An Updated Model of Price to Book

Ben Branch, Anurag Sharma, Chetan Chawla, and Feng Tu

The price-to-book (PB) ratio is a measure of the relative value that the market places on a share of stock. We have estimated an empirical equation of two stages that explain about 62% of the variation in annual PB levels for the S&P 500 companies from the year 2000 to 2009. We explored the market's ability to anticipate changes in performance and found that the market price appears to reflect anticipatory information not present in the model value. This paper both advances understanding of PB's determinants and provides a tool for managers who wish to enhance their firm's PB.

■Almost 30 years ago, Branch and Gale (1983) developed a price-to-book (PB) (the ratio of a stock's price to its book value) model that explained over 70% of their sample's variability. Subsequent research on a later sample validated the model, explaining more than 63% of the variance (Branch, Sharma, Gale, Chichirau, and Proy, 2005).

Since the original Branch-Gale (1983) paper, PB has taken on increasing significance. The price-to-book ratio is a basic measure of the relative value that the market places on a share of stock. For all of its shortcomings, a stock's book value per share remains the best easily accessible measure of the asset value (according to generally accepted accounting principles (GAAP) lying behind each share. Accordingly, the ratio of this per share book value to the stock's market price provides a useful index of how the market values the firm as a going concern (market price of stock) as opposed to the bundle of assets (book value per share). The higher the PB, the more favorably the market views the company's prospects. A PB below one implies that the firm's going concern value is actually below the reported value its net assets.

Herein, using a more recent sample (2000-2009), we further explore the factors that influence the PB level. We build and test a multivariate model which relates those factors to PB. Our study and the resulting model are designed both to advance understanding of PB's determinants and to provide a tool for those managers who wish to enhance their own firm's PB.

I. Literature Background

The relation between the firm's market and book value has long been of interest to researchers. Tobin (1969), in his seminal paper theorized that the economy-wide rate of capital goods investment was related to the ratio (q) of those assets' market values to reproduction costs. The changes in rate of return brought about by a changing market value in relation to reproduction cost, he argued, regulated the rate of investment in durable goods. Conversely, increases in the marginal efficiency of capital (rate of return) tended to raise its valuation in relation to its cost.

Quickly coined Tobin's q in honor of its originator, this ratio of market value to reproduction cost was adapted from macroeconomics to the industry and firm level of analysis. Yet, the interpretation tends to differ in economics and finance literatures. In industrial organization and strategy, the ratio is generally taken to indicate the efficiency with which the installed base of assets (on accounting cost basis) is being utilized. The higher the ratio of market to book,

Ben Branch is a Professor of finance at the Isenberg School of Management at the University Massachusetts in Amherst, MA. Anurag Sharma is an Associate Professor of management in the Isenberg School of at the University Massachusetts in Amherst, MA. Chetan Chawla is a Ph.D. candidate in strategic management at the Isenberg School of Management at the University Massachusetts in Amherst, MA. Feng Tu is a Ph.D. candidate finance at the Isenberg School of Management at the University Massachusetts in Amherst, MA.

the greater is the indicated efficiency. In finance, on the other hand, the ratio is more likely to be used as indicative of market risk and increasingly seen as an additional (to beta) proxy for risk; in other words, the lower the price to book, the greater is the risk (of bankruptcy) to investors. We discuss both viewpoints in the sections below.

The earliest adaptations were in industrial organization and in the merger literature in the banking industry. Lindenberg and Ross (1981), for instance, used Tobin's q – ratio of the market value of a firm to the replacement cost of its assets – as a proxy for the presumed monopoly rents earned by firms. Similarly, Smirlock, Gilligan, and Marshall (1984) used price-to-book to examine the structure-conduct-performance hypothesis in the industrial organization literature. In a slightly different vein, the banking literature too was quick to use the price-to-book ratio as a proxy for the premium paid in mergers and acquisitions (Rogowski and Simonson, 1987; Cheng, Gup, and Wall, 1989). Very rapidly after that, the ratio of market to book value found its way into the mainstream literature in other areas such as management.

A few early efforts notwithstanding, not until the 1990s did a series of Fama and French papers (1992, 1993, 1995, and 1998) spur deeper interest in the relationship between market and book value of the firm. Unlike the literature in other disciplines, however, their concern was with the ability of the ratio to explain variations in the cross-section of portfolio returns. They also defined the ratio as book-to-market, the reciprocal of market-to-book convention used in other areas. Below, we discuss the literature on the relationship between market and book values. We begin with the literature in finance and then turn to a brief discussion of the related literature in other areas.

In one of their first papers in the series, Fama and French (1992) highlighted "several empirical contradictions" (pg. 427) to the presumed supremacy of market in explaining cross-sectional returns. Ever since, they have continued to highlight the prevailing anomalies as reflected in the disconnect between average cross-section of returns on equities and the market βs of the Sharpe (1964) and Lintner (1965) asset pricing model. The disconnect appears to hold true when using the consumption βs of the inter-temporal asset pricing model (Breeden, 1979; Reinganum, 1981; Breeden, Gibbons and Litzenberger, 1989). Furthermore, invoking Banz (1981), Bhandari (1988), Basu (1983), Rosenberg, Reid and Lanstein (1985), and Fama and French (1993) claimed that variables which aren't part of the asset pricing theory, such as size, leverage, earnings-to-price, and book-to-market had reliable power to explain the cross section of average returns.

Over the years, two broad explanations have been put forth for the anomaly as observed by Fama and French in their series of empirical papers (Fama and French, 1992, 1993, 1995, and 1998). The traditional explanations adhere to the rational pricing assumption and the efficient market hypothesis; and the relatively newer literature relies more on potential behavioral explanations for the observed anomalies. Each representing a different paradigm, the rational and behavioral explanations have advanced further insights into why capital asset pricing model (CAPM) may not be able to explain the variation in cross-section of returns – why book-to-market may, in fact, offer a better explanation.

Initial reaction to Fama and French (1992) was one of skepticism. Within the rational framework, in particular, researchers argued that the relationship observed between book-to-market and average returns is an artifact of the sample chosen and is unlikely to be observed out of sample (Black, 1993; MacKinlay, 1995). Contrary evidence to this objection is presented, however, by Chan, Hamao, and Lakonishok (1991), Capaul, Rowley, and Sharpe (1993), and Fama and French (1998). Chan et al. (1991), for instance, find strong evidence linking book-to-market and expected returns in their sample of Japanese firms. Similarly, Capaul et al (1993) find clear confirmation for linkages between book-to-price and returns in a diverse sample of firms from France, Germany, Switzerland, United Kingdom, Japan, and the US. Fama and French (1998) provide more evidence for the out of sample robustness of their original results. Working with data from thirteen major markets (including the US), they show return premium for value (high book-to-market) stocks in twelve of those markets. Barber and Lyon (1997) find similar value premium for financial firms (holdout sample in the original Fama and French 1992 study). Davis (1994) presents evidence of the value premium for US stocks extending back to 1941. Davis, Fama and French (2000) extend this result back to 1926 and include the whole population of NYSE industrial firms. Taken altogether, this research presents formidable confirmation of the relationship between book-to-market and equity returns.

In defense of Fama and French, researchers have argued that not only does the relationship between book-to-market and returns hold true out of sample, it is in fact a reflection of a perfectly reasonable trade-off between risk and return. That is, book-to-market is a proxy for risk and the observed relationship with equity returns captures thus – high book-to-market reflects high risk and yields greater rewards, and vice versa. One should not be surprised, therefore, that the high book-to-market equities generate a value premium – as compensation for risk within a broader multifactor model of inter-temporal capital asset pricing (ICAPM) (Merton, 1973) or the arbitrage pricing theory (APT) of Ross (1976). Much of Fama and French's work in the 1990s supports this viewpoint.

In their seminal 1993 paper, Fama and French identify five common risk factors in the returns on stocks and bonds – three stock market factors, an overall market factor and factors linked to firm size and book-to-market equity. They find return covariation related to book-to-market that is beyond that explained by the market return. In a later paper (1995), they refine the multi-factor model and posit that a three factor model (consisting of factors related to size, leverage, and book-to-market) largely captures the variation in average returns. Vassalou and Xing's study (2004) further supports the risk-based interpretation for the size and book-to-market effects.

Nevertheless, contradictory evidence to the "compensation for risk" explanation is provided by Griffin and Lemmon (2002). Using a direct proxy for financial distress proposed by Ohlson (1980), Griffin and Lemmon (2002) examine the linkages between book-to-market, distress risk and stock returns. Although they find a large return differential between firms with high and low book-to-market values, they show that this differential is driven by extremely low returns on firms with low book-to-market equity. Arguing that this differential cannot be explained by the three-factor model, Griffin and Lemmon (2002) posit that the mispricing explanation is better suited to the findings since "firms with the highest distress risk exhibit the largest return reversals around earnings announcements and the book-to-market return premium is largest in small firms with low analyst coverage" (pg. 2335). This explanation based on investor mispricing is in line with the earlier behavioral explanations (e.g., over-reaction) that have been provided by DeBondt and Thaler (1987), Lakonishok, Shleifer, and Vishny (1994), and Haugen (1995).

In effect, the rational pricing response to Fama and French is, first, of disbelief that a book-to-market anomaly exists and then a grudging acceptance with an explanation based in the risk-reward framework of the efficient market hypothesis. That is, the book-to-market anomaly is encapsulated within the prevailing views about the value premium within the rational pricing/efficient market branch of finance.

Yet, as in Griffin and Lemmon (2002), the risk-reward explanation for the book-to-market anomaly appears to be less robust than originally thought and doubts about that open the door to behavioral and other non-rational explanations. Along these lines, Daniel and Titman (1997) posit that the return (value) premium on small capitalization (size) and high book-to-market firms is caused not by co-movements of returns with pervasive factors but by specific characteristics of the equities in question. In explaining why characteristics may be important, they invoke the behavioral arguments of Lakonishok, Shleifer and Vishny (1994) that "investors may incorrectly extrapolate past growth rates" (pg. 29) based on certain particulars of stocks.

Davis et al. (2000) highlight the causal linkage between the two behavioral explanations: while the first behavioral explanation posits the importance of investor over-reaction to firm performance, the second behavioral explanation links the value premium to value characteristic and not to risk. For example, investors may demonstrate a preference for growth stocks at the expense of value stocks – this may result in a value premium for value stocks (lower prices and higher returns) that is unrelated to risk. This implies that the difference between the two behavioral explanations is one of preference, of demarcation of causal boundaries rather than presence of different causal processes. These final two behavioral explanations are attempts to refute the dominant explanation within the rational pricing/efficient market hypothesis paradigm of finance, i.e., the value premium is compensation for higher risk.

In spite of objections, the proponents of the rational pricing/efficient market hypothesis paradigm have continued to defend the risk-reward linkage between the value premium and the three factor risk model (Davis et al., 2000; Malkiel, 2003; Fama and French, 2006).

That argument has been extended in other ways as well. Gutierrez (2001), for instance, reported that book-to-market and size effects also exist in the cross section of bond returns. Another variant in the literature has been the explaining away of size and price-to-book effects by incorporation of macroeconomic variables. Jensen, Johnson, and Mercer (1997) found that size and price-to-book effects depend largely on the monetary policy of the Fed. They claim, for example, that the low price-to-book and small firm premiums are statistically and economically significant only in expansive monetary policy periods. In a more recent work, Hahn and Lee (2009) claim that changes in default spread and term spread capture the systemic differences in average returns – that, in effect, in the presence of default and term spread, the Fama-French factors are superfluous in explaining the variation in the cross-section of returns.

A growing body of work surrounds the relationship between market and book price and the immense relevance and utility of this ratio. Where the literature in finance has been concerned with the risk implications of the ratio, however, a well-established body of work is concerned with factors that may explain the ratio itself (see Sharma, Branch, Chawla, and Qiu, 2013). That is, the concern in economics and especially in the management literature has been with identifying discretionary variables that managers may be able to use to influence their firm's market valuation in relation to its book value.

Thus an extensive amount of literature is concerned with identifying independent variables, especially firm-level characteristics that explain the market-to-book ratio (Rogowski and Simonson, 1987; Varaiya, Kerin, and Weeks, 1987; Amit and Livnat, 1988; Barton, 1988; Montgomery and Wernerfelt, 1988; Wernerfelt and Montgomery, 1988; Murray, 1989; Cheng, Gup, and Wall, 1989; Morck, Shleifer, and Vishny, 1989; Amit and Wernerfelt, 1990; Fombrun and Shanley, 1990; Nayyar, 1992; Nayyar, 1993;

Huselid, 1995; Welbourne and Andrews, 1996; Becker and Gerhart, 1996; Anand and Singh, 1997; Huselid, Jackson, and Schuler, 1997; Dutta, Narasimhan, and Rajiv, 1999; Wiggins and Ruefli, 2002; Chang, 2003; Lu and Beamish, 2004; Kor and Mahoney, 2005; Cho and Pucik, 2005; Dutta, Narasimhan, and Rajiv, 2005; Tanriverdi and Venkatraman, 2005; Dushnitsky and Lenox, 2006; Short, Ketchen, Palmer, and Hult, 2007; McDonald, Khanna, and Westphal, 2008). This literature is briefly reviewed below.

One of the earliest papers utilizing the price to book ratio as a dependent variable was Rogowski and Simonson (1987) study of bank mergers. They analyzed 168 mergers in order to identify the factors related to the merger premium, measured as excess purchase price over book value. Cheng, Gup, and Wall (1989) also looked into the financial determinants of bank takeovers by analyzing 136 bank mergers in the Southeast between 1981 and 1986. Their focus was on acquirer characteristics.

In the management literature, Varaiya, Kerin, and Weeks (1987) have shown that the market to book ratio and Tobin's q are theoretically and empirically equivalent measures. Numerous studies have used the market to book ratio as a measure of firm performance. Barton (1988), for instance, explored the relationship between corporate diversification and systemic/market risk. Fombrun and Shanley (1990) studied reputation building as strategic and competitive signaling utilizing market to book as a measure of economic performance. Also relying on market to book, Nayyar (1992) investigated firm focus in the context of service firms finding that focus on customer segments yielded higher performance while focus on distinctive internal capabilities or geographical regions lowered performance (see also Nayyar, 1993). McDonald, Khanna, and Westphal (2008) incorporate social networking research into their study of Chief Executive Officer's (CEO's) advice seeking behavior and it's linkages to firm performance, also formulated as market.

The management literature on diversification contains a plethora of studies using market-to-book as a measure of firm performance. Amit and Livnat (1988) employed the ratio as a market based measure of return in their study of risk-return characteristics of firms with related and unrelated diversification strategies. Other studies which have used Tobin's q in the context of diversification and firm focus based studies are: Wernerfelt and Montgomery (1988), Montgomery and Wernerfelt (1988), Anand and Singh (1997), Lu and Beamish (2004), and, more recently, Tanriverdi and Venkatraman (2005).

Tobin's q as a measure of firm performance has been extensively used in the literature on top management teams since the 1980s. Murray (1989), for instance, analyzed 84 Fortune 500 food and oil firms to explore the relationships between top management group composition and firm performance measured as a mix of variables that included price to book. Morck, Shleifer, and Vishny (1989) studied the linkages between corporate board performance, substitute control devices (like takeovers) and firm performance operationalized as market price in relation to other factors such as book value. The broader human resources management (HRM) literature has also used this ratio as a measure of performance. Huselid (1995) investigated the links between systems of High Performance Work Practices (such as comprehensive employee selection and recruitment procedures, incentive compensation, etc.) and firm performance as measured by Tobin's q. Welbourne and Andrews (1996) extended the application of population ecology model to study relations between HRM practices and organizational performance. Other studies using Tobin's q to measure of firm performance in the context of HRM are Becker and Gerhart (1996), and Huselid, Jackson, and Schuler (1997).

The literature on organizational slack has also frequently used market to book as a performance measure. Chakravarthy (1986) used market to book ratio as one of the measures of organizational slack in his study of measures of strategic performance. Davis and Stout (1992) concluded that market to book was one of the measures that lowered the risk of a takeover while organizational slack increased the risk of takeover. In a similar vein, Gibbs (1993), who also looked at organizational slack and the market for corporate control, used Tobin's q as an indicator of investment opportunity. Iyer and Miller (2008) also found that slack increased an organization's propensity to indulge in acquisitions, they used the market to book ratio to control for the firm's growth opportunities.

Combs and Ketchen (1999) explored the determinants of inter-firm cooperation in the restaurant industry, the resource variable – slack was determined to be inversely related to inter-firm cooperation. They used market to book as a market measure of firm performance. Pitcher and Smith (2001) used multi-method research to study top management heterogeneity and it's linkages to organizational slack and performance – measured using market to book ratio. O'Brien (2003) posited that competition type would influence the strategic importance of financial slack and this would be critical for firms pursuing a strategy of innovation. Wang, He, and Mahoney (2009) looked into trust-building mechanisms such as employee stock option plans and their impact in mitigating employee underinvestment in building firm specific knowledge. They found financial slack to be positively related to firm-employee relationships and used Tobin's q as measure of financial performance.

Within the corporate social responsibility (CSR) literature, slack has been indicated as a determinant of corporate philanthropy. Wang, Choi, and Li (2008) support this hypothesis and used Tobin's q as a market based performance measure. More recently, contradictory evidence has emerged, Surroca, Tribo, and Waddock (2010) studied the mediation of a firm's intangible resources (such as innovation, reputation, human resources, etc.) on the relationship between corporate social responsibility and financial performance. They hypothesize that the causal relationship between CSR (authors term – CRP: Corporate Responsibility Performance) and financial performance is spurious due to mediation of intangibles in the slack resources literature (as well as the instrumental stakeholder literature).

In sum, then, the relationship between market value and book value of firms has been extensively used in the literature. While the finance literature has been concerned with the ability of the ratio to reflect market risk, the literature in management has been concerned mostly with it as a measure of firm performance.

In spite of the burgeoning literature on the subject surprisingly little research has explored the contemporaneous and lagged determinants of the market to book value ratio itself. While the literature sheds useful light on the importance of the PB ratio, it is less than helpful in identifying discretionary variables that managers may use to influence the market valuation of the firms. What, one may ask, could managers do to ensure that their firm is correctly – and perhaps aggressively – valued in the financial markets? That is the topic we address herein.

II. Data & Methods

We begin our exploration of the behavior of PB by constructing a database (from COMPUSTAT) consisting of the S&P 500 companies as of 2000. Each year thereafter our sample's membership was revised to reflect changes in the index's composition. The S&P index is very well known and carefully designed to be representative of large publicly traded US companies. Periodic updates maintain the index's basic character. By following the S&P's membership over time, we were thereby working with a set of companies which S&P believed to be particularly representative of the types of firms that its index was designed to reflect. We based our sample on S&P in order to limit the risk of selection bias. We believe our data set to be a well-structured, representative sample of large to midsized US companies.

The earliest Branch-Gale (1983) study employed a group of 600 industrial COMPUSTAT companies for the 1968-1981 period. The more recent Branch et al. (2005) study used the S&P 500 companies for the 1980-2000. Thus, the two prior studies used somewhat different databases from that of the current study, which begins at about the point (2000) that the second study ends, and ends in 2009.

A. Pooled Data Problems and Tests

Sampling issues surrounding the combination of cross-sectional and time series data have a long history (Chetty, 1968; Mundlak, 1978). The pooling approaches used run the risk that they may have "completely neglected the consequences of the correlation which may exist between the effects and the explanatory variables. Such a correlation leads to a biased estimator" (Mundlak, 1978, pg. 70). However, testing for such multicollinearity yielded VIF values lower than ten for all independent variables in our model.

Furthermore, use of the existing datasets or indices like the S&P 500 universe as a selection criterion is common practice to identify large corporations with readily available stock performance and firm data (Dlugosz, Fahlenbrach, Gompers, and Metrick, 2006).

III. Time Series and Cross Sectional Distribution of Price to Book

Branch-Gale (1968-1981) shows the average PB value declined from about 2.3 to about 1.0, and Branch et al. (2005) shows the average PB for their S&P 500 sample rose from about 1.0 at the end of 1980 to about 5.0 by 2000 (Figure 1b). In the current study covering 2000 to 2009, however, the average PB does not exhibit a clear trend. The average PB fell from about 5.0 at the end of 2000 to about 2.96 in 2002, then rose to about 3.65 in 2003 and stayed around this level for the following four years. In 2008, the average PB declined substantially to around 2 and then rose to 2.80 in 2009 (Figure 1a).

We primarily focus herein on the cross sectional variation of PB. As such we need to remove most of the time series variability in order to focus on the cross sectional variability. Our univariate analysis utilizes the variable *PBdiff*, the difference between each company's PB and the corresponding average PB value. *PBdiff* values tend to cluster near zero (Figure 2a) but some PBs depart by a substantial amount. We next examined the determinants of PB's cross sectional and time series variability.

IV. Building a PB Model

Working from the well-known Dividend Discount Model, Branch et al. (2005) developed a theoretical framework for a PB model in the steady state (book equity growth rate = dividend growth rate):

$$PB = (ROE - G)/(R-G). \quad (1)$$

Where:

P= market price of stock;

B=per share book value;

Figure 1a. Average PB Value from 2000 to 2009

PB value, the average PB ratio across S&P500 companies for each year, is plotted on the vertical axis.

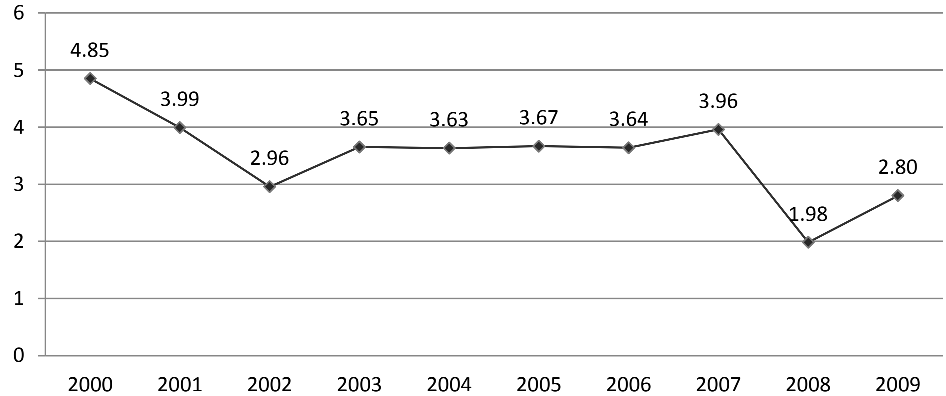
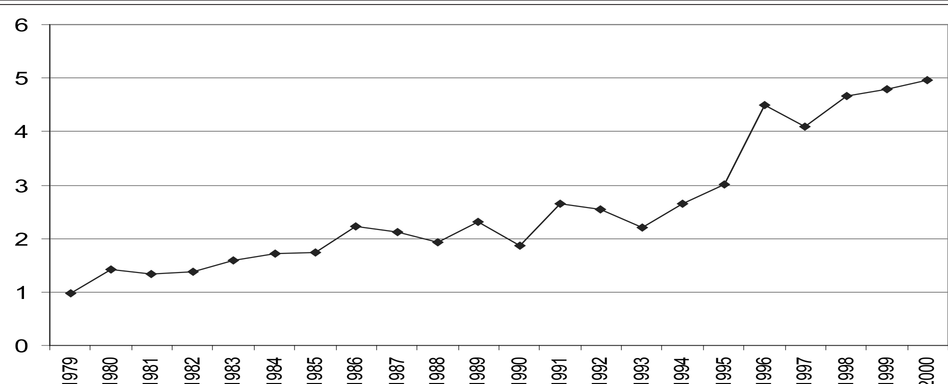


Figure 1b. Average PB Ratio from 1979 to 2000

PB value, the average PB ratio across S&P 500 companies for each year, is plotted on the vertical axis.



ROE=return on book equity (assuming no sale or repurchase of equity);

R= appropriate risk adjusted discount rate;

G= long-term growth rate for per share dividends.

Thus equilibrium PB is a function of ROE, G and R. Or to put it into words: The price to book ratio (PB) is a function of profitability (ROE), growth (G), and the discount rate (R). The nominal risk free rate component of R varies over time but is common to all firms. The non-common component of R varies cross sectionally with the company's risk. Accordingly, the cross sectional variability in PB is a function of profitability (ROE), growth (G), and risk (embedded in R).

Theoretically, R must be greater than G or the price, P, becomes infinite. Similarly, ROE must be greater than or equal to G or P would be negative. And of course we do not observe any infinite or negative market values for P. The limited liability of the corporate form should insure that stock prices are always non negative. Moreover, PB is generally greater than or equal to one indicating that the going concern value of the firm (per share stock price) is greater than its liquidation value (per share book value). This relationship would imply that (ROE-G) is generally greater than or equal to (R-G) which in turn implies that ROE is generally greater than or equal to R. Thus, firms having going concern values greater than their liquidation values (most firms) and firms having finite prices (all firms), should have ROE > R > G. Under these circumstances PB would vary positively with ROE and G and negatively with risk (embedded in R). PB would also vary inversely with the nominal risk free rate (embedded in R).

V. Empirical Analysis

Figure 3a (below) illustrates the relationship between *PB diff* and ROE (bar chart) and ROE and its frequency (line graph). Similar to Branch et al. (2005) study (Figure 3b), most of the ROE values occur within the 0.05-0.30 range with a mean value of about 0.14. For ROE values above the mean level, *PBdiff* rises quite markedly.

For ROEs below the mean and median values, however, *PBdiff* appears to decline with ROE but by no means as dramatically as it rises for above average ROEs. Note that PB itself can only be negative in the unusual circumstance

Figure 2a. Distribution of PBdiff for the Sample Period of 2000 to 2009

The variable, *PBdiff*, is the difference between each company's PB value and the corresponding average PB value.

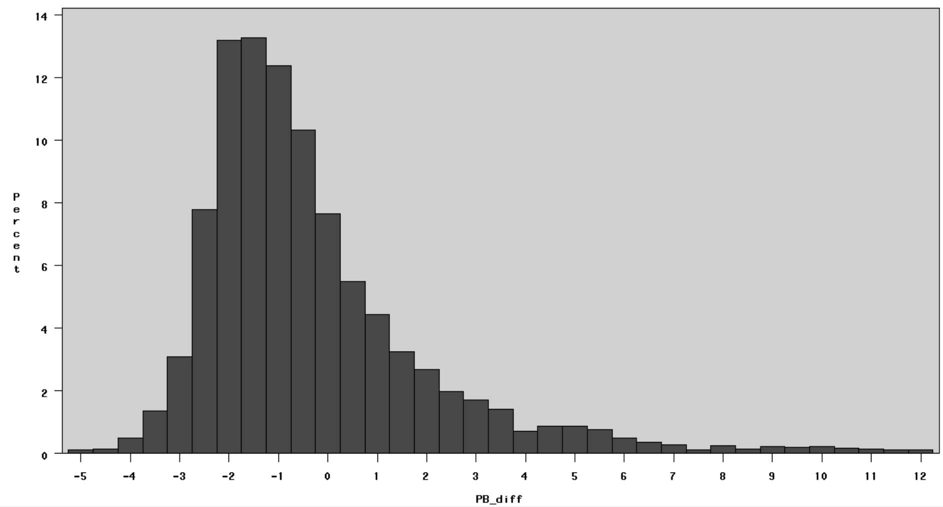
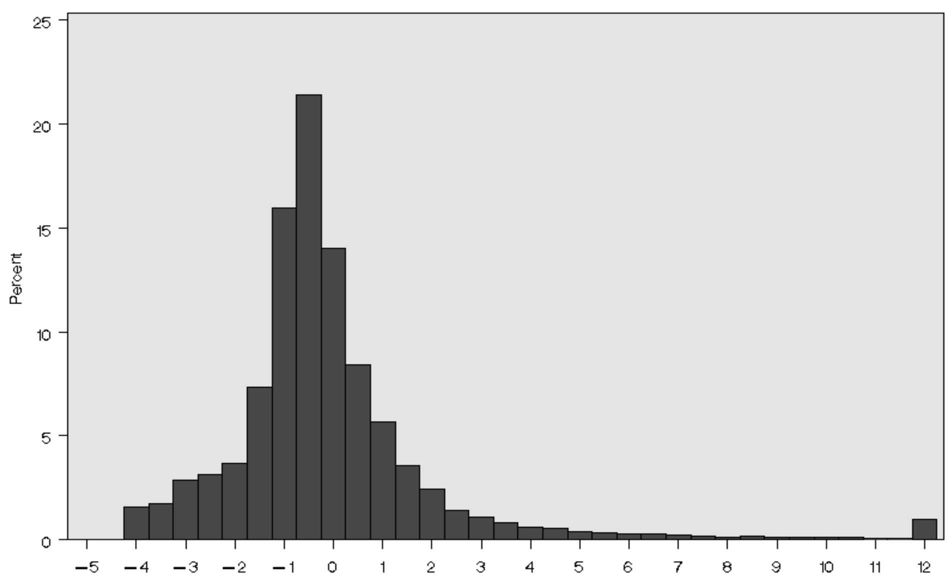


Figure 2b. Distribution of PBdiff for the Sample Period of 1979 to 2000

The variable, *PBdiff*, is the difference between each company's PB value and the corresponding average PB value.



of a negative book value and in general will not be very much below unity (or the firm becomes a candidate for liquidation). The liquidation value of a firm with a very low or negative ROE tends to place a floor on its market value. Thus, we should not be surprised to find that for ROEs above its average value, ROE has a more favorable impact on *PBdiff* than is the negative impact on *PBdiff* of a below average ROEs.

VI. A Multivariate Model

The above reported univariate relationships are consistent with our expectations.

We next develop a more robust set of relationships by building a multivariate regression model in the relationship: PB = (ROE - G)/(R-G). The firm's ROE, R, and G are all long-term forward-looking expectations. Thus proxies for those variables need to capture expectations of their future values. Accordingly we built our model as follows. First we sought to remove the time series variability of PB. To that end we followed Branch et al. (2005) in including in our model the variable average annual PB for our sample of S&P 500 firms. All of the remaining model variables are designed to proxy for the three forward looking expectations

Figure 3a. *PBdiff* rises with ROE in 2000-2009

This exhibit shows the relation between *PBdiff* and ROE in 2000-2009. ROE value is plotted on the horizontal axis. The variable, *PBdiff*, the difference between each company's PB value and the corresponding average PB value, is plotted on the primary vertical axis. The number of observations are plotted on the secondary vertical axis.

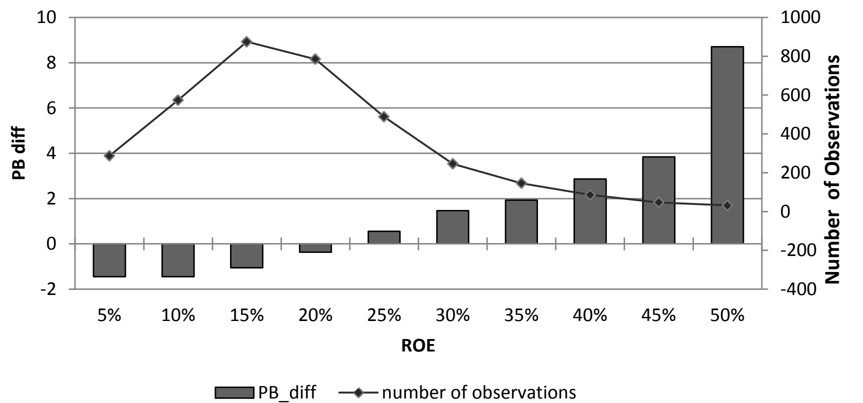
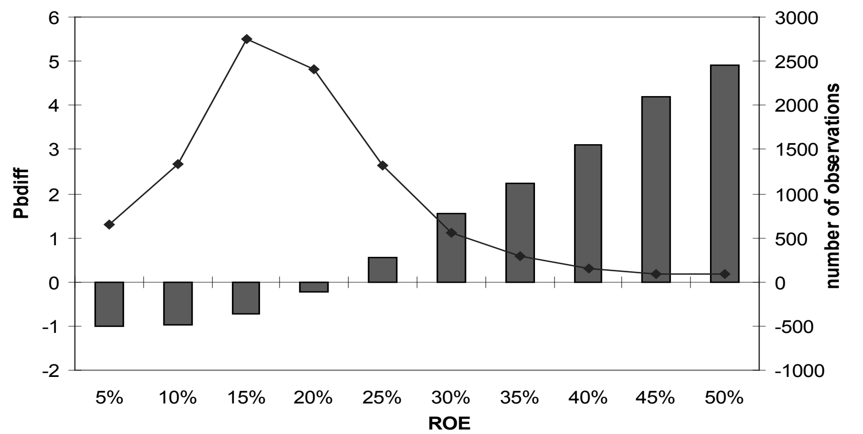


Figure 3b. *PBdiff* rises with ROE in 1979-2000

This exhibit shows the relation between *PBdiff* and ROE in 1979-2000. ROE value is plotted on the horizontal axis. The variable, *PBdiff*, the difference between each company's PB value and the corresponding average PB value, is plotted on the primary vertical axis. The number of observations are plotted on the secondary vertical axis.



of profitability, risk and growth.

A. Profitability Variables: ROE

We expect future profitability to be related to the current levels of return on equity (ROE) and return on capital (ROC) as well as the current dividend as it relates to book value. To the extent that the future will be like the past, current ROE should proxy for the future level. ROC represents a broader measure of profitability which removes the impact of leverage and as such may add to the model's ability to explain the future ROE. Similarly, the dividend as a percentage of book value tends to reflect the firms confidence in its ability to continue to earn profits sufficient to pay out dividends in the future. Some of these relations may be nonlinear and may interact with each other so various forms of the above mentioned variables may enter the regression. We expect profitability to play a major role in explaining PB.

B. Growth Variables: G

We expect future growth to be related to past growth rates in sales and profits as well as the intensity and growth in research and development (R&D) and advertising. Again to the extent that the future will be like the past, we expect that past levels of sales and profits will proxy for future rates. In addition the relative intensity of R&D and advertising spending, which are designed to build future value, are expected to help explain future growth rates. Growth without profits is, however, of little or no value to investors. Accordingly interacting the above mentioned variables with profitability variables is expected to show their power.

Table I. Definitions and Summary Statistics for Exogenous Variables

This table shows the definitions and summary statistics for the exogenous variables. The sample period is 2000-2009. Sample means, medians, and standard deviations are provided for all S&P 500 companies.

Variable	Definition	Sample size	Mean	Median	Standard deviation
Firm price to book ratio					
mnpb	Annual average price to book ratio	4839	3.470	3.639	0.652
Firm profitability					
roe	Return on equity: calculated as the firm's net income divided by equity	4839	0.131	0.140	0.328
db	The firm's dividend as a percentage of book value	4793	0.0488	0.0322	0.0637
roc	Return on capital: calculated as the firm's net income divided by the sum of equity and long term debt	4827	0.0785	0.0816	0.146
shretn	Change in the firm's stock price as a proportion of change in retained earnings	4827	4.046	1.686	46.31
Firm growth					
rdintb	R&D intensity: research and development expenses as a proportion of total revenue	2612	0.0656	0.0284	0.0867
revgrth	Annual revenue growth rate	4839	0.0693	0.0623	0.196
advintb	Advertising intensity: advertising expenses as a proportion of revenue	2062	0.0299	0.0182	0.0309
Firm risk					
cover	Interest coverage ratio: calculated as the firm's EBIT divided by interest expenses	4369	28.82	6.512	98.98
capxintb	Capital intensity: calculated as the firm's capital expenditures divided by total revenue	4678	0.0657	0.0392	0.0766
debtratio	Calculated as the firm's long term debt divided by the sum of equity and long term debt	4827	0.367	0.349	0.242

C. Risk Variables: R

We expect both leverage and capital intensity to impact the market's perception of risk. We use both the long term debt to capital ratio and the coverage ratio to reflect the extent of leverage. As capital intensity is a major source of fixed costs, we expect it to be associated with risk.

The definitions and summary statistics for the exogenous variables are shown in Table I. In this study, we follow Branch et al. (2005) procedures to build our model. We use both the linear and non-linear form of the variables in order to capture the relationship between PB and expected profitability, growth and risk. Then we winsorize our variables using a 1% screen and normalize each of the independent variables except average PB and then create squares of the normalized variables. We also test a number of interaction terms some of which are designed to reflect the joint impact of annual average PB and various independent variables while some others capture the joint impact of profitability and growth. Our final model excludes industry dummies as Branch et al. (2005) finds that differences in PBs across industries are largely due to differences in profitability, growth and risk.

VII. The Regression Model

Using a stepwise regression procedure we obtain a model with 17 statistically significant variables with an $R^2$of 0.5241. The multicollinearity test yields VIFs of less than ten for all independent, which indicates the absence of a multicollinearity problem. We also compute the correlation matrix for the 17 independent variables (shown in Table III below). The absolute value of most correlation coefficients are smaller than 0.1.

The specific PB model (stage I) is reproduced in Table II and Table III.

Table II. PB Model Stage I Regression Results

This table presents regression results for PB Model Stage I. The dependent variable is price to book ratio. All of the level independent variables except *mnpb* are normalized. The non-linear variables and interaction terms are created based on the normalized level variables. The sample period is 2000-2009.

	Coefficient	*t*-statistic
mnpb	0.5896	(8.9755)***
db	1.7070	(28.0271)***
db^2	-0.0532	(-4.1902)***
roe	1.0892	(19.1999)***
mnpb*|roe|	0.7331	(21.3660)***
roe^2	-0.2249	(-12.6582)***
roc	0.6313	(11.5137)***
$mnpb*roc^2$	-0.0166	(-3.6831)***
$mnpb*shretn^2$	0.0052	(3.1899)***
mnpb*rdintb	0.1666	(9.6990)***
mnpb*revgrth	0.1123	(9.1273)***
mnpb*advintb	0.0393	(2.1574)**
roe*revgrth	0.5628	(10.7010)***
roc*revgrth	-0.1312	(-3.1044)***
cover	0.2889	(6.4386)***
capxintb	-0.1137	(-2.6702)***
debtratio	-0.4276	(-8.5146)***
Constant	0.5928	(2.6281)***
Observations	4839	
R^2	0.524	
Adjusted R^2	0.522	

***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

Compared with Branch et al. (2005), *R*-square declined from 0.6324 to 0.5241, as the number of observations in this study is less than half that of the 2005 study. We identify 15 pairs of variables that are highly correlated. As any one of the 15 pairs entering the model will lead to multicollinearity, we select one variable from each pair. Among the original 14 variables, *mnpb, db,* db^2, *mnpb**|*roe*|, $mnpb*roc^2$, *mnpb*rdintb, mnpb*revgrth, and mnpb*advintb* are all retained. Although *mnpb*roc, mnpb*capxintb,* $shret^2$, *mnpb*cover, and mnpb*roe* are not included in the current model, their level variables, roc*, capxintb,* $mnpb*shretn^2$, *cover, and roe*, which are highly correlated with these five variables respectively, emerge significantly in the model. So only one variable, *mnpb*shretn ,* used in 2005 paper lost its explanation. Furthermore, we select four new variables, i.e., roe^2, *roe*revgrth, roc*revgrth, and debtratio,* to be included in the model. Grouping the variables by category we find as follows.

A. Pure Time Series Variables

mnpb = annual average PB
(.0087 vs .120 in 2005 paper). (2)

Thus, *mnpb* by itself explain about 0.87% of the variability in the dependent variable, which is greatly reduced compared to the 2005 study. From Figure 1, *mnpb* doesn't change as much in the 2000-2009 period as in the period of 1979-2000, thereby its power is much smaller than that in 2005 study. The partial contribution to R^2 appears in parentheses.

B. Profitability Variables

db = dividend / book (.3016 vs. .004 in 2005);

db^2 = dividend/book squared (.0015 vs. .238 in 2005);

roe = return on equity(.0651 vs. *mnpb_roen* .004 in 2005);

Table III. Correlation Matrix for the Independent Variables

This table shows the correlation coefficients for the independent variables in the PB Model Stage I. The associated *p*-values are in parentheses. The sample period is 2000-2009.

Variable	mnpb	db	db^2	roe	mnpb*|roe|	roe^2	roc	mnpb*roc^2	mnpb*shretn^2	mnpb*rdintb	mnpb*revgrth	mnpb*advintb	roe*revgrth	roc*revgrth	cover	capxintb
db	0	1														
	(1.00)	(0.00)														
db^2	0	0.68	1													
	(0.97)	(0.00)	(0.00)													
roe	0	0.39	0.33	1												
	(1.00)	(0.00)	(0.00)	(0.00)												
mnpb*|roe|	0.12	0.28	0.42	0.17	1											
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)											
roe^2	0	0.21	0.39	0.25	0.88	1										
	(1.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)										
roc	0	0.21	0.15	0.48	-0.15	-0.09	1									
	(1.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)									
mnpb*roc^2	0.05	0.04	0.10	-0.16	0.56	0.40	-0.37	1								
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.37)								
mnpb*shretn^2	0.03	-0.01	0	-0.04	0.03	0.02	-0.01	-0.01	1							
	(0.07)	(0.67)	(0.97)	(0.00)	(0.04)	(0.29)	(0.41)	(0.37)	(0.00)							
mnpb*rdintb	0	-0.13	-0.04	-0.13	0.05	0.01	-0.16	0.15	0.04	1						
	(1.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.59)	(0.00)	(0.00)	(0.01)	(0.01)						
mnpb*revgrth	0	-0.09	-0.05	0.05	-0.12	-0.08	0.14	-0.10	0.01	0.04	1					
	(1.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.41)	(0.01)	(0.08)					
mnpb*advintb	0	0.15	0.09	0.05	0.04	0.01	0.08	0	0	-0.05	-0.03	1				
	(1.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.34)	(0.00)	(0.74)	(0.93)	(0.00)	(0.08)	(0.00)				
roe*revgrth	-0.03	-0.05	-0.06	-0.38	-0.02	-0.06	-0.21	0.13	-0.06	0.03	-0.21	-0.03	1			
	(0.04)	(0.00)	(0.00)	(0.00)	(0.22)	(0.00)	(0.00)	(0.00)	(0.00)	(0.06)	(0.00)	(0.02)	(0.00)			
roc*revgrth	-0.06	-0.06	-0.03	-0.18	0.11	0.08	-0.28	0.23	-0.04	0.03	-0.26	-0.04	0.63	1		
	(0.00)	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.04)	(0.00)	(0.01)	(0.00)	(0.59)		
cover	0	-0.03	-0.02	0.03	-0.04	-0.03	0.14	0.01	0.01	0.12	0.06	-0.02	0	0.01	1	
	(1.00)	(0.03)	(0.25)	(0.02)	(0.01)	(0.05)	(0.00)	(0.62)	(0.49)	(0.00)	(0.00)	(0.11)	(0.79)	(0.59)	(0.00)	
capxintb	0	-0.04	-0.03	-0.06	-0.02	-0.02	-0.08	-0.02	0.05	0.09	0.08	0.01	0.01	0.02	-0.04	1
	(1.00)	(0.00)	(0.02)	(0.00)	(0.18)	(0.13)	(0.00)	(0.24)	(0.00)	(0.00)	(0.00)	(0.41)	(0.33)	(0.17)	(0.01)	(0.00)
debtratio	0	0.24	0.22	0.07	0.32	0.28	-0.20	0	0	-0.25	-0.07	-0.03	-0.03	-0.02	-0.23	0.09
	(1.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.79)	(0.79)	(0.00)	(0.00)	(0.07)	(0.03)	(0.26)	(0.00)	(0.00)

mnpb*|roe| = roe absolute value interacted with annual average PB (.0375 vs. .005 in 2005);

roe^2 = *roe* squared (.0254);

roc = return on capital (.0309 vs. *mnpb_roc* .0123 in 2005);

mnpb*roc^2 = *roc* squared interacted with annual average PB (.0017 vs. .037 in 2005);

$shret^2$ = the square of (change in stock price / change in retained earnings) (.0009 vs. *mnpb_shretnnsq* .0065 in 2005).

Variables *mnpb_shretn* could not explain PB in period 2000-2009, although they have a significant role in period 1979-2000 in 2005 study. And roe^2 is the newly entering variable.

All of the above variables except *roe^2, db^2 and mnpb*roc^2* have positive signs and are highly significant (at least at the 95% level). Together they imply that PB rises with dividend / book, *roe*, and *roc*, the absolute value of *roe* with a greater positive effect the higher the annual average value for PB, which is indicated by the positive coefficient of *mnpb*|roe|*. These variables explain about 46.5% of the variability in PB, which is higher than that the 41% in 2005 study. So, profitability seems to play a greater role in explaining PB in the recent period.

C. Growth Variables

mnbp*rdintb = R&D intensity interacted with annual average PB (.0096 vs. .020 in 2005);

mnpb*revgrth = revenue growth interacted with annual average PB (.0088 vs. .017 in 2005);

roe*revgrth = revenue growth rate interacted with *roe* (.0083);

roc*revgrth = revenue growth rate interacted with *roc* (0.0010);

mnpb*advintb = advertising intensity interacted with annual average PB (.0005 vs. .017 in 2005).

All of the three growth variables, *mnpb*rdintb, mnpb*revgrth, mnpb*advintb*, used in 2005 study, are still significant and have the same positive sign as in the 2005 study but with less power. Besides, two new growth variables are added to the model: the interaction terms, *roe*revgrth and roc*revgrth*. The five growth variables all together explain about 2.8% of the variability in PB, which is lower than that the 5.4% in the 2005 study.

Expected growth does impact PB but appears to have a much smaller affect than does profitability. Besides, the positive coefficient of interaction term *roe*revgrth* suggests *roe* with a greater positive impact on PB the higher level of revenue growth rate.

D. Risk Variables

cover = interest coverage ratio (.0039 vs. *mnpb_cover* .004 in 2005);

capxintb = capital intensity(0.0007 vs. *mnpb_capxintb*0.029); debtratio = total long term debt/total capital (0.0181).

All of the level risk variables *cover*, c*apxintb* and *debtratio* emerge significantly in the model. Together the three risk variables explain about 2.3% of the variability in PB, only 1% lower than that 3.3% in the 2005 study. Note, although *db* and *db^2* are classified as profitability variables, such variables have both a profitability and risk component. Companies that pay dividends tend to have more stable earning streams than those that do not. Here, *db* and *db^2* together contribute 30.3%. Thus the impact of risk on PB variability is greater than 2.3%.

In the model building, we also try the change of default spread and the change of the term spread, which are measure of default risk and interest risk, and their interactions with the three risk variables. We expect the change of default spread (*deltaDEF*) may have a significant negative coefficient, the interaction between *deltaDEF* and cover positive, the interaction between *deltaDEF* and *capxintb*(or *debtratio*) negative, and the level and interaction terms of change of term spread (*deltaTERM*) be opposite to those of *deltaDEF*. It turns out that the yearly average *deltaDEF* and *deltaTERM* are highly correlated and they have the right sign but they lose significance as other profitability variables come in the model. Some of the interaction terms get the wrong sign. In the end, they all are out of model as they do not play a role as big as other variables selected.

In the 2005 study, the *mnpb* variable and the nine interaction terms between *mnpb* and various independent variables together explained 37.5% of variability in PB. In contrast, the *mnpb's* contribution is greatly reduced in the recent period 2000-2009. Similarly the nine interaction terms are now much less important. Only five *mnpb* interactions remain in the model, together with *mnpb* explaining only about 6.68% of variability in PB. We do, however, find a significant joint impact of profitability and growth, which was not significant in the 2005 study. However, these newly entered variables could not make up the lost power of *mnpb* and its interaction terms. Therefore, we attribute the smaller *R*-square in our study to the reduced power of annual average PB(*mnpb*).

Having fit our model to contemporaneous data, we next added a data set of lagged variables which enter the model in a second stage. The second stage containing our lagged data set, explains the first stage residual. Working with a set of 12 variables, we were able to explain 19.39% of the variability of the residual. Since our first stage explained 52.41% of the variability and the second stage explained 19.39% of the residual our combined explanatory power was about 61.63%

Table IV. PB model Stage II Regression Results

This table presents regression results for PB Model Stage II. The dependent variable is the residuals from Stage I regressions. All of the level independent variables except *mnpb* are normalized. The non-linear variables and interaction terms are created based on the normalized level variables. The sample period is 2000-2009. *t*-statistics are in parentheses.

	Coefficient	*t*-statistic
pb_lag	1.53	(29.99)***
db_lag	-1.19	(-19.11)***
db^2_lag	0.08	(6.76)***
revgrth_lag	-0.21	(-5.48)***
debtratio_lag	0.19	(4.48)***
roe_lag	-0.28	(-5.88)***
rdintb_lag	-0.18	(-3.29)***
roe^2_lag	-0.05	(-3.46)***
cover_lag	-0.11	(-2.74)***
roc_lag	0.13	(2.86)***
deltadef*debtratio_lag	-0.09	(-2.55)**
mnpb*|roe|_lag	0.05	(2.09)**
Constant	-0.11	(-2.33)**
Observations	4839	
R^2	0.194	
Adjusted R^2	0.192	

***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

Figure 4a. Distribution of the Residual Values from Stage II Regression

This figure plots the distribution of stage II regression residual values for the sample period of 2000 to 2009.

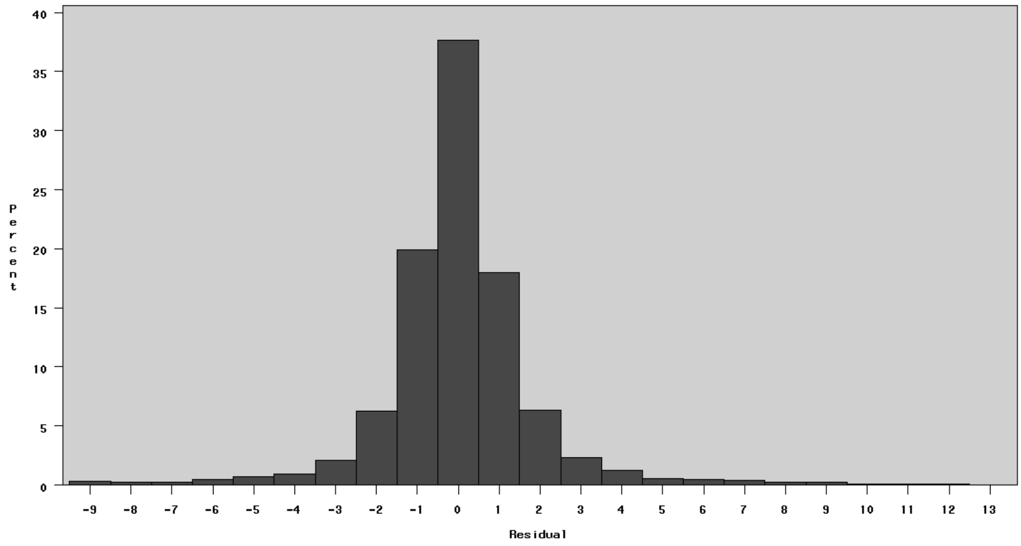


Figure 4b. Distribution of the Residual Values from Stage II Regression

This figure plots the distribution of Stage II regression residual values for the sample period of 1979 to 2000.

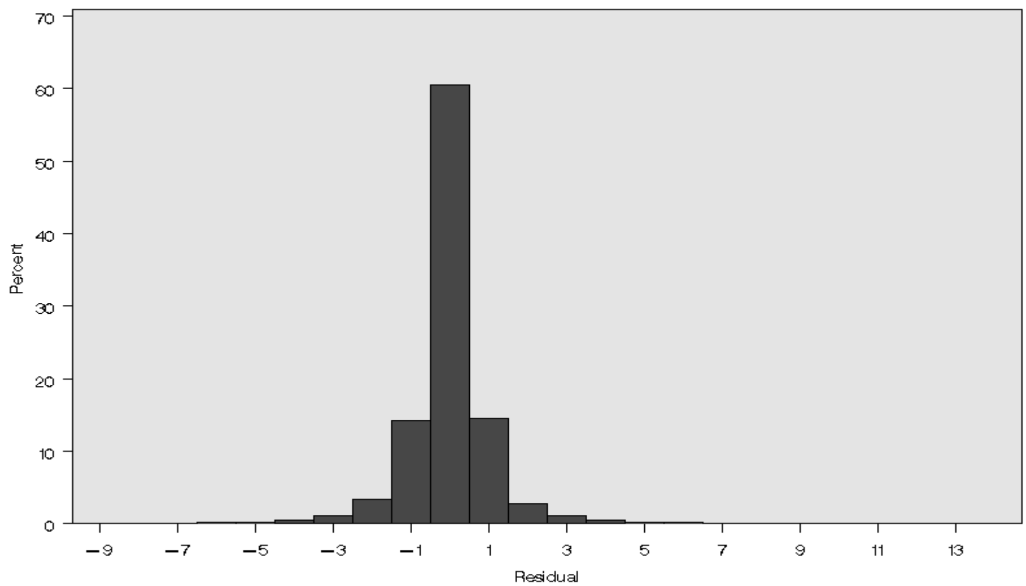
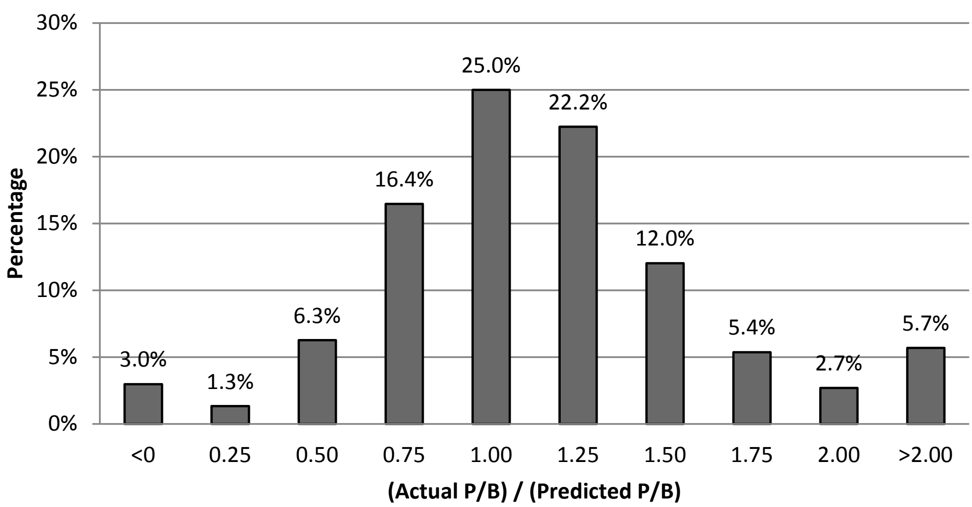


Figure 5a. The Ratio of Actual to Predicted PBs

This figure plots the distribution of actual to predicted PB ratio for the period of 2000 to 2009.



[.5241 + (1-.5241) (.1939) = *.6163*].

VIII. The PB Model Stage II

In Stage II we fit a model to explain the residual for Stage I of our model. The independent variables of Stage II are lagged by one year from the dependent variable. The regression had 15 variables and an R^2 of .1939. The regression result is shown in Table IV.

A. The Variables

PB lagged has a coefficient of 1.53 and a partial R^2 contribution of 0.1058. Thus over one half of the total R^2 of this stage comes from the lagged dependent variable. The next most important variable is (dividend/book) lagged with a partial R^2 contribution of .0599. The remaining variables have contributions in the range of 3% or less.

B. The Fit of the Model

Figure 4a illustrates the distribution of the residual from our model. The residuals cluster near zero with most residuals having values between -2.0 and +2.0. Figure 5a plots the ratio of actual to predicted PBs. About 25% of the ratios are 1.0 or very close to 1.0 (Actual = Predicted). Another 16.4% and 22.2% have actual-to-predicted ratios in

Figure 5b. The Ratio of Actual to Predicted PBs

This figure plots the distribution of actual to predicted PB ratio for the period of 1979 to 2000.

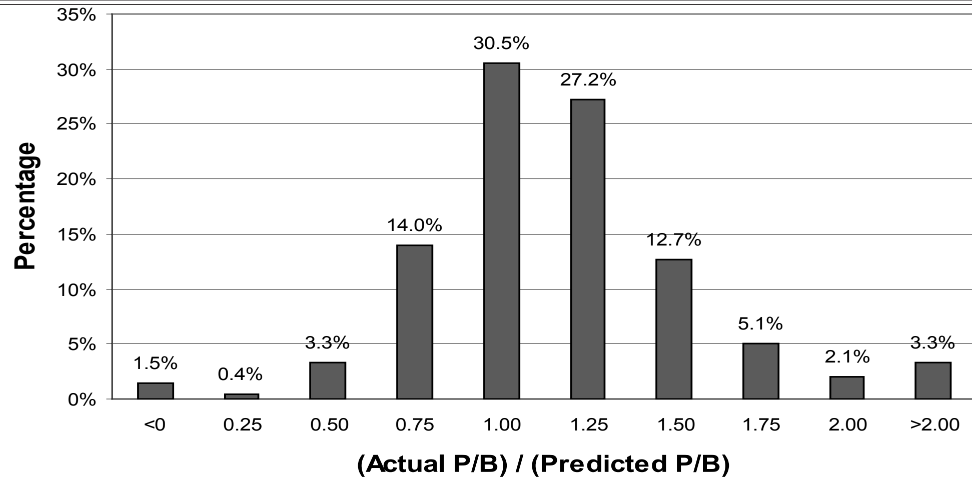
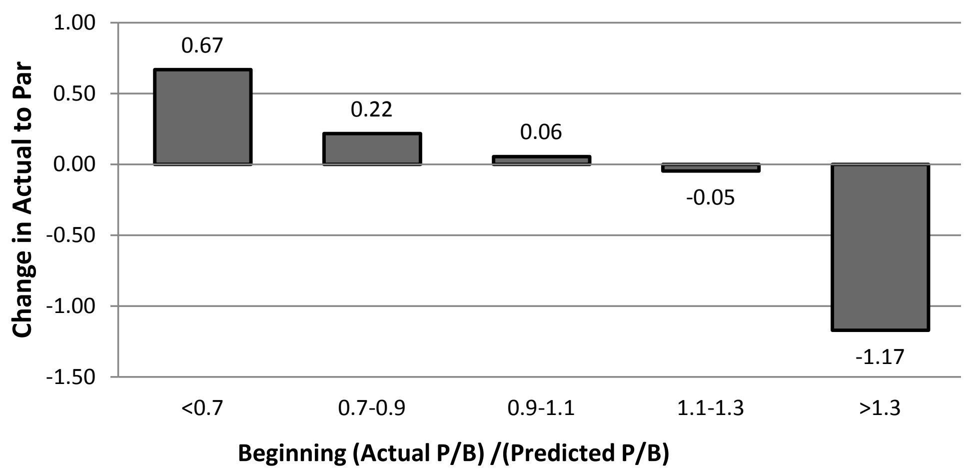


Figure 6a. Actual and Predicted PB Move Together in 2000-2009

This figure shows the actual PB and Predicted PB moves together in the period of 2000 to 2009. The beginning actual PB to Predicted PB ratio is plotted on the horizontal axis. Change in Actual to Par, the difference between the ending Actual PB to Predicted PB ratio and the beginning actual PB to Predicted PB ratio, is plotted on the vertical axis.



the range of .75 and 1.25 respectively. Overall, about 63.6% of the observations (.25 + .164 +.222 = .636) are in the vicinity of .75 to 1.25.

IX. Dynamic Behavior

From the above reported results, we see that our model explains our dataset well.

We explore the model's dynamic properties in this section. We observe a similar tendency for the ratio of actual to predicted PB to move toward one over the period 2000-2009 (Figure 6a) as over the period 1979-2000 (Figure 6b). If the beginning actual is below the predicted, the ratio tends to rise and if the actual begins above the predicted, the ratio tends to fall. Put another way observations with large residuals tend to have smaller residuals in the subsequent period.

X. Actual versus Model Values and Subsequent Firm Performance

We next explore the market's ability to anticipate future company performance, particularly future profitability and growth. When a company's actual PB is above its model value, the market probably expects the company's performance to improve. Similarly, a company with an actual PB below its model value suggests that the market is concerned that the company's performance is likely to deteriorate. The 2005 study documented the market's ability to anticipate future company performance for the period of 1979-2000. We also follow the procedure used in 2005 to test the hypothetical set of relation over the period 2000-2009. Figure 7a illustrates the relationship between the beginning

Figure 6b. Actual and Predicted PB Move Together in 1979-2000

This figure shows the actual PB and Predicted PB moves together in the period of 1979 to 2000. The beginning actual PB to Predicted PB ratio is plotted on the horizontal axis. Change in Actual to Par, the difference between the ending Actual PB to Predicted PB ratio and the beginning actual PB to Predicted PB ratio, is plotted on the vertical axis.

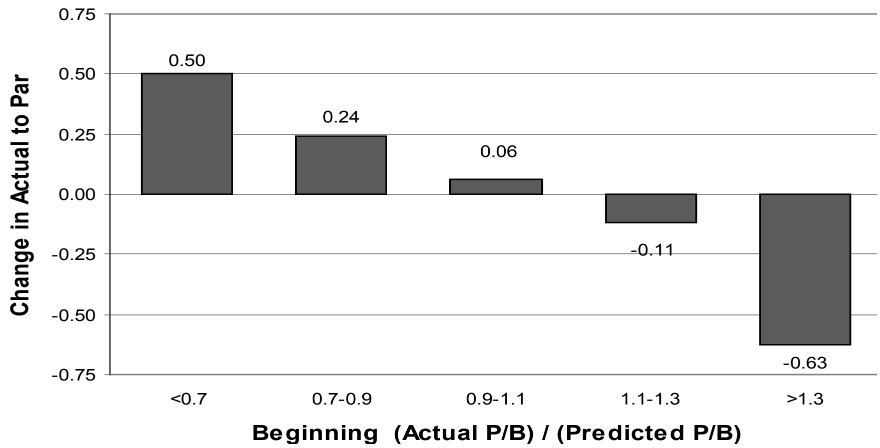
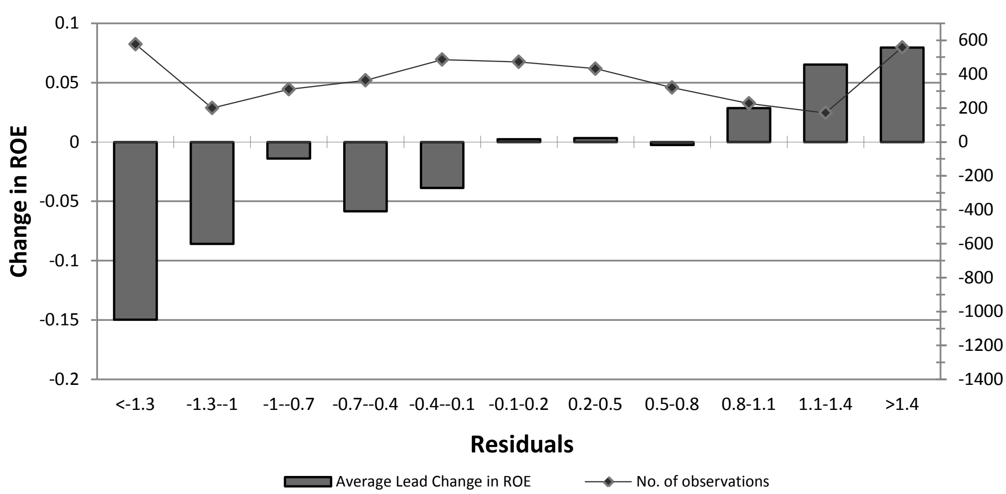


Figure 7a. Lead Changes in ROE and Residuals in 2000-2009

This figure shows the relationship between the beginning period residual and the change in ROE in the following year for the period 2000-2009. The beginning period residual is plotted on the horizontal axis. Lead change in ROE, the difference between the ending period ROE and the beginning period ROE, is plotted on the primary vertical axis. The number of observations are plotted on the secondary vertical axis.



period residual and the change in ROE in the following year for the period 2000-2009. We see that the more positive the residual the more ROE tends to rise, but the pattern is not as persistent as in the 2005 study.

Figure 8a (below) illustrates the relation between the beginning period residual and subsequent change in revenue growth. The more negative is the residual, the more the revenue growth rate tends to fall. Finally Figure 9a illustrates the joint association of profitability and growth with the residual. Firms whose ROEs and revenue growth rates are rising tend to have positive beginning period residuals.

XI. Summary, Conclusion, and Direction for Further Work

We have updated an earlier analysis by rebuilding our PB model and exploring the behavior of PB with a more recent sample. Using the foundation of the dividend discount model we have estimated an empirical equation of two stages which explain about 62 percent of the variation in annual PB levels for the S&P 500 companies from the year 2000 to 2009. Most of the variables used in the earlier Branch et al. (2005) study still explain a significant part of the variation

Figure 7b. Lead Changes in ROE and Residuals in 1979-2000

This figure shows the relationship between the beginning period residual and the change in ROE in the following year for the period 1979-2000. The beginning period residual is plotted on the horizontal axis. Lead change in ROE, the difference between the ending period ROE and the beginning period ROE, is plotted on the primary vertical axis. The number of observations are plotted on the secondary vertical axis.

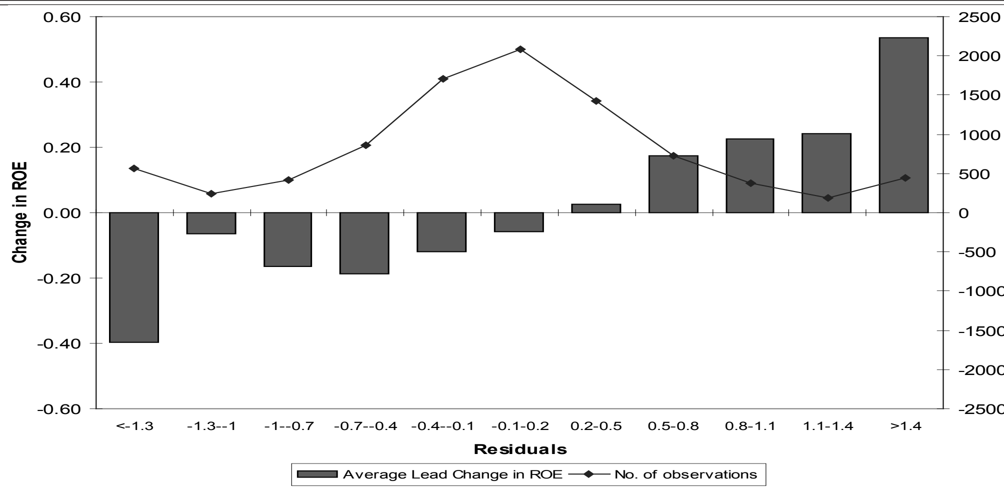


Figure 8. Lead Changes in Revenue Growth and Residuals in 2000-2009

This figure shows the relationship between the beginning period residual and the change in revenue growth in the following year for the period 2000-2009. The beginning period residual is plotted on the horizontal axis. Lead change in revenue growth, the difference between the ending period revenue growth and the beginning period revenue growth, is plotted on the primary vertical axis. The number of observations are plotted on the secondary vertical axis.

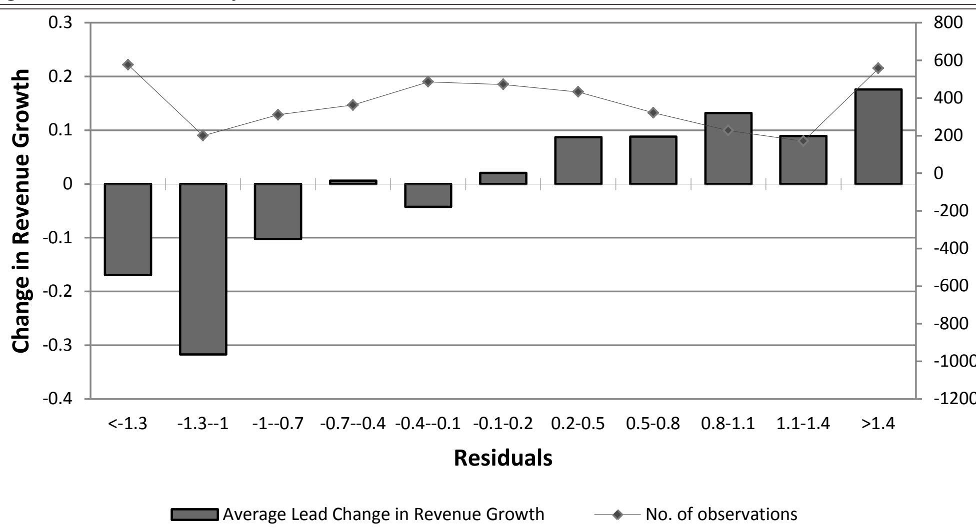


Figure 8b. Lead Changes in Revenue Growth and Residuals in 1979-2000

This figure shows the relationship between the beginning period residual and the change in revenue growth in the following year for the period 1979-2000. The beginning period residual is plotted on the horizontal axis. Lead change in revenue growth, the difference between the ending period revenue growth and the beginning period revenue growth, is plotted on the primary vertical axis. The number of observations are plotted on the secondary vertical axis.

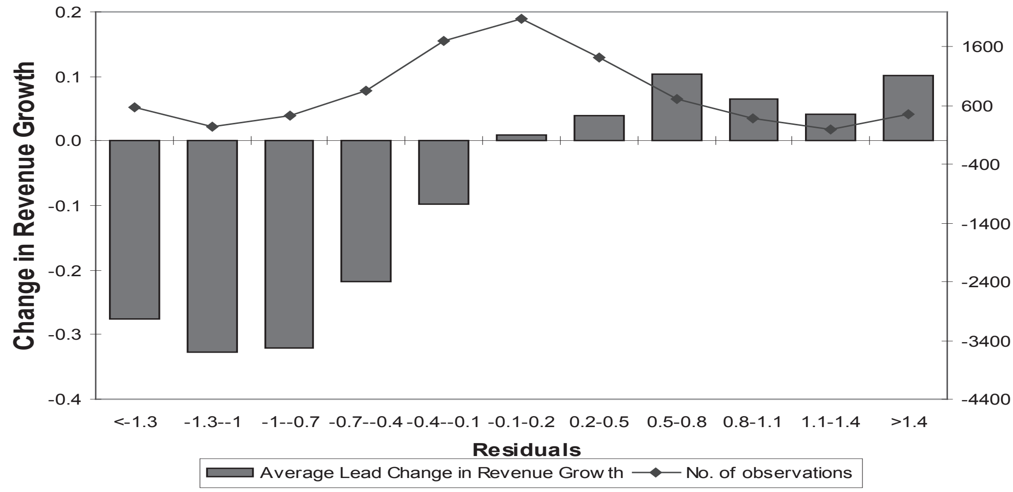
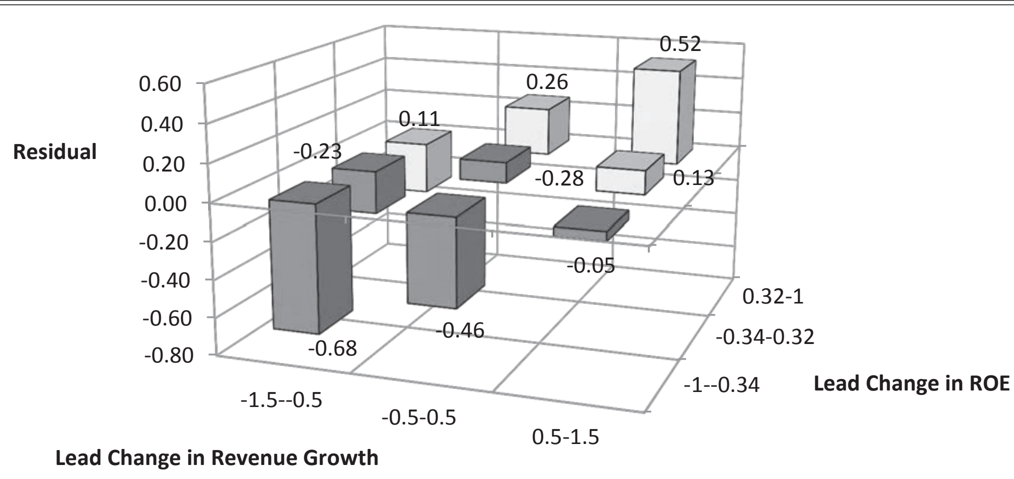


Figure 9a. The Joint Association of Profitability and Growth with the Residual in 2000-2009

This figure shows the joint association of profitability and growth with the residual in 2000-2009. Lead change in ROE, the difference between the ending period ROE and the beginning period ROE, is plotted on the x-axis. Lead change in revenue growth, the difference between the ending period revenue growth and the beginning period revenue growth, is plotted on the y-axis. The beginning period residual is plotted on the z-axis.



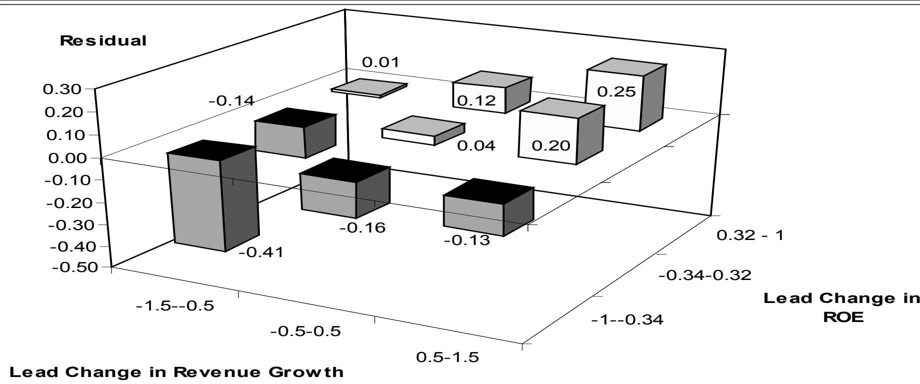
of PB. And we also find a similar time series behavior of the residuals. Observations with large residuals in period t tend to have smaller residuals in period t+1. This movement is a result of both the predicted moving toward the actual and the actual moving toward the predicted.

We also explored the market's ability to anticipate changes in performance. We found that those observations with positive residuals (actual greater than model value PB) tended to experience higher next period profitability (ROE) and more rapid revenue growth. The performance of those with negative residuals tended to deteriorate. Thus the market price appears to reflect anticipatory information not present in the model value.

Our current PB model focuses on four basic forces to explain both cross section and time series variability in PB. First, the time series variability in the yearly average PB picks up most of the market variability. This average PB variable accounts for about 1% of the PB variability in our sample. Second, various profitability related variables explain about 46.5% of PB variability. Profitability

Figure 9b. The Joint Association of Profitability and Growth with the Residual in 1979-2000

This figure shows the joint association of profitability and growth with the residual in 1979-2000. Lead change in ROE, the difference between the ending period ROE and the beginning period ROE, is plotted on the x-axis. Lead change in revenue growth, the difference between the ending period revenue growth and the beginning period revenue growth, is plotted on the y-axis. The beginning period residual is plotted on the z-axis.



levels above its mean value tend to impact PB more than profitability levels below its mean. Third, growth variables explain about 2.8% of PB variability. Finally risk variables explain about 2.3% of PB variability. Profitability still has a very powerful effect on PB in the more recent period. Note that certain of the variables classified as profitability have risk and growth components. Moreover, the market may be reacting to factors not reflected in our model and thereby anticipating growth and risk factors that we have not been able to quantify. Still, we do find that profitability is more powerful in explaining variability in PB in the 2000-2009 period than in the 1979-1999 period.■

References

Amit, R. and J. Livnat, 1988, "Diversification and the Risk-Return Trade-Off," *Academy of Management Journal* 31 (No. 1), 154-166.

Amit, R. and B. Wernerfelt, 1990, "Why do Firms Reduce Business Risk?" *Academy of Management Journal* 33 (No. 3), 520-533.

Anand, J. and H. Singh, 1997, "Asset Redeployment, Acquisitions and Corporate Strategy in Declining Industries," *Strategic Management Journal* 18 (No. S1), 99-118.

Banz, R.W., 1981, "The Relationship Between Return and Market Value of Common Stocks," *Journal of Financial Economics* 9 (No. 1), 3-18.

Barber, B.M. and J.D. Lyon, 1997, "Firm Size, Book-to-Market Ratio, and Security Returns: A Holdout Sample of Financial Firms," *Journal of Finance* 52 (No. 2), 875-883.

Barton, S.L., 1988, "Diversification Strategy and Systematic Risk: Another Look," *Academy of Management Journal* 31 (No. 1), 166-175.

Basu, S., 1983, "The Relationship between Earnings' Yield, Market Value and Return for NYSE Common Stocks: Further Evidence," *Journal of Financial Economics* 12 (No. 1), 129-156.

Becker, B. and B. Gerhart, 1996, "The Impact of Human Resource Management on Organizational Performance: Progress and Prospects," *Academy of Management Journal* 39 (No. 4), 779-801.

Bhandari, L.C., 1988, "Debt/Equity Ratio and Expected Common Stock Returns: Empirical Evidence," *Journal of Finance* 43 (No. 2), 507-528.

Black, F., 1993, "Return and Beta," *Journal of Portfolio Management* 20 (No. 1), 8-8.

Branch, B.S. and B. Gale, 1983, "Linking Corporate Stock Price Performance to Strategy Formulation," *Journal of Business Strategy* 4 (No. 1), 44-50.

Branch, B.S., A. Sharma, B. Gale, C. Chichirau, and J. Proy, 2005, "Explaining Price to Book," Business Quest, westga.edu/~bquest/2005/Model.pdf.

Breeden, D.T., 1979, "An Intertemporal Asset Pricing Model with Stochastic Consumption and Investment Opportunities," *Journal of Financial Economics* 7 (No. 3), 265-296.

Breeden, D.T., M.R. Gibbons, and R.H. Litzenberger, 1989, "Empirical Test of the Consumption-Oriented CAPM," *Journal of Finance* 44 (No. 2), 231-262.

Capaul, C., I. Rowley, and W.F. Sharpe, 1993, "International Value and Growth Stock Returns," *Financial Analysts Journal* 49 (No. 1), 27-36.

Chakravarthy, B.S., 1986, "Measuring Strategic Performance," *Strategic Management Journal* 7 (No. 5), 437-458.

Chan, L.K.C., Y. Hamao, and J. Lakonishok, 1991, "Fundamentals and Stock Returns in Japan," *Journal of Finance* 46 (No. 5), 1739-1764.

Chang, S.J., 2003, "Ownership Structure, Expropriation, and Performance of Group-Affiliated Companies in Korea," *Academy of Management Journal* 46 (No. 2), 238-253.

Cheng, D.C., B.E. Gup, L.D. Wall, 1989, "Financial Determinants of Bank Takeovers," *Journal of Money, Credit & Banking* 21 (No. 4), 524-536.

Chetty, V.K., 1968, "Pooling of Time Series and Cross Section Data," *Econometrica* 36 (No. 2), 279-290.

Cho, H.J. and V. Pucik, 2005, "Relationship Between Innovativeness, Quality, Growth, Profitability, and Market Value," *Strategic Management Journal* 26 (No. 6), 555-575.

Combs, J.G. and D.J. Ketchen, Jr., 1999, Explaining Interfirm Cooperation and Performance: Toward a Reconciliation of Predictions from the Resource-Based View and Organizational Economics," *Strategic Management Journal* 20 (No. 9), 867-888.

Daniel, K. and S. Titman, 1997, "Evidence on the Characteristics of Cross Sectional Variation in Stock Returns," *Journal of Finance* 52 (No. 1), 1-33.

Davis, G.F. and S.K. Stout, 1992, "Organization Theory and the Market for Corporate Control: A Dynamic Analysis of the Characteristics of Large Takeover Targets, 1980-1990," *Administrative Science Quarterly* 37 (No. 4), 605-633.

Davis, J.L., 1994, "The Cross-Section of Realized Stock Returns: The Pre-COMPUSTAT Evidence," *Journal of Finance* 49 (No. 5), 1579-1593.

Davis, J.L., F.F. Fama, and K.R. French, 2000, "Characteristics, Covariances, and Average Returns: 1929 to 1997," *Journal of Finance* 55 (No. 1), 389-406.

De Bondt, W.F.M. and R.H. Thaler, 1987, "Further Evidence on Investor Overreaction and Stock Market Seasonality," *Journal of Finance* 42 (No. 3), 557-581.

Dlugosz, J., R. Fahlenbrach, P. Gompers, and A. Metrick, 2006, "Large Blocks of Stock: Prevalence, Size, and Measurement," *Journal of Corporate Finance* 12 (No. 3), 594-618.

Dushnitsky, G. and M.J. Lenox, 2006, "When Does Corporate Venture Capital Investment Create Firm Value?" *Journal of Business Venturing* 21 (No. 6), 753-772.

Dutta, S., O. Narasimhan, and S. Rajiv, 1999, "Success in High-Technology Markets: Is Marketing Capability Critical?" *Marketing Science* 18 (No. 4), 547-568.

Dutta, S., O. Narasimhan, and S. Rajiv, 2005, "Conceptualizing and Measuring Capabilities: Methodology and Empirical Application," *Strategic Management Journal* 26 (No. 3), 277-285.

Fama, E.F. and K.R. French, 1992, "The Cross-Section of Expected Stock Returns," *Journal of Finance* 47 (No. 2), 427-465.

Fama, E.F. and K.R. French, 1993, "Common Risk Factors in the Returns on Stocks and Bonds," *Journal of Financial Economics* 33 (No. 1), 3-56.

Fama, E.F. and K.R. French, 1995, "Size and Book-to-Market Factors in Earnings and Returns," *Journal of Finance* 50 (No. 1), 131-155.

Fama, E.F. and K.R. French, 1998, "Value Versus Growth: The International Evidence," *Journal of Finance* 53 (No. 6), 1975-1999.

Fama, E.F. and K.R. French, 2006, "The Value Premium and the CAPM," *Journal of Finance* 61 (No. 5), 2163-2185.

Fombrun, C. and M. Shanley, 1990, "What's in a Name? Reputation Building and Corporate Strategy," *Academy of Management Journal* 33 (No. 2), 233-258.

Gibbs, P.A., 1993, "Determinants of Corporate Restructuring: The Relative Importance of Corporate Governance, Takeover Threat, and Free Cash Flow," *Strategic Management Journal* 14 (S1), 51-68.

Griffin, J.M. and M.L. Lemmon, 2002, "Book-to-Market Equity, Distress Risk, and Stock Returns," *Journal of Finance* 57 (No. 5), 2317-2336.

Gutierreez, Jr., RC., 2001, "Book-to-Market Equity, Size, and the Segmentation of the Stock and Bond Markets," Texas A&M University Working Paper.

Hahn, J. and H. Lee, 2009, "Financial Constraints, Debt Capacity, and the Cross-Section of Stock Returns," *Journal of Finance* 64 (No. 2), 891-921.

Haugen, R.A., 1995, *The New Finance: The Case Against Efficient Markets*, Prentice Hall, NJ.

Huselid, M.A., 1995, "The Impact of Human Resource Management Practices on Turnover, Productivity, and Corporate Financial Performance," *Academy of Management Journal* 38 (No. 3), 635-672.

Huselid, M.A., S.E. Jackson, and R.S. Schuler, 1997, "Technical and Strategic Human Resource Management Effectiveness as Determinants of Firm Performance," *Academy of Management Journal* 40 (No. 1), 171-188.

Iyer, D.N. and K.D. Miller, 2008, "Performance Feedback, Slack, and the Timing of Acquisitions," *Academy of Management Journal* 51 (No. 4), 808-822.

Jensen, G.R., R.R. Johnson, and J.M. Mercer, 1997, "New Evidence on Size and Price-to-Book Effects in Stock Returns," *Financial Analysts Journal* 53 (No. 6), 34-42.

Kor, Y.Y. and J.T. Mahoney, 2005, "How Dynamics, Management, and Governance of Resource Deployments Influence Firm-Level Performance," *Strategic Management Journal* 26 (No. 5), 489-496.

Lakonishok, J., A.,Shleifer, and R.W. Vishny, 1994, "Contrarian Investment, Extrapolation, and Risk," *Journal of Finance* 49 (No. 5), 1541-1578.

Lindenberg, E.B. and S.A. Ross, 1981. "Tobin's q Ratio and Industrial Organization," *Journal of Business* 54 (No. 1), 1-32.

Lintner, J., 1965, "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets," *Review of Economics and Statistics* 47 (No. 1), 13-37.

Lu, J.W. and P.W. Beamish, 2004, "International Diversification and Firm Performance: The S-Curve Hypothesis," *Academy of Management Journal* 47 (No. 4), 598-609.

MacKinlay, A.C., 1995, "Multifactor Models do not Explain Deviations from the CAPM," *Journal of Financial Economics* 38 (No. 1), 3-28.

Malkiel, B.G., 2003, "The Efficient Market Hypothesis and its Critics," *Journal of Economic Perspectives* 17 (No. 1), 59-82.

McDonald, M.L., P. Khanna, and J.D. Westphal, 2008, "Getting them to Think Outside the Circle: Corporate Governance, CEOS' External Advice Networks, and Firm Performance," *Academy of Management Journal* 51 (No. 3), 453-475.

Merton, R.C., 1973, "An Intertemporal Capital Asset Pricing Model," *Econometrica* 41 (No. 5), 867-887.

Montgomery, C.A. and B. Wernerfelt, 1988, "Diversification, Ricardian Rents, and Tobin's q," *Rand Journal of Economics* 19 (No. 4), 623-632.

Morck, R., A. Shleifer, and R.W. Vishny, 1989, "Alternative Mechanisms for Corporate Control," *American Economic Review* 79 (No. 4), 842-852.

Mundlak, Y., 1978, "On the Pooling of Time Series and Cross Section Data," *Econometrica* 46 (No. 1), 69-85.

Murray, A.I., 1989, "Top Management Group Heterogeneity and Firm Performance," *Strategic Management Journal* 10 (No. S1), 125-141.

Nayyar, P.R., 1992, "Performance Effects of Three Foci in Service Firms," *Academy of Management Journal* 35 (No. 5), 985-1009.

Nayyar, P.R., 1993, "Performance Effects of Information Asymmetry and Economies of Scope in Diversified Service Firms," *Academy of Management Journal* 36 (No. 1), 28-57.

O'Brien, J.P., 2003, "The Capital Structure Implications of Pursuing a Strategy of Innovation," *Strategic Management Journal* 24 (No. 5), 415-431.

Ohlson, J.A., 1980, "Financial Ratios and the Probabilistic Prediction of Bankruptcy," *Journal of Accounting Research* 18 (No. 1), 109-131.

Pitcher, P. and A.D. Smith, 2001, "Top Management Team Heterogeneity: Personality, Power, and Proxies," *Organization Science* 12 (No. 1), 1-18.

Reinganum, M.R., 1981, "A New Empirical Perspective on the CAPM," *Journal of Financial and Quantitative Analysis* 16 (No. 4), 439-462.

Rogowski, R.J. and D.G. Simonson, 1987, "Bank Merger Pricing Premiums and Interstate Banking," Paper presented at Financial Management Association Annual Meeting, Las Vegas, NV.

Rosenberg, B., K. Reid, and R. Lanstein, 1985, "Persuasive Evidence of Market Inefficiency," *Journal of Portfolio Management* 11 (No. 3), 9-16.

Ross, S.A., 1976, "The Arbitrage Theory of Capital Asset Pricing," *Journal of Economic Theory* 13 (No. 3), 341-360.

Sharma, A., B.S. Branch, C. Chawla, and L. Qiu., 2013, "Explaining Market to Book: The Relative Impact of Firm Performance, Growth, and Risk," Business Quest: http://www.westga.edu/~bquest/2013/research2013.htm.

Sharpe, W.F., 1964, "Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk," *Journal of Finance* 19 (No. 3), 425-442.

Short, J.C., D.J. Ketchen, Jr., T.B. Palmer, and G.T.M. Hult, 2007, "Firm, Strategic Group, and Industry Influences on Performance," *Strategic Management Journal* 28 (No. 2), 147-167.

Smirlock, M., T. Gilligan, and W. Marshall, 1984, "Tobin's q and the Structure-Performance Relationship," *American Economic Review* 74 (No. 5), 1051-1060.

Surroca, J., J.A. Tribó, and S. Waddock, 2010, "Corporate Responsibility and Financial Performance: The Role of Intangible Resources," *Strategic Management Journal* 31 (No. 5), 463-490.

Tanriverdi, H. and N. Venkatraman, 2005, "Knowledge Relatedness and the Performance of Multibusiness Firms," *Strategic Management Journal* 26 (No. 2), 97-119.

Tobin, J., 1969, "A General Equilibrium Approach to Monetary Theory," *Journal of Money, Credit and Banking* 1 (No. 1), 15-29

Varaiya, N., R.A. Kerin, and D. Weeks, 1987, "The Relationship Between Growth, Profitability, and Firm Value," *Strategic Management Journal* 8 (No. 5), 487-497.

Vassalou, M. and Y. Xing, 2004, "Default Risk in Equity Returns," *Journal of Finance* 59 (No. 2), 831-868.

Wang, H., J. Choi, and J. Li, 2008, "Too Little or too Much? Untangling the Relationship between Corporate Philanthropy and Firm Financial Performance," *Organization Science* 19 (No. 1), 143-159.

Wang, H.C., J. He, and J.T. Mahoney, 2009, "Firm-Specific Knowledge Resources and Competitive Advantage: The Roles of Economic-and Relationship-Based Employee Governance Mechanisms," *Strategic Management Journal* 30 (No. 12), 1265-1285.

Welbourne, T.M. and A.O. Andrews, 1996, "Predicting the Performance of Initial Public Offerings: Should Human Resource Management be in the Equation?" *Academy of Management Journal* 39 (No. 4), 891-919.

Wernerfelt, B. and C.A. Montgomery, 1988, "Tobin's q and the Importance of Focus in Firm Performance," *American Economic Review* 78 (No. 1), 246-250.

Wiggins, R.R. and T.W. Ruefli, 2002, "Sustained Competitive Advantage: Temporal Dynamics and the Incidence and Persistence of Superior Economic Performance," *Organization Science* 13 (No. 1), 82-105.