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On the Value of 'Value'

According to conventional financial theory, competition among diverse investors and arbitrage should keep stock prices close to their "fair" value. But a growing body of research indicates that psychological factors, "noise" trading and fads in investment styles can cause stock prices to deviate from value, and that such departures can be significant and long-lasting. Furthermore, there is now substantial evidence that return regularities are associated with equity attributes. In a market that is not price-efficient, value as measured by a dividend discount model (DDM) is but a small part of the security pricing story.

An examination of the relation between DDM expected returns and 25 equity attributes, using multivariate regression and data from over 1000 stocks during the mid-1982 to mid-1987 period, reveals whether certain equity attributes tend to be favored by DDM models. Low P/E, sales/price, yield, zero yield, beta, sigma and trends in analysts' earnings estimates were all positively correlated with DDM expected return. Coskewness, small size, residual-return reversal and high book/price were negatively associated. Neglect and earnings surprise were uncorrelated with DDM expected return, although they were associated with anomalous returns. A DDM strategy cannot be replicated with equity attributes alone, nor can all anomalous returns be captured with a DDM.

An examination of actual security returns over the five-year period shows that a DDM strategy would have produced positive but insignificant returns. At times, the DDM was perverse, with DDM expected returns negatively correlated with actual returns. In a bivariate regression pitting the DDM against low P/E, low P/E provided a higher payoff and was significant in more quarters than the DDM; low P/E appears to subsume some portion of the DDM, rather than the reverse. A full multivariate regression considering the DDM simultaneously with 25 equity attributes showed the DDM to be insignificant, while many equity attributes—sales/price, neglect, relative strength, residual-return reversal, trends in analysts' estimates and earnings surprise—provided statistically significant abnormal performance.

Equity attributes such as P/E are not mere proxies for value. Many attributes are better predictors of return than the DDM. In fact, the results suggest that DDM value is nothing more than an additional equity attribute and, like other attributes, may be amenable to prediction.

1. Footnotes appear at end of article.

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IN AN EFFICIENT MARKET, prices reflect information instantaneously and unbiasedly and are good indicators of value.[1] We find, however, substantial evidence contravening stock market efficiency.[2] There is also a growing body of literature suggesting that prices deviate from value, and that such departures can be substantial and long-lasting. This

accumulating evidence calls into question the blind pursuit of value in a marketplace that is not price-efficient.

This article investigates the usefulness of value-modeling. For purposes of exposition, we use the dividend discount model, or DDM, because it is the quintessential value model and currently enjoys widespread acceptance among practitioners.[3] The DDM's theoretical appeal derives from its all-encompassing nature, as it discounts the entire anticipated stream of future cash flows to arrive at fair, or intrinsic, value. It is the equity counterpart to the yield-to-maturity concept for bonds.

In theory, a strong case can be made for focusing on value to the exclusion of other equity characteristics, such as price/earnings ratio and yield. In practice, we find, matters are much less clear-cut. The evidence indicates that value is but a small part of the security pricing story.

Value and Equity Attributes

The DDM was first articulated by John Williams in 1938.[4] It posits that the value, V, of any asset equals the present value of all future dividends, D, discounted at a rate, r, as follows:

$$V = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} \quad \ldots .$$

If dividends are assumed to grow at a constant rate, g, this formula reduces to:[5]

$$V = \frac{D_1}{(r-g)} .$$

Assuming the denominator (r−g) is the same for all firms, value is just a constant multiple of dividends. In this simplified world, high-yielding stocks sell below fair value, while low-yielding stocks are overpriced.

Modigliani and Miller demonstrated the equivalence of discounting dividends, earnings or cash flow.[6] Thus valuation models can be defined in terms of alternative accounting measures. With appropriate (if sometimes heroic) simplifying assumptions, such models can also be reduced to simple financial ratios.

For example, if value is a constant multiple of dividends, and if the payout ratio (dividends/earnings) is also assumed constant, then value is just a fixed multiple of earnings. In this case, low-P/E stocks would be undervalued. Similarly, if depreciation as a percentage of earnings is assumed constant, value is a fixed multiple of cash flow; if net profit margin is assumed constant, value is a fixed multiple of sales; and if return on equity is assumed constant, value is a fixed multiple of book. In these cases, low price/cash flow, low price/sales and low price/book stocks would be undervalued.

Reasons can be proposed for why these financial ratios might be important indicators of value. Current yield, for example, may interest endowment funds restricted from invading principal. The price/book ratio may interest corporate raiders concerned with break-up value, assuming a relation between book and resale value. The price/cash flow ratio may interest investors prospecting for leveraged buyouts, as excess cash flow may be synonymous with unused debt capacity.

Although these ratios clearly differ from the "going concern" notion of value embodied in the DDM, equity characteristics and valuation modeling are intimately related. Some have asserted that low-P/E, high-yield and anti-growth biases "explain" the DDM's performance, and that DDM forecasts are statistically indistinguishable from those obtained from a low-P/E model.[7] Others argue that equity attributes such as low P/E are associated with anomalous returns simply because they are incomplete proxies for value and conclude that they are not useful measures.[8]

Below, we compare the efficacy of the DDM with that of the simple financial ratios discussed above, plus other equity attributes. First, however, we review existing evidence, which suggests that value may not be the linchpin of asset pricing. Rather, human behavior may violate many of the assumptions underlying conventional financial theory, and market psychology may result in "irrational" pricing.[9]

Market Psychology, Value and Equity Attributes

The DDM can be implemented for individual stocks or for the aggregate market. At the individual stock level, DDMs using consensus earnings estimates usually show some securities to be mispriced by a factor of two or greater (that is, price more than double or less than half estimated value). Entire groups of stocks often appear to be mispriced for long spans of time.[10] While this degree of mispricing is not inconsis-

tent with Black's "intuitive" definition of an efficient market, it does suggest that more than just value matters.[11]

As an asset allocation tool, the DDM appears to be useful in valuing equities relative to alternative asset classes.[12] But the DDM is far from omniscient. The market often departs widely from its underlying value. 1987 provides a stark example. During the first three quarters, stocks outperformed bonds by 46.7 per cent, despite the prediction of value-based asset allocation models that bonds would provide higher returns.[13] Equilibrium was practically restored in just one cataclysmic day—October 19. In the words of Summers, "If anyone did seriously believe that price movements are determined by changes in information about economic fundamentals, they've got to be disabused of that notion by Monday's 500-point [Dow] movement."[14]

While this particular market overvaluation was corrected quickly, mispricing can be longer lasting. Modigliani and Cohn maintained, in 1979, that the stock market had been 50 per cent undervalued for as long as a decade because of inflation illusion.[15] The emergence of a bull market after inflation subsided was consistent with their hypothesis.

Such significant and long-lasting departures from value run counter to conventional theory, which suggests that the competitive efforts of many diverse investors are sufficient to restrain prices to some small corridor around fair value.[16] They are more in line with the perspectives of such market observers as Shiller, who argues that "social movements, fashions or fads are likely to be important or even the dominant cause of speculative asset price movements."[17] Moreover, Summers has pointed out that the whole litany of empirical tests supporting market efficiency is also consistent with an alternative "fads" hypothesis; he takes issue with the notion that market prices must represent rational assessments of fundamental value.[18]

In the context of arguing that the stock market is inefficient because it is too volatile, Shiller documented wide departures of historical prices from theoretical value and cited these departures as evidence for the existence of fads.[19] Fama and French found that dividend yields can explain over 25 per cent of the variance in future two to four-year returns and suggested, as one possible explanation, that prices behave whimsically in an irrational market.[20]

Furthermore, the market appears to overreact to world news (such as presidential illnesses), dividends and other financial news, and may systematically overreact during panics.[21] Several studies, including those by DeBondt and Thaler and Fama and French, have documented long-run reversals in security prices, which seem to be due to investor overreaction.[22] DeBondt and Thaler showed reversals lasting up to five years, which occurred primarily in January. Fama and French demonstrated that up to 40 per cent of the variance of three to five-year returns is a predictable reversal of previous returns. Others, extending these findings, have generally concluded that such reversals represent evidence of serious market inefficiency.[23]

How can such "mispricing" persist in the face of "smart money"? Summers concluded that irrationality may be difficult to identify and risky to exploit, hence irrational prices need not be eliminated in time.[24] Black has argued that trading by those who do not possess useful information creates "noise"—that is, deviations of price from value.[25] These deviations induce information-based traders to enter the market, but the time required for them to correct pricing errors caused by noise traders "is often measured in months or years."[26] As evidence from economic theory, experimental markets and the real world (such as racetrack betting behavior) has indicated, learning, competition and arbitrage may be insufficient to eliminate irrationality and market inefficiencies.[27]

Furthermore, institutional investors may be particularly susceptible to fads. Bernstein has suggested that value models move in and out of favor with portfolio managers, based on their current effectiveness.[28] Such "style" fads might affect prices. Camerer and Weigelt have maintained that the relative performance goal of professional money managers is conducive to price bubbles.[29] Friedman noted that the close-knit professional investment community shares the same research sources and suggested that the asymmetry of rewards in money management leads to "herd" opinions and decisions.[30] In a similar vein, Treynor has demonstrated that "shared errors" can decrease price accuracy.[31] A shared error results, for example, if all investors accept the imperfect opinion of one Wall Street expert. Ironically, the ubiquitous application of the DDM using analysts' consensus earnings estimates may lead to more, rather than less, misvaluation.

Finally, fads and other departures of price from valuation fundamentals may last because they represent return-maximizing behavior. As Arrow has noted, "If everyone else is 'irrational,' it by no means follows that one can make money by being rational, at least in the short run. With discounting, even eventual success may not be worthwhile."[32] It can be demonstrated that, under certain conditions, irrational traders actually earn higher returns than their more rational counterparts.[33]

This is not inconsistent with Keynes' observation, made over 50 years ago, that the market is like a beauty contest, in which each investor's goal is not to pick the prettiest contestant but, rather, the contestant other judges deem the prettiest. In this view, investors find it more profitable to anticipate the opinions of others than to focus on value. It has in fact been demonstrated that foreknowledge of future consensus earnings estimates is more valuable than foreknowledge of actual earnings.[34] Keynes may well have been correct in asserting that "investment based on genuine long-term expectations is so difficult . . . as to be scarcely practicable. He who attempts it must surely . . . run greater risks than he who tries to guess better than the crowd how the crowd will behave."[35]

The Importance of Equity Attributes

The power of the DDM appears diminished when it is combined in a multivariate framework with P/E and dividend yield measures.[36] This suggests that equity attributes are more than just surrogates for value.

There are several reasons why equity attributes might be related to subsequent returns. First, attributes have long been recognized as important determinants of investment risk.[37] Attributes associated with greater riskiness should command higher expected returns. Second, the effects of macroeconomic forces may differ across firms, depending on the firms' equity attributes.[38] For instance, changes in inflation affect growth stocks differently from utility stocks. Furthermore, like the overall market, attributes may be mispriced. Mispricing might manifest itself in the form of persistent, anomalous pockets of inefficiency, such as the residual-return-reversal effect.[39] Or it may, just as fads in the stock market, be psychologically motivated, hence mean-reverting over time.

Because individual stocks are less universally scrutinized than the overall market, one might presume them to be relatively less efficiently priced. Indeed, there is growing evidence that fads cut across stocks sharing a common attribute. As these fads ebb and flow, abnormal returns accrue.

Anomalous returns to some attributes, such as neglect, sigma and earnings controversy, may arise because investors demand compensation for perceived risk.[40] In conventional theory, such a demand would be irrational, because the risks are diversifiable, hence should earn no abnormal returns. More recent theories that incorporate the effects of incomplete information posit abnormal returns to such attributes.[41]

The novel cognitive psychological approach termed "Prospect Theory" by Kahneman and Tversky has been applied by Shefrin and Statman to explain the dividend yield, small size, low P/E, neglected firm and January anomalies and by Arrow to explain anomalies associated with investor overreaction.[42] Arrow's argument can be generalized to encompass a host of anomalies, including the earnings torpedo and residual-return-reversal effects.

As noted above, DeBondt and Thaler and Fama and French cite overreaction as a potential explanation of long-term price reversals. Overreaction can also explain low P/E, yield and other effects related to simple financial ratios.[43] Overreactions have also been related to stock splits, earnings and news events.[44]

The human tendency to avoid, or at least delay, announcing bad news may explain day-of-the-week and week-of-the-month anomalies.[45] Human psychology may also underlie analysts' tendency to overestimate growth stock earnings, which accounts for the earnings torpedo effect.[46] Other behavioral predilections appear to explain the trends in analysts' earnings estimates effect. The persistence of analysts' revisions is consistent with the "herd instinct" on Wall Street and analysts' tendency to avoid reversing forecasts.[47]

Simon's "procedural rationality," a psychological decision-making framework, has been useful in understanding the January, size, yield and other effects.[48] Noise in securities prices may explain low-P/E and other simple financial ratio effects.[49] It may also account for the seemingly inexplicable discount to net asset value of many closed-end funds.[50]

Once we loosen the strict rationality assumptions of conventional theory, we find cognitive

psychological models capable of explaining seemingly anomalous pricing. Equity characteristics other than theoretical value thereby become important in understanding stock returns.

Examining the DDM

While previous evidence thus suggests that DDM is a useful construct, it appears to be far from the complete answer to modeling returns. We provide further insight on this issue. First, we examine the relation between DDM expected, or *ex ante*, security return and other equity attributes. We thereby ascertain whether certain attributes tend to be favored by DDM models. We next examine the relation between actual, or *ex post*, security return and equity attributes, including the DDM. This provides an empirical assessment of the value of "value" modeling.

Methodology

We used the 25 equity attributes analyzed in our previous article. Table I defines these measures.[51] We also utilized expected stock returns from a commercially available three-stage DDM.[52] These expected returns are based on consensus earnings forecasts, and were collected quarterly, in real time, to avoid potential biases such as look-ahead and survivorship.

We employed cross-sectional regression of returns on predetermined attributes. Both DDM expected returns and actual stock returns were tested as the dependent variable. The independent variables were the attribute exposures, normalized as described below.

Table I Equity Attributes

Attribute	*Definition*
Low P/E	trailing year's fully diluted earnings per share divided by price
Book/Price	common equity per share divided by price
Cash Flow/Price	trailing year's earnings plus depreciation and deferred taxes per share divided by price
Sales/Price	trailing year's sales per share divided by price, relative to the capitalization-weighted average sales per share for that stock's industry
Yield	indicated annual dividend divided by price, as well as a binary indicator of zero yield
Beta	calculated quarterly from a rolling 60-month regression of stock excess (over Treasury bill) returns on S&P 500 excess returns, with a Vasichek Bayesian adjustment.
Coskewness	calculated quarterly on a rolling 60-month basis as: $\frac{\Sigma(R_i-\overline{R}_i)\,(R_m-\overline{R}_m)^2}{\Sigma(R_m-\overline{R}_m)^3}$, where R_i is stock excess (over Treasury bill) return, R_m is the S&P 500 excess return, and $\overline{R}_i$ and $\overline{R}_m$ are rolling 60-month arithmetic averages
Sigma	calculated as the standard error of estimate, or dispersion of error terms, from the beta regression
Small Size	the negative of the natural log of market capitalization
Earnings Torpedo	the change from the latest earnings per share last reported to next year's consensus estimate, divided by stock price
Earnings Controversy	the standard deviation of next year's analysts' earnings estimates, divided by stock price
Neglect	the negative of the natural log of one plus the number of security analysts following each stock
Low Price	the negative of the natural log of stock price
Relative Strength	the intercept, or alpha, from the rolling 60-month beta regression
Residual Reversal	measured separately for each of the two most recently completed months as the residuals from the beta regression
Tax-Loss Measures	proprietary models of potential short and long-term tax-loss selling pressure for each stock
Trends in Analysts' Earnings Estimates	measured separately for each of the three most recently completed months as the change in the next fiscal year's consensus estimate, divided by stock price
Earnings Surprise	measured separately for each of the three most recently completed months as the difference between the announced earnings and the consensus estimate on that date, divided by stock price

We utilized both univariate and multivariate regressions, as appropriate. Multivariate regression measures several effects jointly, thereby "purifying" each effect so that it is independent of the others. We refer to multivariate return attributions as "pure" returns and to univariate attributions as "naive" returns. Univariate regression naively measures only one attribute at a time, with no control for other related effects. A single attribute will often proxy for several related effects; a multivariate analysis properly attributes return to its underlying sources.

We analyzed the 20 quarters of the five-year period from June 1982 to June 1987. For each quarter, we ran a generalized-least-squares (GLS) regression for the universe, which averaged 1183 of the largest-capitalization stocks.[53] The GLS weights, updated quarterly, were the squared reciprocal of each stock's residual risk. Each stock's weight was limited to a maximum of 10 times and a minimum of one-tenth the average GLS weight. The use of GLS regression produces greater estimation accuracy than ordinary least squares.

We normalized each independent variable (including DDM expected return in the *ex post* analysis only) by subtracting its capitalization-weighted average and dividing by its cross-sectional standard deviation. Outliers were truncated. The normalization procedure provided coefficients, or attributions of return, that are scaled consistently across measures. Each coefficient represents the marginal return to a stock with an exposure of one cross-sectional standard deviation to that measure. We refer to this as "one unit of exposure." In addition to these normalized measures, some regressions include a zero-yield indicator in the form of a binary dummy variable and 38 binary industry variables to control for industry comovements.

Stability of Equity Attributes

Would the quarterly time frame we utilized bias our conclusions? On one hand, longer time frames hamper measures that are short-lived. The information content of variables such as earnings surprise may become stale quickly. On the other hand, characteristics such as book/price are relatively stable. We examined the relative stability of the various equity attributes to determine whether quarterly DDM expected return was sufficiently timely.

We calculated the correlation of each equity attribute between beginning-of-quarter and end-of-quarter exposures across stocks. Our stability measure for each attribute was an average of these quarterly correlations. Book/price and P/E turned out to be rather stable, with average correlations of 0.94 and 0.87, respectively. DDM expected return was less stable, with an average correlation of 0.66, and the more transient effects exhibited much less stability. For instance, the average correlation was 0.29 for earnings surprises and 0.15 for trends in analysts' earnings estimates.[54]

What are the implications for testing the DDM in a quarterly framework? DDM expected return is substantially more stable than transient measures but somewhat less stable than measures such as book/price. It should be noted that attribute exposures were updated quarterly; intraquarter correlations for one and two months apart would be even higher for all measures, including DDM expected return. But even a monthly framework could be criticized as being inferior to a daily one. Moreover, a quarterly analysis would definitely handicap short-lived measures, such as earnings surprise. We believe our conclusions regarding the DDM are robust to shorter time frames.

Expected Returns

We examined the relation of DDM expected security return to various predetermined equity characteristics. First we considered naive, or univariate, attributions of DDM expected return. These naive attributions enable us to verify intuitive notions of association, such as that between low P/E and DDM. We then analyzed pure, or multivariate, attributions of DDM expected return. Because multivariate regression disentangles the effects of one attribute from those of others, it provides for a proper attribution of DDM expected return and reveals the true relations between equity characteristics and DDM attractiveness.

Table II presents summary statistics for the *ex ante* cross-sectional regressions over the period from June 1982 to June 1987. Each quarter's regression coefficients can be interpreted as the expected return to the equity attributes, as implied by the DDM. Quarterly average regression coefficients, in both naive and pure form, and associated t-statistics are displayed for the various attributes.

The t-statistic measures whether the average of expected returns differs significantly from zero. Another measure of the relation between

Table II Quarterly Average Expected Returns to Attributes

	Naive			Pure		
Attribute	*Average Expected Return*	*T-Stat.*	*Number of Quarters |T| > 2*	*Average Expected Return*	*T-Stat.*	*Number of Quarters |T| > 2*
Low P/E	1.67	4.1**	16	1.11	5.5**	8
Book/Price	0.92	8.2**	18	−0.22	−3.9**	0
Cash Flow/Price	0.51	2.1*	13	0.08	0.6	3
Sales/Price	0.80	10.6**	17	0.53	9.6**	14
Yield	0.53	3.6**	15	1.66	17.7**	20
Zero Yield	−0.10	−0.8	2	1.08	7.9**	11
Beta	0.52	3.1**	18	0.65	17.9**	16
Coskewness	−0.09	−0.3	15	−0.23	−3.7**	1
Sigma	0.74	2.3*	14	0.50	7.3**	3
Small Size	0.22	2.9**	6	−0.24	−5.2**	7
Earnings Torpedo	0.43	2.0*	13	0.60	3.6**	13
Earnings Controversy	0.22	0.9	7	−0.19	−1.5	2
Neglect	0.14	1.6	6	−0.05	−1.1	0
Low Price	0.79	11.8**	17	0.67	11.1**	16
Relative Strength	−0.45	−1.9*	15	0.10	1.6	2
Residual Reversal (−1)	−1.04	−4.0**	17	−0.66	−13.8**	18
Residual Reversal (−2)	−0.36	−1.9*	16	−0.25	−3.7**	11
Short-Term Tax-Loss	1.51	6.1**	18	0.43	2.8*	5
Long-Term Tax-Loss	0.09	0.3	11	−0.10	−1.3	1
Trend in Estimates (−1)	0.02	0.2	6	0.19	1.9*	4
Trend in Estimates (−2)	0.00	0.0	7	0.18	1.7*	6
Trend in Estimates (−3)	0.24	1.9*	4	0.15	1.9*	2
Earnings Surprise (−1)	−0.12	−0.2	1†	−0.09	−0.3	0†
Earnings Surprise (−2)	0.04	0.1	3†	−0.06	−0.4	0†
Earnings Surprise (−3)	−0.24	−1.7	2†	−0.09	−0.9	2†

*Significant at the 10 per cent level.
**Significant at the 1 per cent level.
†Data for the earnings surprise measures were available for the last 13 quarters. All other measures are for 20 quarters.

equity attributes and DDM expected return is the frequency of cross-sectional significance. On average, an attribute may not be associated with an expected return significantly different from zero, but it may nonetheless be tied cross-sectionally to DDM expected return. To show cross-sectional explanatory power, we display a count of the number of quarters in which the attribute had a t-statistic greater than two in absolute value. This should occur by chance alone about 5 per cent of the time, or in one out of 20 quarters.

Naive Expected Returns

In naive form, all the simple financial ratios—P/E, book/price, cash flow/price, sales/price and yield—have significant positive expected return attributions, ranging between 51 and 167 basis points for one unit of exposure. These expected payoffs are significant at the 1 per cent level, except for cash flow/price, which is significant at the 10 per cent level. Also, the number of times the financial ratios have a cross-sectional t-statistic greater than two in absolute value ranges from 13 to 18, which is much higher than would occur by chance alone.

We noted earlier that, under appropriate simplifying assumptions, the DDM reduces to simple financial ratios. Now we have found empirical evidence of an intimate relation between such ratios and DDM expected return.[55] This evidence supports the hypothesis that these ratios are mere proxies for value (a notion tested directly in a later section).

The beta and sigma attributes are also tied positively and significantly to DDM expected return. These relations are consistent with an expected reward for bearing risk. The average expected return to earnings torpedo, too, is significantly positive. Because DDM expected return is derived from analysts' earnings estimates, which tend to be overly optimistic for high-growth stocks, this relationship is not surprising.[56]

Significant associations between DDM expected return and price-based attributes may arise from changes in stock price that are unrelated to changes in value.[57] Price movements consistent with changes in value leave DDM expected return unaffected, hence induce no correlation with other attributes. Price movements unrelated to value, however, affect DDM

expected return as well as price-based attributes, thereby inducing a correlation. For instance, a decline in price raises a stock's position on the low-price scale. If unassociated with a change in value, the price decline also raises its DDM expected return.[58] Price-based attributes include the simple financial ratios, but even more directly price-related are measures such as residual-return reversal and potential short-term tax-loss selling. These measures are significantly related to DDM expected return.

Pure Expected Returns

Expected return attributions in pure form are sometimes consistent with those in naive form. For instance, the expected naive payoff to low P/E is 1.67 per cent, with a t-statistic of 4.1, while the expected pure payoff is 1.11 per cent with a t-statistic of 5.5. The expected pure return is less than the naive return, indicating that the latter proxies for related effects such as yield. Despite the lower magnitude of the pure return, its larger t-statistic attests to the greater consistency of its association with DDM expected returns.[59]

Among the simple financial ratios, the cash flow/price attribution disappears in pure form. Sales/price remains significant at the 1 per cent level, while yield becomes larger and more significant, with a t-statistic of 17.7. Expected return to book/price flips sign, becoming negatively related to DDM expected return. Naive returns to book/price apparently proxy for positively correlated pure attributes such as yield. When these relationships are properly controlled, higher book/price is associated with lower DDM expected return.

Pure expected return to zero yield is notably different from its naive counterpart. The pure expected payoff is 1.08 per cent, with a t-statistic of 7.9. Controlling for the common features of zero-yielding stocks, such as their below-average size, allows a positive association between zero yield and DDM expected return to emerge. Expected return to small size flips sign and is negative in pure form.

The positive beta and sigma relationships with DDM expected return are even stronger, statistically, in pure form, while coskewness emerges as significant and negative. Residual-return reversal becomes even more significant, while potential short-term tax-loss selling weakens.

Trends in analysts' earnings estimates emerge significantly positive at the 10 per cent level. This correlation might arise because of revisions in estimates that have not yet been fully reflected in stock prices. Such an upward revision in the consensus estimate would render a stock more attractive on a DDM basis.

Some measures, such as neglect and earnings surprise, are uncorrelated with DDM expected returns. These measures are associated, however, with anomalous returns.[60] Calendar-related anomalies also appear unrelated to the DDM. It is improbable, for instance, that value varies in a fashion consistent with the day-of-the-week effect.[61] The DDM does not provide the whole story on returns.

We analyzed the time pattern of the association between DDM expected returns and pure returns to each attribute. Some relationships were quite stable. For example, the expected return to yield was positive and significant in all 20 quarters. Not surprisingly, weaker relationships were less stable. For instance, trends in analysts' estimates were positively related to DDM expected return in 14 quarters.

We derived the expected pure return to each attribute in a "bottom-up" fashion from individual security DDM expected returns. Such estimates may be useful in assessing the relative attractiveness of various sectors of the market.[62] Alternatively, macroeconomic drivers can be used in a "top-down" fashion to forecast attribute, or sector, returns.[63]

The average quarterly R^2, or percentage of variation in cross-sectional return explained by our attributes, is 28 per cent. Thus a DDM strategy cannot be replicated with attributes alone. But if some attributes produce anomalous returns, a DDM strategy will not fully exploit them.

Actual Returns

We tested the potency of the DDM by examining the determinants of actual return over the five-year period from June 1982 to June 1987. First, we assessed the DDM's power by regressing actual, or *ex post*, stock return on DDM expected return. Then we examined the relative power of DDM and P/E by including both measures in a bivariate regression. We made this direct comparison because of the widespread use of P/E by practitioners.[64] Next, we pitted DDM against the simple financial ratios related to valuation modeling. Lastly, we carried our analysis to its logical conclusion by considering DDM simultaneously with 25 other

attributes, as well as 38 industry classifications.

The four panels of Table III present summary statistics for the *ex post* cross-sectional regressions. The returns displayed represent an average of the quarterly cross-sectional regression coefficients. The t-statistics measure whether the average actual payoff differs significantly from zero. Also shown is a count of the number of quarters in which the attribute had a t-statistic greater than two in absolute value.

Table III Quarterly Average Actual Returns to Attributes

Panel A	*Attribute*	*Average Actual Return*	*T-Statistic*	*Number of Quarters | T | > 2*
	DDM	0.21	1.1	8

Panel B	*Attribute*	*Average Actual Return*	*T-Statistic*	*Number of Quarters | T | > 2*
	DDM	0.15	0.7	10
	Low P/E	1.53	1.2	17

Panel C	*Attribute*	*Average Actual Return*	*T-Statistic*	*Number of Quarters | T | > 2*
	DDM	0.06	0.3	9
	Low P/E	0.92	0.5	10
	Book/Price	0.01	0.0	12
	Cash Flow/ Price	0.18	0.2	9
	Sales/Price	0.96	4.1**	7
	Yield	−0.51	−0.9	15

Panel D	*Attribute*	*Average Actual Return*	*T-Statistic*	*Number of Quarters | T | > 2*
	DDM	0.23	1.4	6
	Low P/E	−0.22	−0.3	5
	Book/Price	0.51	1.6	5
	Cash Flow/ Price	0.61	1.6	4
	Sales/Price	0.80	5.4**	7
	Yield	−0.33	−1.0	4
	Zero Yield	−0.13	−0.4	2
	Beta	−0.18	−0.9	5
	Coskew- ness	0.14	0.7	1
	Sigma	−0.99	−2.5*	9
	Small Size	0.05	0.2	6
	Earnings Torpedo	−0.33	−1.2	5
	Earnings Cont.	0.19	0.5	2
	Neglect	0.50	2.0*	7
	Low Price	0.08	0.3	8
	Relative Strength	0.92	2.2*	12
	Residual Rev. (−1)	−1.69	−8.1**	15
	Residual Rev. (−2)	−0.37	−2.0*	8
	Short-Term Tax-Loss	−0.83	−2.5*	5
	Long-Term Tax-Loss	−0.17	−0.6	3
	Trend in Est. (−1)	1.11	4.5**	7
	Trend in Est. (−2)	0.52	2.2*	1
	Trend in Est. (−3)	0.38	1.4	2
	Earnings Surp. (−1)	0.98	1.7	2†
	Earnings Surp. (−2)	1.11	2.6*	1†
	Earnings Surp. (−3)	0.74	2.4*	2†

*Significant at the 10 per cent level.
**Significant at the 1 per cent level.
†Data for the earnings surprise measures were available for the last 13 quarters. All other measures are for 20 quarters.

Power of the DDM

As Panel A shows, a one-unit-of-exposure bet on DDM expected return would have provided a quarterly average payoff of 21 basis points, exclusive of transaction costs, over the five-year period. This average payoff has a t-statistic of 1.1, and thus is not significantly different from zero. The impotence of DDM should be viewed in context, however; this particular period was one of the worst performance stretches for the DDM in the last 20 years.[65]

While DDM had little predictive power, it was tied cross-sectionally to actual stock returns. DDM had a t-statistic with an absolute value exceeding two in eight of the 20 quarterly regressions. The lack of significant average returns over this period, however, underscores the fact that DDM predictions were at times perverse. That is, DDM expected return was sometimes negatively correlated with actual returns.

Panel B shows the results of pitting DDM against low P/E.[66] The quarterly average payoff to DDM declines to 15 basis points. The average payoff to low P/E is larger—1.53 per cent—but not statistically significant. Low P/E is significant in 17 of the quarterly cross-sectional regressions, while DDM is significant in only 10 quarters. If low P/E were a mere proxy for DDM, it would be subsumed by DDM. This is not the case; rather, DDM appears partially subsumed by low P/E.

Panel C displays results from the simultaneous analysis of DDM and the simple financial

ratios. The average quarterly payoff to DDM drops to six basis points. The highest payoffs are 92 basis points to low P/E and 96 to sales/price. The payoff to sales/price is statistically significant at the 1 per cent level, while the other payoffs are insignificant.

Power of Equity Attributes

Panel D displays results from the full multivariate regression. While DDM remains insignificant, many equity attributes provide statistically significant abnormal performance. These include sales/price, neglect, relative strength, residual return reversal, trends in analysts' earnings estimates and earnings surprise.[67] Once again, the DDM does not subsume equity attributes.

The conjecture that the predictive power of equity characteristics arises solely from their proxying for value is wrong. To the contrary, equity attributes emerge important in their own right. In fact, many attributes were better predictors of subsequent return than the DDM.

Moreover, DDM expected return is nothing more than an additional equity attribute. Our test of the DDM's predictive power can be interpreted as a semi-strong-form test of market efficiency. Because all inputs to the model are publicly available, this measure is no different from other predetermined attributes, such as P/E, from the perspective of market efficiency.

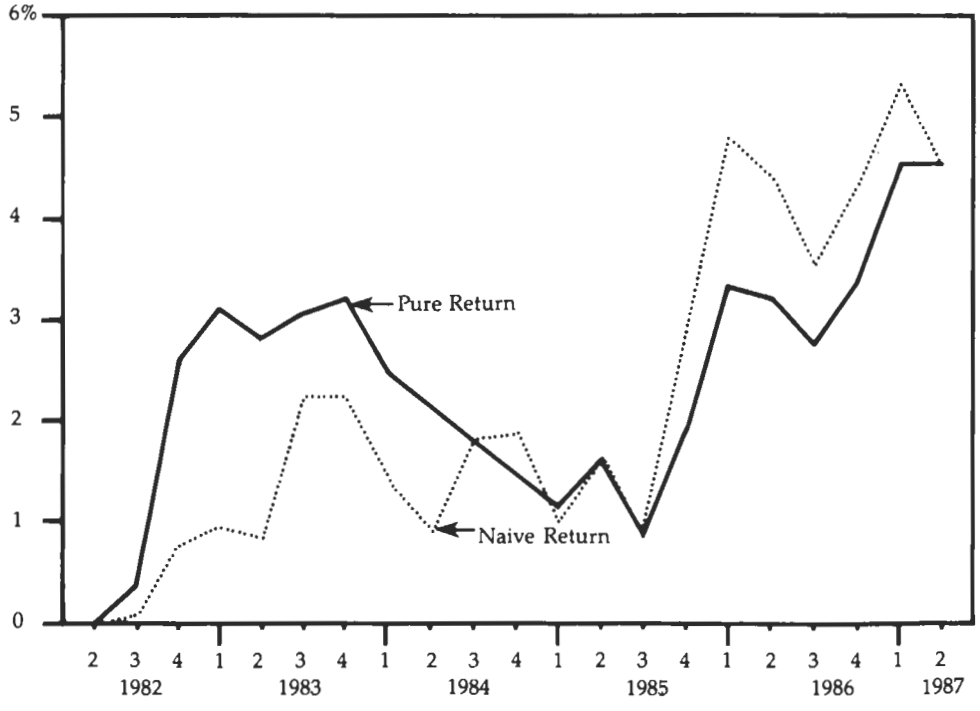
Table IV Summary

	Average Adjusted R^2
Panel A: DDM	0.37%
Panel B: DDM & P/E	3.38%
Panel C: DDM & Simple Financial Ratios	8.94%
Panel D: DDM & All Equity Attributes	43.93%

Table IV summarizes the additional investment insight provided by equity attributes by showing the average quarterly R^2, adjusted for degrees of freedom, for each set of *ex post* regressions. Clearly, the full model has substantially more explanatory power than the DDM alone. Stock returns are driven by much more than just value considerations.

Our previous article showed that returns to many equity attributes appear forecastable. This leads us next to examine the predictability of returns to the DDM.

Figure A Cumulative Return to DDM



Forecasting DDM Returns

Figure A plots cumulative *ex post* returns to DDM in both naive and pure form. The naive returns arise from a constant bet of one unit of exposure on DDM, letting the chips fall where they may in regard to unintentional bets on other attributes. The pure strategy places the same intensity of bet on DDM, but simultaneously neutralizes bets on all other attributes. That is, the pure strategy maintains equity characteristics, such as yield and industry exposures, identical to those of the market.

The similarity in the payoff patterns of the two strategies is not coincidental, because naive returns equal pure returns plus "noise" from unintentional side bets. Below, we focus on the pure returns. The payoff to DDM appears unstable, which leads us to investigate its predictability.

First, we considered a time-series analysis of the pure returns, as we previously found such an approach to be useful.[68] However, no significant patterns were found.

We then examined correlations between the time-series of pure returns to the DDM and pure returns to the simple financial ratios. All relationships were insignificantly different from zero, except for the correlation between pure returns to DDM and pure returns to yield. This correlation was −0.55, with a t-statistic of −3.3, significant at the 1 per cent level. The fact that the payoff patterns of the simple financial ratios are not positively correlated with the DDM reinforces the notion that these ratios are not mere proxies for value. Moreover, the negative relationship with returns to the yield attribute suggests that the DDM may be "aggressive" in nature, as our previous work showed yield to be "defensive."[69]

We regressed quarterly pure returns to the DDM attribute on S&P 500 excess returns (over Treasury bills) for the five-year period. We found the following relationship:

DDM Pure Return = −0.12 + 0.08 Market Excess Return.

The DDM's positive market responsiveness of 0.08 has a t-statistic of 5.2, which is highly significant. For each additional 1 per cent of positive (negative) quarterly market excess return, a one-unit-of-exposure bet on the DDM provides eight more (fewer) basis points of return over this period. Contrary to conventional wisdom, the value attribute appears to detract from performance in bear markets.

Furthermore, the intercept of the DDM regression is negative (with a t-statistic of −1.0). On a market-adjusted basis, the DDM was detrimental to returns over this period. Positive returns to DDM accumulated only because this was a bull market period.

The DDM's dependency on market climate may arise from variations in investors' willingness to be far-sighted. Because the DDM discounts an infinite stream of future dividends, it is a forward-looking measure. When the market is rising, investors are more optimistic and extend their horizons; they are more willing to rely on DDM expectations. When the market is falling, they are less willing to trust DDM expectations and place greater emphasis on more tangible attributes such as current yield.

In theory, prices are value-based and immune to mood swings. In practice, we find investor psychology to be paramount.

Conclusion

Market efficiency, investor rationality and value-based pricing are major tenets of conventional investment theory. All three of these presumptions are suspect.

We have demonstrated that equity characteristics are not mere proxies for value. The explanatory power of other equity attributes dwarfs that of the DDM. Furthermore, the DDM appears to be just another equity attribute and, like some attributes, may be amenable to prediction.

In an inefficient market driven by investor psychology, investment opportunities are bountiful. Blind adherence to value models is suboptimal, and a heavy dose of empiricism is warranted. As Noble Laureate Herbert Simon has asserted, the emerging laws of economic behavior "have much more the complexity of molecular biology than the simplicity of classical mechanics. As a consequence, they call for a very high ratio of empirical investigation to theory building."[70] In a similar vein, Paul Samuelson has stated: "I prefer paradigms that combine plausible Newtonian theories with observed Baconian facts. But never would I refuse houseroom to a sturdy fact just because it is a bastard without a name and a parental model."[71] ■

Footnotes

1. See E. Fama, *Foundations of Finance* (New York: Basic Books, 1976), p. 133 and W. Sharpe, *Investments*, 3rd ed. (Englewood Cliffs, NJ: Prentice-Hall, 1985), pp. 67–69.
2. For cross-sectional effects, see B. Jacobs and K. Levy, "Disentangling Equity Return Regularities: New Insights and Investment Opportunities," *Financial Analysts Journal*, May/June 1988. For a briefer treatment, see B. Jacobs and K. Levy, "Disentangling Equity Return Regularities," in *Equity Markets and Valuation Methods* (Charlottesville, VA: Institute of Chartered Financial Analysts, forthcoming 1988). This evidence is more compelling than previous market anomaly research because it documents multiple independent rejections of efficiency. For calendar effects, see Jacobs and Levy, "Calendar Anomalies," *Financial Analysts Journal*, forthcoming 1988 and Jacobs and Levy, "Trading Tactics in an Inefficient Market," in W. Wagner, ed., *A Complete Guide to Securities Transactions: Controlling Costs and Enhancing Performance* (New York: John Wiley, 1988).
3. See B. Donnelly, "The Dividend Model Comes Into Its Own," *Institutional Investor*, March 1985, pp. 77–82.
4. J. Williams, *The Theory of Investment Value* (Cambridge: Cambridge University Press, 1938).
5. This valuation formula is sometimes referred to as the Gordon-Shapiro model. It is developed in the context of a dynamic growth model in M. Gordon and E. Shapiro, "Capital Equipment Analysis: The Required Rate of Profit," *Management Science*, October 1956, pp. 102–110.
6. M. Miller and F. Modigliani, "Dividend Policy, Growth, and the Valuation of Shares," *Journal of Business*, October 1961, pp. 411–433.
7. R. Michaud and P. Davis, "Valuation Model Bias and the Scale Structure of Dividend Discount Returns," *Journal of Finance*, May 1982, pp. 563–564. Sorenson and Williamson find, however, improved predictive power for successively more complete security valuation models—including P/E, constant growth DDM (Gordon-Shapiro), two-stage DDM and three-stage DDM. See "Some Evidence on the Value of Dividend Discount Models," *Financial Analysts Journal*, November/December 1985, pp. 60–69.
8. T. Estep, "A New Method for Valuing Common Stocks," *Financial Analysts Journal*, November/December 1985, pp. 26–33, argues that such attributes are incomplete estimators of expected return, in that they ignore important parts of the full valuation equation. In "Security Analysis and Stock Selection: Turning Financial Information Into Return Forecasts" (*Financial Analysts Journal*, July/August 1987) Estep asserts that returns to attributes such as price/book are not anomalous, but rather evidence that PB is somewhat correlated with true value. The existence of returns to PB "does not mean, however, that PB is a 'factor' that 'generates' returns; in fact, when the true relation of PB to return is seen, it is clear that construing PB as a factor is not appropriate" (p. 42). Finally, in "Manager Style and the Sources of Equity Returns," *Journal of Portfolio Management*, Winter 1987, Estep concludes that "the success enjoyed by these naive models [such as PB] comes in spite of, rather than because of, the level of understanding of their users" (p. 6).
9. For a variety of perspectives, see R. Hogarth and M. Reder, eds., *Rational Choice: The Contrast Between Economics and Psychology* (Chicago: University of Chicago Press, 1987).
10. For instance, the banking and tobacco industries have been attractive in recent years. Either the discount rates used do not adequately reflect the risks of third-world default and product liability suits or, alternatively, market prices reflect more than value characteristics.
11. F. Black, "Noise," *Journal of Finance*, July 1986, pp. 529–543.

    The effectiveness of the DDM may be improved upon by incorporating timing and macroeconomic measures. At the individual stock level see R. Arnott and W. Copeland, "The Business Cycle and Security Selection," *Financial Analysts Journal*, March/April 1985, pp. 26–32. They find value-oriented approaches to have unstable effectiveness over time and identify a statistically significant increase in DDM effectiveness in the first quarter of each year (perhaps related to the January effect), a significant first-order autocorrelation (or persistence), as well as a negative correlation between DDM effectiveness and inflation. At the aggregate market level see Arnott and J. VonGermeten, "Systematic Asset Allocation," *Financial Analysts Journal*, November/December 1983, pp. 31–38. These methods depart from targeting value alone and are suggestive of pricing that is not solely value-based.
12. See S. Einhorn and P. Shangkuan, "Using the Dividend Discount Model for Asset Allocation," *Financial Analysts Journal*, May/June 1984, for evidence on the usefulness of DDM for asset allocation.

    The recent growth of portfolio insurance strategies has led to more frequent and more significant departures of the market from value considerations. With insured assets recently as high as $68 billion, the insurers' trading rule of buying as the market rises and selling as it falls has increased market volatility. DDM strategies tend to follow the opposite trading rule. As market vola-

tility increases, insured strategies become more costly and DDM strategies more profitable. See B. Jacobs, "Portfolio Insurance: Prone to Failure," *Pensions & Investment Age*, November 16, 1987, pp. 3 and 79.

13. The S&P 500 returned 35.9 per cent, versus −10.8 per cent for long-term Treasury bonds.
14. L. Summers, quoted in "Efficient Market Theorists Are Puzzled By Recent Gyrations in Stock Market," *Wall Street Journal*, October 23, 1987, p. 7.
15. F. Modigliani and R. Cohn, "Inflation, Rational Valuation and the Market," *Financial Analysts Journal*, March/April 1979, pp. 24–44.
16. See W. Sharpe, *Investments*, *op. cit.*, pp. 68–69, for an articulation of this view and R. Verrecchia, "On the Theory of Market Information Efficiency," *Journal of Accounting and Economics* 1 (1979), pp. 77–90, for a theoretical analysis.
17. R. Shiller, "Stock Prices and Social Dynamics," *Brookings Papers on Economic Activity*, Vol. 2, 1984, p. 497. Shiller does not totally dismiss rational expectations and the usefulness of fundamentals. In his "Comments" in Hogarth and Reder, *Rational Choice*, *op. cit.*, pp. 318-319, Shiller states, "I think the truth may well be that financial prices can be successfully modeled as reflecting proper anticipations of those future movements in dividends that can be predicted plus a term reflecting the anticipation of fashions or fads among investors."
18. L. Summers, "Does the Stock Market Rationally Reflect Fundamental Values?" *Journal of Finance*, July 1986, p. 598.
19. The excess volatility argument is presented in R. Shiller, "Do Stock Prices Move Too Much To Be Justified By Subsequent Changes In Dividends?" *American Economic Review*, June 1981, pp. 421–436, and remains controversial. For a summary of the debate, see C. Camerer and K. Weigelt, "Rational Price Bubbles in Asset Markets: A Review of Theory and Evidence" (Working paper #371, Salomon Brothers Center, New York University, March 1986), p. 27. Shiller discusses departures from value, rather than excess volatility, as evidence of fads in "Comments," *op. cit.*, p. 320–321.
20. E. Fama and K. French, "Dividend Yields and Expected Stock Returns" (Working paper #215, Center for Research in Security Prices, July 1987).
21. See V. Niederhoffer, "The Analysis of World Events and Stock Prices," *Journal of Business*, April 1971, pp. 193–219; Shiller, "Stock Prices and Social Dynamics," *op. cit.*, pp. 481–488; K. Arrow, "Risk Perception in Psychology and Economics," *Economic Inquiry*, January 1982, p. 7; W. DeBondt, "Does the Stock Market React to New Information?" (Ph.D. dissertation, Cornell University, 1985); and E. Renshaw, "Stock Market Panics: A Test of the Efficient Market Hypothesis," *Financial Analysts Journal*, May/June 1984, pp. 48–51. (J. O'Hanlon and C. Ward, "How to Lose at Winning Strategies," *Journal of Portfolio Management*, Spring 1986, pp. 20–23, contend that Renshaw's rules fail out-of-sample tests.) Other markets may also overreact. See J. Frankel and R. Meese, "Are Foreign Exchange Rates Excessively Variable?" (Working paper #2249, National Bureau of Economic Research, May 1987).
22. See DeBondt and Thaler, "Does the Stock Market Overreact?" *Journal of Finance*, July 1985, pp. 793–805. (K.C. Chan, "On the Return of the Contrarian Investment Strategy," *Journal of Business*, April 1988, pp. 147–163, claims that DeBondt and Thaler's reversal effect is explained by changing risk: Stocks suffering price declines become riskier, and this heightened risk explains their subsequent outperformance. However, DeBondt and Thaler, in "Further Evidence on Investor Overreaction and Stock Market Seasonality," *Journal of Finance*, July 1987, pp. 557–581, demonstrate that losers subsequently have higher betas in up markets and lower betas in down markets, and thus reject the changing-risk explanation.) E. Fama and K. French, "Permanent and Temporary Components of Stock Prices" (Working paper #178, Center for Research in Security Prices, February 1987). Two possible explanations are advanced—market inefficiency and changing risk premiums.
23. See J. Poterba and L. Summers, "Mean Reversion in Stock Prices: Evidence and Implications" (Working paper, Harvard University, 1987) and J. O'Brien, "Testing for Transient Elements in Stock Prices" (Working paper, Board of Governors of the Federal Reserve System, September 1987).
24. Summers, "Does the Stock Market Rationally Reflect Fundamental Values?" *op. cit.*, p. 599.
25. F. Black, "Noise," *op. cit.* K. French and R. Roll, "Stock Return Variances: The Arrival of Information and the Reaction of Traders," *Journal of Financial Economics* 17 (1986), pp. 5–26, find that a significant portion of market volatility is due to mispricing. B. DeLong, A. Shleifer, L. Summers and R. Waldman, "The Economic Consequences of Noise Traders" (Working paper #218, Center for Research in Security Prices, September 1987) maintain that noise traders cause prices to deviate so far from fair value as to create serious consequences for society as a whole.
26. Black, quoted in P. Bernstein, "Liquidity, Stock Markets, and Market Makers," *Financial Management*, Summer 1987, p. 56. H. Shefrin and M. Statman ascribe the persistence of noise trading to errors in cognition, in "A Behavioral Solution to the Noise Trading Puzzle" (Working paper, Santa Clara University, December 1987).
27. G. Akerlof and J. Yellen, "Can Small Deviations

from Rationality Make Significant Differences to Economic Equilibria?" *American Economic Review*, No. 4, 1985, pp. 708–720, demonstrate that small amounts of irrationality can have large economic effects. See references to experimental markets in C. Plott, "Rational Choice in Experimental Markets," in Hogarth and Reder, *Rational Choice, op. cit.* and D. Hausch, W. Ziemba and M. Rubinstein, "Efficiency of the Market for Racetrack Betting," *Management Science* 27 (1981), pp. 1435-1452.

28. P. Bernstein, "The Ill-Behaved E's," *Journal of Portfolio Management*, Summer 1987, p. 1.
29. Camerer and Weigelt, "Rational Price Bubbles," *op. cit.*, p. 3.
30. B. Friedman, "Discussion: Stock Prices and Social Dynamics," *Brookings Papers on Economic Activity*, Vol. 2, 1984, pp. 507-508.
31. J. Treynor, "Market Efficiency and the Bean Jar Experiment," *Financial Analysts Journal*, May/June 1987, pp. 50–53.
32. Arrow, "Risk Perception in Psychology and Economics," *op. cit.*, p. 7. For a theoretical elaboration, see T. Russell and R. Thaler, "The Relevance of Quasi-Rationality in Competitive Markets," *American Economic Review* 75 (1985).
33. B. DeLong, A. Shleifer, L. Summers and R. Waldmarı, "The Economic Consequences of Noise Trading," *op. cit.* They demonstrate that irrational traders can earn higher returns because they bear the large amount of risk that they induce, and this risk scares off more rational investors.
34. See E. Elton, M. Gruber and M. Gultekin, "Capital Market Efficiency and Expectational Data" (Working paper, New York Univeristy, May 1979), p. 12; L. Zacks, "EPS Forecasts—Accuracy is Not Enough," *Financial Analysts Journal*, March/April 1979, pp. 53-55; and R. Arnott, "The Use and Misuse of Consensus Earnings," *Journal of Portfolio Management*, Spring 1985, pp. 18–27.
35. J. Keynes, *The General Theory of Employment, Interest and Money* (New York: Harcourt, Brace and World, 1964 reprint), p. 157. For a theoretical model, see S. Aiyagari, "Economic Fluctuations Without Shocks to Fundamentals; Or, Does the Stock Market Dance To Its Own Music?" *Federal Reserve Bank of Minneapolis Quarterly Review*, Winter 1988, pp. 8–24.
36. R. Lanstein, "Using Regression Analysis to Value Stocks" (Paper presented at the Institute for International Research Conference on Stock Valuation Methods, New York, May 20, 1987). Furthermore, B. Jacobs ("Depreciation: Accounting, Taxes, and Capital Market Equilibrium" (Ph.D. dissertation, Wharton School, University of Pennsylvania, 1986)) shows a simple financial measure to be superior to present value in predicting stock returns to changes in depreciation accounting methods having real economic impacts.
37. See B. Rosenberg and V. Marathe, "The Prediction of Investment Risk: Systematic and Residual Risk," *Proceedings of the Center for Research in Security Prices*, University of Chicago, November 1975, pp. 85–225.
38. Rosenberg and Marathe, "Common Factors in Security Returns: Microeconomic Determinants and Macroeconomic Correlates," *Proceedings of the Center for Research in Security Prices*, University of Chicago, May 1976.
39. See Jacobs and Levy, "Disentangling Equity Return Regularities," *op. cit.*
40. For neglect, see A. Arbell, S. Carvell and P. Strebel, "Giraffes, Institutions and Neglected Firms," *Financial Analysts Journal*, May/June 1983, pp. 57–63; for sigma, see H. Levy, "Equilibrium in an Imperfect Market: A Constraint on the Number of Securities in the Portfolio," *American Economic Review*, September 1978, pp. 643–658; and for earnings controversy, see R. Arnott, "What Hath MPT Wrought: Which Risks Reap Rewards?" *Journal of Portfolio Management*, Fall 1983, pp. 5–11.
41. See R. Merton, "A Simple Model of Capital Market Equilibrium With Incomplete Information," *Journal of Finance*, July 1987, pp. 483–510.
42. D. Kahneman and A. Tversky, "Prospect Theory: An Analysis of Decision Under Risk," *Econometrica*, March 1979, pp. 263–291; H. Shefrin and M. Statman, "Explaining Investor Preference for Cash Dividends," *Journal of Financial Economics* 13 (1984), pp. 253–282; Shefrin and Statman, "The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory and Evidence," *Journal of Finance*, July 1985, pp. 777-792; Shefrin and Statman, "A Behavioral Finance Solution," *op. cit.*; and Arrow, "Risk Perception in Psychology and Economics," *op. cit.*
43. On low P/E, see Shiller, "Stock Prices and Social Dynamics," *op. cit.*, pp. 488–491. For a practitioner's viewpoint, see D. Dreman, *The New Contrarian Investment Strategy* (New York: Random House, 1982).
44. On splits, see J. Ohlson and S. Penman, "Variance Increases Subsequent to Stock Splits: An Empirical Aberration," *Journal of Financial Economics*, June 1985, pp. 251–266; on earnings, see DeBondt and Thaler, "Further Evidence on Investor Overreaction," *op. cit.*; on events, see Renshaw, "Stock Market Panics," *op. cit.*; J. Howe, "Evidence on Stock Market Overreaction," *Financial Analysts Journal*, July/August 1986, pp. 74–77; and K. Brown and W. Harlow, "Market Overreaction: Magnitude and Intensity," *Journal of Portfolio Management*, Winter 1988, pp. 6–13.
45. S. Penman, "The Distribution of Earnings News Over Time and Seasonalities in Aggregate Stock

Returns," *Journal of Financial Economics* 18 (1987), pp. 199-228.

46. E. Elton, M. Gruber and M. Gultekin, "Professional Expectations: Accuracy and Diagnosis of Errors," *Journal of Financial and Quantitative Analysis*, December 1984, pp. 351–364. This bias is also consistent with Prospect Theory's base-rate fallacy.
47. See Arnott, "The Use and Misuse of Consensus Earnings," *op. cit.*
48. See E. Miller, "Explaining the January Small Firm Effect" (Working paper, University of New Orleans, November 1986).
49. Black, "Noise," *op. cit.*, p. 534.
50. See DeLong, Shleifer, Summers and Waldman, "The Economic Consequences of Noise Trading," *op. cit.*
51. For an extensive discussion of these attributes and our methodology, see B. Jacobs and K. Levy, "Disentangling Equity Return Regularities," *op. cit.*
52. For a description of the three-stage DDM, see W. Sharpe, *Investments*, *op. cit.*, chapter 14.
53. The universe each quarter was a subset of the 1500 largest capitalization stocks for which all the necessary data were available to calculate DDM expected returns. The sample size ranged from a low of 1035 to a high of 1337.
54. The correlation, significant at the 1 per cent level, between the unanticipated component of consecutive earnings announcements indicates that surprises tend to repeat. This may be due to the behavior of analysts, if they do not fully incorporate all relevant information in forming their earnings expectations.

    This persistence of earnings surprise is consistent with C. Jones, R. Rendleman and H. Latané, "Stock Returns and SUEs During the 1970's," *Journal of Portfolio Management*, Winter 1984, pp. 18–22. In "Further Insight Into the SUE Anomaly: Size and Serial Correlation Effects" (Working paper, University of North Carolina at Chapel Hill, April 1986) these authors propose that most of the post-announcement stock response to an earnings surprise may actually be a pre-announcement adjustment to next quarter's surprise.
55. See R. Michaud and P. Davis, "Valuation Model Bias and the Scale Structure of Dividend Discount Returns," *op. cit.* and W. Bethke and S. Boyd, "Should Dividend Discount Models Be Yield-Tilted?" *Journal of Portfolio Management*, Spring 1983, pp. 23–27, for earlier documentation on growth, P/E and yield.
56. For discussion of this analyst bias, see footnote 46. Michaud documents a negative correlation of DDM expected return with long-term growth. Our earnings torpedo measure is not comparable because it looks ahead only one fiscal year.
57. Note that we lagged price one month to avoid bid/ask and pricing error problems for most measures, as discussed in B. Jacobs and K. Levy, "Disentangling Equity Return Regularities," *op. cit.* DDM and residual-return reversal are notable exceptions.
58. Alternatively, a relationship could be spuriously induced by a price change near quarter-end consistent with a value change that has not yet been reflected in the DDM model. This may occur because of lags in updating consensus earnings databases for revisions in analysts' estimates.
59. See B. Jacobs and K. Levy, "Disentangling Equity Return Regularities," *op. cit.*
60. *Ibid.*
61. For an extensive discussion of calendar-based anomalies, see Jacobs and Levy, "Calendar Anomalies," *op. cit.* and W. Ferson, S. Foerster and D. Keim, "Tests of Asset Pricing Models with Changing Expectations" (Working paper, Stanford University, November 1987).
62. See A. Rudd and H. Clasing, *Modern Portfolio Theory: The Principles of Investment Management* (Homewood, IL: Dow Jones-Irwin, 1982), pp. 167–172.
63. See B. Jacobs and K. Levy, "Disentangling Equity Return Regularities," *op. cit.*
64. *Pensions & Investment Age*, November 10, 1986, p. 92, reported that 29.3 per cent of all institutional managers identified low P/E as an integral part of their style.
65. See R. Jones, "Goldman Sachs Stock Selection" (Goldman Sachs, New York, quarter ended June 1987), p. 34 for a 20-year perspective. Jones' results are generally consistent with ours regarding the efficacy of the DDM. Moreover, R. Michaud and P. Davis, "Valuation Model Bias and the Scale Structure of Dividend Discount Returns," *op. cit.*, find that even during the period 1973–80, when the DDM provided significant economic rewards, it was still not statistically significant.
66. A skeptic might assert that our results may be affected by look-ahead bias. While DDM expected returns were collected in real time, P/E and other measures were determined retroactively. To avoid look-ahead bias, we lagged announced earnings three months, consistent with R. Banz and W. Breen, "Sample Dependent Results Using Accounting and Market Data: Some Evidence," *Journal of Finance*, September 1986, pp. 779–793. We also reran the regressions in Panel B utilizing a P/E attribute based on expected, rather than historical, earnings. These earnings estimates were also used as input to the DDM, so that any potential advantage was eliminated. The results were almost identical to those in Panel B. The DDM average coefficient was 0.11 with t-statistic 0.44, and the low-P/E average coefficient

was 0.88 with t-statistic 0.90.

67. Note that industry attributions are not shown in Panel D. For the time period studied, the returns to equity attributes are generally consistent with our earlier paper. However, the adoption of a quarterly, rather than a monthly, time frame does lead to some differences. First, the January effect is obscured. Second, transient measures such as residual reversal are less significant. Third, the three-month-ago earnings surprise measure is more significant. This arises from a data artifact relating to the uneven distribution of firms across fiscal reporting months.
68. See B. Jacobs and K. Levy, "Disentangling Equity Return Regularities," *op. cit.*, for an autocorrelation analysis of all 25 non-DDM measures. R. Arnott and W. Copeland, "The Business Cycle and Security Selection," *op. cit.*, report significant first-order autocorrelation of naive returns to the DDM. We find first-order autocorrelation insignificantly negative for naive returns and insignificantly positive for pure returns. Also, both series exhibit the first-quarter seasonality reported by Arnott and Copeland.
69. See Jacobs and Levy, "Disentangling Equity Return Regularities," *op. cit.*
70. H. Simon, "Rationality in Psychology and Economics," in Hogarth and Reder, *Rational Choice, op. cit.*, p. 39.
71. P. Samuelson, "Paradise Lost and Refound: The Harvard ABC Barometers," *Journal of Portfolio Management*, Spring 1987, p. 6.