge | -.025(-1.68)* | .616 | .030(1.13) | .511 | -.041(-2.03)** | .473 | .052(1.98)** | .262 |
| Model 6 | l.Energy | .089(4.61)*** | .650 | .082(2.75)*** | .524 | .102(4.34)*** | .482 | .018(.67) | .260 |

*$p$ <.1 **$p$ <.05 ***$p$ <.01. $t$-statistics are in parentheses. Control variables are not shown to save space. BE: Brand Equity.

**Table 14** Relationship between brand equity and systematic risk by R&D expenditures

| | | Low R&D Expenditures | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | .000(.01) | .730 | .020(.33) | .669 | -.110(-1.58) | .614 | .067(.90) | .415 |
| Model 2 | l.Differentiation | -.031(-1.62) | .733 | -.070(-2.43)** | .665 | -.070(-2.16)** | .616 | -.018(-.48) | .400 |
| Model 3 | l.Relevance | .011(.61) | .734 | .104(3.24)*** | .678 | -.022(-0.60) | .624 | .080(1.98)** | .434 |
| Model 4 | l.Esteem | .033(1.58) | .736 | .161(4.22)*** | .688 | -.046(-1.10) | .643 | .153(3.33)*** | .498 |
| Model 5 | l.Knowledge | .002(.10) | .733 | .013(.43) | .670 | -.002(-.04) | .618 | -.006(-.15) | .408 |
| Model 6 | l.Energy | .035(1.29) | .727 | .020(.49) | .670 | -.046(-1.00) | .603 | .073(1.30) | .389 |
| | | High R&D Expenditures | | | | | | | |
| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | -.016(-.39) | .676 | .051(.84) | .588 | -.037(-.80) | .701 | .086(1.92)* | .138 |
| Model 2 | l.Differentiation | .052(1.70)* | .679 | .058(1.32) | .591 | .032(1.02) | .679 | .000(.01) | .157 |
| Model 3 | l.Relevance | -.061(-3.23)*** | .718 | -.032(-1.04) | .643 | -.049(-2.14)** | .691 | .029(1.13) | .148 |
| Model 4 | l.Esteem | -.049(-2.69)*** | .705 | -.009(-.31) | .618 | -.057(-2.55)** | .701 | .047(1.94)* | .137 |
| Model 5 | l.Knowledge | -.063(-3.59)*** | .727 | -.044(-1.48) | .653 | -.087(-3.78)*** | .713 | .04 (1.58) | .144 |
| Model 6 | l.Energy | .134(5.75)*** | .685 | .162(4.80)*** | .603 | .108(4.01)*** | .653 | .065(2.61)*** | .189 |

*$p$ <.1 **$p$ <.05 ***$p$ <.01. $t$-statistics are in parentheses. Control variables are not shown to save space. BE: Brand Equity.

**Table 15** Relationship between brand equity and systematic risk by economic conditions

| | | (I) $\beta^{2000\text{-}2002}$ (Market Downturn) | | (II) $\beta^{2003\text{-}2006}$ (Market Upturn) | |
|---|---|---|---|---|---|
| Model | Variable | Est.(t stat) | $R^2$ | Est.(t stat) | $R^2$ |
| Model 1 | l.Aggregated BE | .013(.46) | .711 | -.071(-3.61)*** | .354 |
| Model 2 | l.Differentiation | -.005(-.39) | .712 | -.019(-1.47) | .348 |
| Model 3 | l.Relevance | -.038(-2.57)*** | .715 | -.065(-5.67)*** | .379 |
| Model 4 | l.Esteem | .009(.59) | .713 | -.052(-4.50)*** | .368 |
| Model 5 | l.Knowledge | -.032(-2.44)** | .714 | -.039(-3.46)*** | .351 |
| Model 6 | l.Energy | .100(8.11)*** | .726 | .043(1.82)* | .350 |

*$p$ <.1 **$p$ <.05 ***$p$ <.01. $t$-statistics are in parentheses. Control variables are not shown to save space. BE: Brand Equity

**Table 16** Systematic betas of companies with high vs. low Esteem and Energy

| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
|---|---|---|---|---|---|---|---|---|---|
| Company Name | Esteem : Energy | Company Average | Industry Average | Company Average | Industry Average | Company Average | Industry Average | Company Average | Industry Average |
| Whirlpool | High : High | 1.094 | 1.079 | 1.350 | 1.023 | 1.009 | 1.128 | 0.341 | -0.104 |
| General Mills | High : Low | 0.332 | 0.567 | 0.312 | 0.549 | 0.319 | 0.604 | -0.007 | -0.055 |
| Advanced Micro Devices | Low : High | 1.926 | 1.452 | 1.734 | 1.453 | 1.543 | 1.322 | 0.191 | 0.130 |
| Madden Steven | Low : Low | 1.094 | 1.079 | 0.854 | 1.023 | 1.157 | 1.128 | -0.302 | -0.104 |

**Table 17** Systematic betas of companies with high vs. low Relevance and Energy

| | | (I) $\beta^{CAPM}$ | | (II) $\beta^{up}$ | | (III) $\beta^{down}$ | | (IV) $\beta^{up} - \beta^{down}$ | |
|---|---|---|---|---|---|---|---|---|---|
| Company | Relevance : Energy | Company Average | Group Average | Company Average | Group Average | Company Average | Group Average | Company Average | Group Average |
| Microsoft | High : High | 1.097 | 0.968 | 1.197 | 1.004 | 1.060 | 1.076 | 0.137 | -0.072 |
| Palm, Inc | Low : High | 1.652 | 1.183 | 1.164 | 0.989 | 2.206 | 1.281 | -1.043 | -0.291 |

**Figure 1** Mean upside potential vs. downside risk

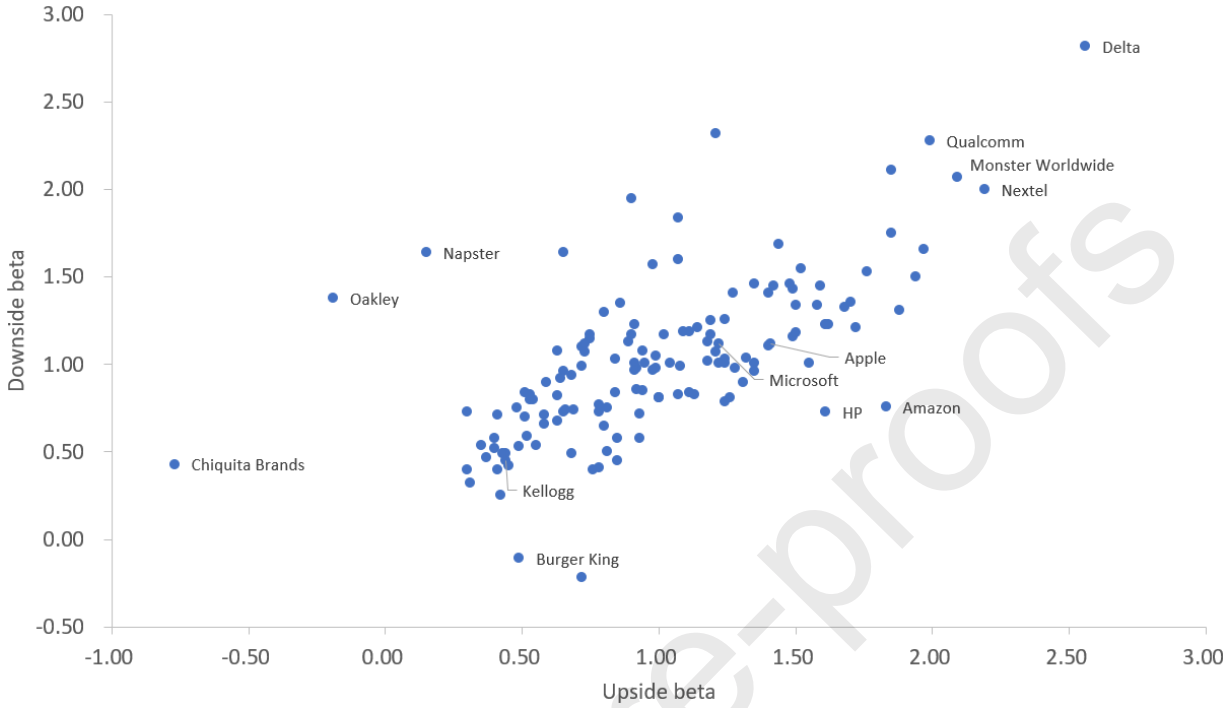


**Figure 2** Histogram of mean upside minus downside beta across years

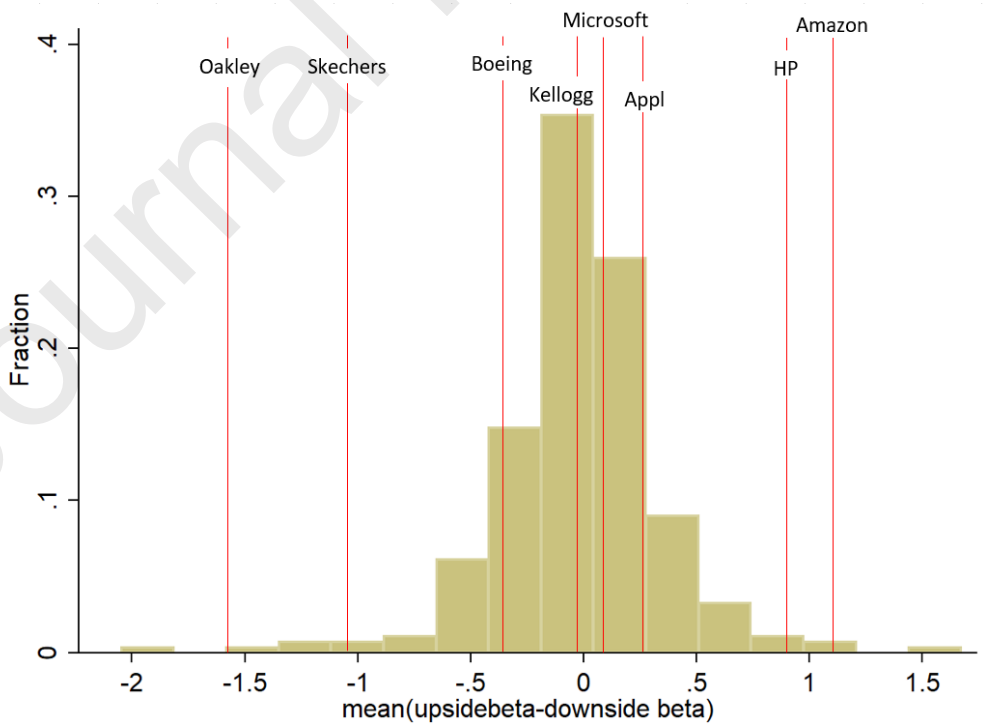

**Figure 3** Factors in rotated space

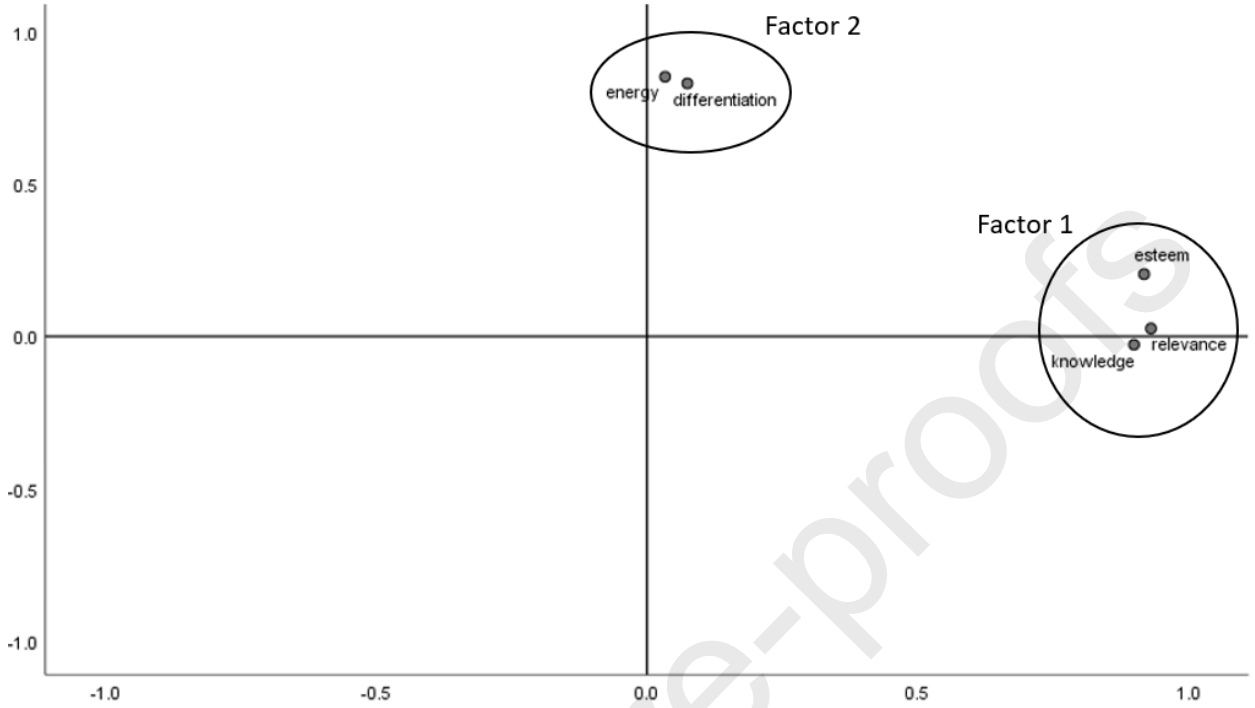


**Figure 4** S&P 500 historical price (2000 - 2006)

Appendix

**Table A1** Relationship between brand equity and systematic risks (IV model)

| | | (I) $\beta^{CAPM}$ | (II) $\beta^{up}$ | (III) $\beta^{down}$ | (IV) $\beta^{up} - \beta^{down}$ |
|---|---|---|---|---|---|
| Model | Variable | Est.(t stat) | Est.(t stat) | Est.(t stat) | Est.(t stat) |
| Model 1 | l.Aggregated BE | -1.523(-1.98)** | -.460(-1.21) | -.944(-1.97)** | .600(2.30)** |
| Model 2 | l.Differentiation | .368( 1.85)* | .305( 1.46) | .463(1.88)* | -.167(-0.88) |
| Model 3 | l.Relevance | -.332(-2.64)*** | -.214(-2.00)** | -.397(-2.57)*** | .278( 2.81)*** |
| Model 4 | l.Esteem | -.364(-2.18)** | -.241(-1.04) | -.645(-2.06)** | .530 (2.46)** |
| Model 5 | l.Knowledge | -.382(-3.16)*** | -.348(-2.61)*** | -.324(-2.65)*** | -.025(-0.23) |
| Model 6 | l.Energy | .298(1.97)** | .405(2.13)** | .082(0.45) | .269(2.22)** |

*$p$ <.1 **$p$ <.05 ***$p$ <.01. $t$-statistics are in parentheses. Control variables are not shown to save space. BE: Brand Equity