The Journal of FINANCE

VOL. XXXVII 1982

REPRINT

The Journal of THE AMERICAN FINANCE ASSOCIATION

THE JOURNAL OF FINANCE • VOL. XXXVII, NO. 2 • MAY 1982

Valuation Model Bias and the Scale Structure of Dividend Discount Returns**

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THE DIVIDEND DISCOUNT return model (DDM) is a stock valuation tool used by many financial institutions. It is a natural generalization of the yield-to-maturity concept used to value bonds. In perhaps its most "standard" form (Sharpe [1981], pp. 381–82), analysts' forecasts of earnings, dividends, earnings growth rates and payout ratios are used to derive anticipated future dividends. The dividend discount return is defined as the internal rate of return that equates current price to the discounted stream of anticipated future dividends.

The primary objectives of the DDM are to resolve, to the extent possible, the problem of comparability of analysts' stock recommendations and to improve the security valuation process. The model provides a consistent and plausible framework for imbedding analysts' judgments of stock value. The discipline implicit in a DDM valuation, requiring considerations of current price and future cash flows, earnings, etc., may lead to improved security valuation. The forecast dividends are often not intended as literal forecasts of future dividends but as the vehicle for analysts' valuation judgments. As a quantification of security value, the DDM is often a first and critical step in a quantitative investment management program.

However, as described by Michaud [1980], the DDM may be subject to significant misinterpretation and misuse. In particular, it was argued that DDM returns may be on a different scale from actual expected returns. The implications of the scale mismatch problem were noted, particularly for interpreting parameters of the dividend discount "market line" (Sharpe [1981], pp. 368–69) and implementing the information adjustment procedure for portfolio optimization (Ambachtsheer [1977]).

This paper is a report on the performance history of some "standard" DDMs and an examination of the relationship of the forecasting characteristics and scale structure of the models. Four sets of DDM data, covering various subperiods of the eight-year period 1973–80 were used.

Evidence of consistent and significant *ex ante* anti-growth stock (high dividend yield, low *P/e*) bias "explains" the forecasting performance of the model. Overall, forecasting performance is positive but statistically insignificant. To the extent that the forecasts represent a "private" source of investment information, the empirical evidence is consistent with the strong form of the Efficient Market

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** Earlier versions were presented to: Investment Risk Analysis Seminar, Darden School, University of Virginia, March 1981; NYSSA, Investment Technology Association, July 1981; Investment Analysts Society of Chicago, October 1981; Seminar on the Analysis of Security Prices, University of Chicago, November 1981.

Hypothesis (Fama [1970]). In particular, a low *P/e* forecast model and the DDM are generally statistically indistinguishable.

Two issues emerge from our empirical analysis: 1) Is the observed *ex ante* bias a necessary property of the model? 2) Is the lack of statistical significance in forecast performance due to the lack of investment information from the analysts' inputs or to the dominance of an *ex ante* bias implicit in the return construction process?

Assuming that the DDM is a one-period forecast of return,[1] it is shown that the scale of the forecast return components, induced by standardized assumptions in the construction of the returns, results in the observed *ex ante* bias in the model. Information in analysts' forecasts, measured in terms of *ex ante/ex post* component correlations, is often positive and statistically significant.

The sensitivity of the *ex ante* structure of the model to many assumptions in the return construction process suggests the possibility of choosing the assumptions consistent with a given "market outlook." While a search for an appropriate set of assumptions may be of interest, the introduction of the "structured" DDM provides a straightforward and convenient valuation methodology for altering the *ex ante* structure of the model without changing the underlying information in the component correlations.

Tests of a structured DDM, conditional on a "passive" or "neutral" market outlook, were performed. Empirical evidence indicated an elimination of most of the "standard" DDM bias, a substantial reduction in the error rate, and a small improvement in overall forecasting performance.

The structured DDM is based on the recognition of the priority in *ex post* performance of bias implicit in the *ex ante* structure of the model. Explicit awareness and control of the *ex ante* structure of the model and its investment implications may lead to the elimination of self-defeating inconsistencies and improved forecast performance.

The structured DDM concept implies a sharp perceptual change in the nature and usage of the DDM. In particular, the model emerges with little, if any, endogenous market valuation information. As a result, a number of current institutional uses of the DDM as an investment strategy tool may be subject to significant error.

Section I describes the data bases that form the empirical basis of our discussions. Section II describes the results of the empirical tests of the standard DDM. Section III examines the relationship of valuation model bias to scale structure. Section IV introduces the "structured" DDM and empirically evaluates the performance of the "passive"-structured DDM. Section V draws some implications of the study for current institutional usage of the DDM. Section VI provides a summary.

[1] The proof that the DDM is interpretable as a one-period return is straightforward: The best estimate of the price of the security at the end of the first period (at present) will reflect the then remaining expected dividends and the assumption that the future discount rates do not change. Consequently, first period total return will be equal to the first period discount rate, which, in the case of the "standard" DDM, is equal to the dividend discount return. The issue of the appropriate time horizon for the DDM is an empirical, not theoretical one.

I. *The DDM Data Bases and Notation*

The discussions involve four data bases, denoted by the capital letters A through D. Each data set is composed of standard dividend discount returns, K, forecast dividend and earnings[2] yields, y and e/P respectively (the first-year forecast dividend or earnings divided by the beginning of the period price), and beta. Forecast capital appreciation or "growth" is defined as $g = K - y$.

The A and C data bases use in-house analysts' forecasts for stocks of institutional interest with a DDM as described by Sharpe (1981, pp. 381–82). The B and D data bases use a somewhat simplified DDM with forecasts taken from a widely available external source. In each time period the A data consisted of three hundred to four hundred stocks, the B data consisted of the top two hundred capitalization stocks in the S&P 500 index, the C data consisted of approximately three hundred stocks, and the D data consisted of approximately five hundred stocks in the S&P 500 index. The A data is based on forecasts available at the beginning of each year from 1973 through 1980. The B data is based on forecasts available beginning each year from 1973 through 1976. The C data is based on forecasts available at the beginning of the periods 77/06, 78/02, 79/01, 80/02. The D data is based on forecasts available at the beginning of 79/06, 79/08, 79/11, 80/03, 80/05, 80/07. The actual return data are subsequent annual total returns computed from the date on which the forecast information was available.

Generally, the A, B, and C data bases will be used as the primary basis for inferences concerning the DDM. We will sometimes use the B and C data bases as a single data base spanning the eight-year period. Our empirical results must be evaluated in light of the limitations of the available data.

In our tables and discussions we shall use the following symbols: R-total actual return; Y-actual dividend yield; C-actual capital appreciation; $c(.,.)$-correlation of the two variables within the parentheses.

II. *The Standard DDM: Empirical Data Summary*[3]

The first section of Table I is descriptive; it provides time-series averages of each data set. The relatively stable mean and small standard deviation of the DDM is consistent with the view that the model is a relative valuation of expected return.

The middle section of Table I documents the *ex ante* return structure of the DDM in terms of time-series averages and standard errors of cross-sectional correlations of the model with respect to the *ex ante* forecast variables: β, y, e/P. The *ex ante* average correlations of y and e/P with the model are positive and, with one exception, strongly statistically significant; on an *ex ante* basis, the DDM is, in general, strongly related or "biased" towards high dividend yield, low P/e stocks. The anti-growth stocks bias in the *ex ante* DDM return data represents an implicit "market outlook;" that is, an investment strategy bet on the future return generating process. It is also of interest to note the ambivalence of the DDM to beta.

[2] The fourth data set did not always have earnings yield data available.

[3] The year-by-year cross-sectional statistical analysis of the data is available upon request.

Table I

Annual Returns and Dividend Discount Returns

Data Set	A: 73–80	B: 73–76	C: 77–80	D: 79–80
	Averages and Standard Deviations of Cross-Sectional Average Returns			
R	10.4/30.0	6.8/25.7	23.8/30.7	31.4/36.6
K	13.4/2.2	12.8/2.3	15.1/1.7	17.1/2.6
	Averages and Standard Errors of Ex Ante Correlations			
β	0.15/0.04	−0.22/0.02	0.10/0.13	−0.04/0.04
e/P	0.70/0.03	0.93/0.01	0.43/0.03	NA
y	0.52/0.07	0.76/0.04	0.09/0.13	0.38/0.04
	Averages and Standard Errors of Annual Return Correlations			
K	0.06/0.07	.36/0.07	.05/0.10	−.06/0.05
β^*	.18/0.04	.18/.03	.22/0.09	.13/0.03
e/P	.13/0.08	.37/0.07	−0.04/0.06	−.09/0.06
y	.01/0.09	.35/0.06	−.30/0.06	−.19/0.03
α_K	.05/0.07	.35/0.09	0.0/0.07	−0.05/0.05
$\alpha_{K \cdot e/P}$	−.07/0.04	.04/0.06	.04/0.09	−0.12/0.05
$\alpha_{K \cdot y}$	0.02/0.06	.20/0.04	.04/0.09	−0.01/0.05

* Averages and standard errors of absolute values.

The final section of table I tabulates the *ex post* correlations of the DDM and other forecast variables with subsequent annual total return or alpha.[4] The *ex post* performance of the standard DDM is described in the rows beginning with K and α_K. Except for the B data, the correlations are not statistically significant. The last two rows of table I tabulate the partial correlations of forecast to actual alphas holding either e/P or y constant. There is no positive statistically significant forecasting information in the DDM after eliminating the effect of e/P in the forecast.

The image of the DDM that is presented in Table I is in sharp contrast to the extraordinary forecasting success of the model during the middle years of this eight-year period: cross-sectional *ex post* correlations of as much as 0.5 were observed. However, these same time periods turned out to be essentially equally favorable for the simpler high dividend yield, low P/e valuation models. Table II documents the results of a simple test of the similarity of the forecast performance of the DDM with y or e/P. Multiple regressions of actual return were performed with respect to beta and either K, e/P or y. The t-statistic of the regression coefficient represents the forecast power of the *ex ante* variable when the effect of beta is held constant. The columns K, y and $K, e/P$ represent the correlations of eight pairs of t-statistics; each pair is taken from the t-statistics of K and y or e/P for each of the eight years of data. The t-statistic of the correlations of each

[4] The choice of annual data as the base time period for analysing the performance of the DDM is compatible with the results of Ambachtsheer (1977) and with the views of some practitioners (e.g., Ambachtsheer and Farrell, 1980). An analysis of the time horizon problem is beyond the scope of this paper. Preliminary analyses of six-month return data were roughly consistent with the results presented here.

Table II

Multiple Regression t-Statistics
Annual Return vs. Beta and Forecast Variables

	A Data			B&C Data		
	Time Series Correlations and t-Statistics ($df = 6$)					
	K, y		$K, e/P$	K, y		$K, e/P$
r/t	0.82/3.51		0.94/6.75	0.88/4.54		0.88/4.54
	Numbers of Statistically Significant Coefficients (.05 Level)					
	K	y	e/P	K	y	e/P
Pos/Neg	3/3	4/3	4/1	5/1	3/4	4/1

Table III

Differences of (Fisher Z Transformed) Correlation Statistics
K and R with Forecast Variables: Averages and Standard Errors

Data Set	A: 73–80	B: 73–76	C: 77–80	D: 79–80
y	.60/.11	.64/.14	.71/.08	.6/.03
e/P	.88/.13	1.26/.17	.50/.03	NA

eight pairs is also tabulated. The results show that the forecast performance of the DDM is strongly similar to that of forecast yield and earnings yield.

The second part of table II provides further evidence for the lack of statistical significance in the forecasts. Out of the eight years, there were as many good years as bad for the A data base. While the B&C data bases performed better, the positive performance was attributable to a strong low P/e bias in the B model during time periods that were favorable for the bias.

Table III describes the difference between the *ex ante* and *ex post* return structure. The differences in the correlations demonstrate the significant differences of the relationship of forecast versus actual return to forecast dividend yield and earnings yield over this time period.

The t-statistics from the multiple regressions also allow a simple test of the performance similarity of the different DDMs over time. The correlation of the A versus B&C t-statistics of K in the multiple regression is 0.7 with a t-statistic of the correlation of 2.4.

III. *The Relationship of Scale Structure and DDM Bias*

If the DDM is a single-period forecast of return, the intuition that there may be "too much" dividend yield implies a scale misalignment of the forecast return components. The theoretical question we consider is whether scale misalignment can lead to the effects observed in the empirical data.

The following example illustrates the argument. Let X, Y and Z represent three stocks with total returns of 34%, 27% and 20% and DDM returns of 16%, 18% and 20% respectively. The forecast performance correlations of the DDM is -1. Assume that forecast yields agree with *ex post* yields of 0%, 5% and 10%. Therefore, the capital appreciation component correlation $c(C, g) = 1$. On a

Table IV
Averages and Standard Errors of Component Correlations

Data Set	A: 73–80	B: 73–76	C: 77–80	D: 79–80
$c(y, Y)$	.89/0.04	.89/0.02	.93/0.02	.90/0.01
$c(g, C)$	.10/0.08	−.02/0.05	.32/0.10	.16/0.03

component basis, the forecast information in the model is perfect even as the forecasts of the model are inversely related to return.

The simplest non-trivial scale change of the components is an "interval" or linear scaling of g. We define a "structured" DDM as: $E' = y + g' = y + (ag + b)$. If we let $ag + b = 2g - 10$, E' is perfectly correlated with R. We note that linear scale changes do not alter the component correlation. The reason that the "structured" model of the example is positively correlated to *ex post* return is not the result of a particular choice of scale change but because the *ex ante* return structure is now consistent with the *ex post* structure of the return generating process. In this case, while $c(K, y) = 1$, $c(E', y) = -1$ agrees with the *ex post* correlation of R and Y.

Is the notion of information loss underlying this theoretical example realistic? The component correlations for the A data were strongly positive in the years 1978–80 even as the return correlations were zero or negative. Conversely, the capital appreciation component correlation in 1974 for the A data was negative, even as the return correlation was positive. In the context of our analysis, the *ex ante* anti-growth stock bias implicit in the valuation model structure dominated *ex post* performance whether or not information existed in the forecasts.

Table IV documents the averages and standard errors of the component correlations. The dividend yield component correlations are, as expected, large, positive, and uniformly significant. While the C and D data bases exhibit positive and statistically significant capital appreciation component correlations, A and B do not. However, the A data base component correlations, have a secular correlation of 0.9. We may wish to interpret this correlation as an indication of an increasing familiarity and/or competence of the A data base analysts with the DDM.

The sensitivity of the *ex ante* return structure of the DDM to relatively small changes in the component scale structure, defined in terms of the standard deviations and correlation of forecast capital appreciation and yield, can be illustrated. Using typical values[5], assume that $\sigma_g = \sigma_y$ and $c(g, y) = -.7$. We can then compute the correlation of $E = y + ag + b$ with y for any value of the scale parameter a. When $a = 1$, $c(E, y) = c(K, y) = .40$; $a = 1.5$, $c(E, y) = -.05$; $a = 2.0$, $c(E, y) = -.25$. Similar changes in the scale parameter can have a similar effect on the *ex ante* correlations of the DDM with β and e/P.

We have yet to consider the source of scale structure and valuation model bias. In the DDM, as in most valuation models, standardized intermediate and/or terminal "default" assumptions are invoked so that relative valuation decisions are primarily influenced by forecasts in the early years. However, default as-

[5] An analysis of *ex ante* correlations of g, y, e/P and β revealed consistent and stable relationships across all four data bases.

sumptions influence the component scale structure of the model. Given the sensitivity of the *ex ante* return structure of the DDM to changes in component scale structure, alternative "reasonable" default assumptions may lead to sharply different *ex ante* characteristics. As a result, the *ex ante* bias observed in our DDM data may be an artifact of widely standardized default assumptions. Indeed, the terminal assumptions in comparable time periods for all four of our data bases were very similar. Moreover, the possibility of substantially different *ex ante* characteristics from a different set of default assumptions points to an essential ambiguity in the DDM valuation process; the interpretation of the *ex ante* structure has little, if any, endogenous information.

The relationship of default assumptions to scale structure serves to focus attention on the priority of the induced return structure of the model and provides an opportunity to free the DDM from a rigid association with a single market outlook. Changes in the default assumptions are likely to induce nonlinear scale changes in the model and alter the return component correlations. While the search for "appropriate" or "optimal" default assumptions may be of interest, the complexity of the process of defining assumptions that lead to a specific *ex ante* return structure can be compared to the convenience of the structured DDM approach. To the extent that valuation model bias is the primary determinant of *ex post* performance, the structured DDM gains in interest.

IV. *The Structured DDM*

Our objective is to define and test a generalization of the DDM that enables the user to control valuation model bias. The "structured" DDM, defined in terms of interval scale changes of the return components of the standard model, allows the user to control for biases along the *ex ante* yield-capital appreciation spectrum.

There are many possible criteria for defining a structured DDM. We have chosen the Sharpe (1964)-Lintner (1965) Capital Asset Pricing Model (CAPM) Security Market Line as the basis for structuring the model. Given the "standard" DDM valuations, we solve for the interval scale parameters, a and b, in the formula $g' = ag + b$ such that the *ex ante* return structure of $E = y + g'$ is consistent with the assumed *ex ante* risk premium and risk free rate market line parameters.

In order to test the forecast characteristics of the restructuring process, we define a specific structured DDM. The "passive" DDM is defined in terms of an *ex ante* risk premium of 6% and a risk-free rate equal to the beginning of the period one-year government bond rate. The 6% value of the assumed risk premium is approximately consistent with some historical data (e.g., Ibbotson and Sinquefield [1979]). The purpose of the assumptions is to reduce or eliminate *ex ante* biases by referencing a "neutral" or "no information" market outlook. The operational meaning of such a structuring of the DDM is generally to place more emphasis on capital appreciation relative to yield in the return forecasts.

Table V tabulates the passive DDM data corresponding to Table I. The *ex ante* correlations show that the return structure of the passive model is more closely related to beta and less strongly positively related to e/P and y. The passive DDM *ex post* correlations show a small, not statistically significant,

Table V

Passive Structured DDM: E

Data Set	A: 73–80	B: 73–76	C: 77–80	D: 79–80
	Averages and Standard Deviations of Cross-Sectional Average Returns			
E	14.6/4.2	12.7/5.7	16.8/4.4	19.0/5.9
	Averages and Standard Errors of Ex Ante Correlations			
β	0.41/0.03	0.30/0.06	0.48/0.06	0.30/0.03
e/P	0.30/0.07	0.42/0.10	0.10/0.07	NA
y	−0.22/0.15	−0.12/0.11	−0.54/0.04	−0.22/0.02
	Averages and Standard Errors of Annual Return Correlations			
E	0.06/0.07	0.11/0.05	0.22/0.10	0.05/0.04
α_E	0.05/0.05	0.13/0.03	0.12/0.08	0.02/0.05
$\alpha_{E\cdot e/P}$	0.02/0.06	−0.08/0.04	0.13/0.09	NA

Table VI

Passive DDM
Multiple Regression t-Statistics
Annual Return vs. Beta and Forecast Variables

	A Data			B&C Data		
	Time Series Correlations and t-Statistics ($df = 6$)					
	E, y	$E, e/P$	E, K	E, y	$E, e/P$	E, K
r/t	−.21/.53	.15/.37	.36/.95	.18/.45	.22/.55	.59/1.79
	Numbers of Statistically Significant Coefficients					
Pos/Neg	4/1			4/0		

forecast performance improvement—the ratio of average to standard error in the α row is consistently improved.

Table VI provides the passive DDM data corresponding to Table II. The t-statistic correlations show the significant differences of the performance characteristics of the passive DDM; the passive model does not perform as a forecast yield or e/P valuation. The data allow the measurement of the empirical similarity of the passive and standard DDM—the t-statistic correlation of the two models is approximately 0.5. Finally, the number of statistically significant coefficients show that the passive model is less error prone. The one statistically significant negative *ex post* correlation for the passive model was in 1973 for the A data. In contrast, the two large negative errors for the e/P model were in 1980.

Table VII provides a measure of the bias in the passive DDM corresponding to Table III for the standard model. The highly significant differences in the *ex ante-ex post* return structure observed for the standard DDM are substantially diminished. The replication of the *ex ante* return structure in the *ex post* performance of the model is the basic empirical fact validating the passive structured DDM methodology.

Table VII

Differences of (Fisher Z Transformed) Correlation Statistics E and R with Forecast Variables: Averages and Standard Errors

Data Set	A: 73–80	B: 73–76	C: 77–80	D: 79–80
y	−.23/.17	−.48/.10	−.31/.09	−.04/.03
e/P	.2/.07	.06/.13	.14/.12	NA

The issue of the "representativeness" of the eight-year time period covered by our data is related to fundamental questions concerning the nature of the stock return generating process. In particular, the relationship of dividend yield to stock prices has been the subject of intense academic controversy (e.g., Black and Scholes [1974], Litzenberger and Ramaswamy [1979]). Some recent evidence (Miller and Scholes [1980]), reporting no significant relation between dividend yields and stock returns, is consistent with the conclusions from our much simpler analysis and restricted data set. Nevertheless, an investor's priors will dictate whether, and to what extent, a dividend yield bias should be part of a stock valuation model.

A mathematical foundation for making investment strategy "bets" on the relationship of yield to *ex post* return is based on the following proposition: If $\sigma_y = \sigma_Y$ and $c(y, Y) = 1$, then $c(E, y) = c(E, Y)$. Therefore, if the assumptions of the proposition are sufficiently accurate for the stock universe at hand, the *ex ante* structuring of the DDM leads to the implementation of the investment strategy bet on actual yield in the *ex post* performance of the valuations. For stock universes of institutional interest, the assumptions of the proposition are likely to be valid; however, various specialized stock groups may not satisfy the assumptions.

V. *Implications for Investment Management*

The structured DDM appears to add another decision to the valuation process. However, this perception is not correct. The choice of a particular valuation model may be equivalent to an implicit decision on the market outlook. Our analysis indicates that the standard DDM implies a strong active investment strategy bet against growth stocks. With the structured DDM, the manager is explicitly confronted with an otherwise implicit decision and has a tool at hand for controlling biases in the valuations.

In our structured DDM methodology, the CAPM market line serves as the conceptual framework for implementing investment strategy. Changes in the risk premium are interpretable in terms of changes in the importance of capital appreciation relative to yield over the forecast horizon. While the value of the *ex ante* risk premium may have some intuitive meaning, the structuring process should also consider the value of other forecast correlations. Also, there is no imperative in the structuring process that requires the use of a "market" outlook; individual homogeneous sectors may be viewed as requiring different valuation biases.

The notion that the *ex ante* structure of the DDM has little endogenous market valuation information has important consequences for many institutional uses of the model:

1. The DDM is often used for valuing sectors of the market. In this procedure, the average DDM sector return or alpha serves as the basis for the relative valuation. However, if the standard DDM has *ex ante* bias, it will be reflected in the sector "valuations." DDM sector valuations may have value if the *ex ante* bias is understood and consistent with the market outlook of the institution.

2. The DDM is often used as a market timing tool. The DDM market line is defined as the least squares regression line of DDM return with respect to beta and possibly other variables. An abnormally high value of the slope coefficient of beta is taken to be indicative of an oversold market and vice versa. However, if the DDM is dividend yield biased, the relationship of the model to beta (and other factors) will be an artifact of the induced scale structure of the DDM rather than a reflection of market expectations.

3. The DDM is often used to make asset allocation decisions. The average dividend discount return for a universe of stocks is considered a proxy for the expected return of the equity market. These expected returns are compared to rates of return available from corporate bonds, cash equivalents, etc., leading to asset mix considerations. However, the standard DDM is a relative valuation; the average level of return is influenced by the "terminal period" and other assumptions used in the construction of the returns. To the extent that any of the assumptions are unrealistic, comparison of the forecasts with actual rates of return will be invalid.

The empirical tests of the DDM and the principles that have emerged may be viewed in a more general context. To the extent that the DDM is representative of valuation models, three broad conclusions of interest to the investment community at large may be drawn: 1) The *ex post* performance history of many valuation models may be explained in terms of *ex ante* bias. 2) Use of a valuation model is appropriate only when valuation model bias is well understood and consistent with the operative investment strategy of the institution. 3) "Black box" valuation models are extremely risky investment tools.

VI. *Summary*

The performance history of four standard DDMs, over the period 1973–80, was analyzed. The existence of substantial *ex ante* anti-growth stock "bias" explains the performance history of the model.

The *ex ante* bias in the DDM was traced to component scale structure induced by relatively arbitrary "default" assumptions used in the return construction process. This fundamental ambiguity in the return structure of the DDM suggested a valuation methodology conditional on the market outlook. Tests of a "no market outlook" or "passive"-structured DDM showed a substantial reduction in anti-growth stock bias and a marginal improvement in forecast performance.

The implications of a basically arbitrary return structure are described with respect to a number of current institutional practices. Serious questions were raised concerning the validity of using the model for asset allocation, sector valuation and market timing.

Valuation model bias is not inherently positive or negative; it provides substantial investment value to the extent that it is consistent with a reliable investment outlook. The structured DDM can be a useful investment tool for linking a top-down with a bottom-up approach to the investment management process. However, positive, statistically significant *ex post* component correlations, often observed over the 1973–80 period, are fundamental to the value of the structured DDM as a valuation technology. The dichotomization of information in valuation forecasts into return structure and analysts' inputs may lead to a better understanding of the valuation process and improved forecasting performance.

While conclusions reached in a statistical analysis are never definitive, given the data limitations of this study, the tentativeness of our results should be emphasized. Nevertheless, because the standard DDM is a widely used investment management tool, an interim report and the advisability of mid-course corrections may be useful.

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