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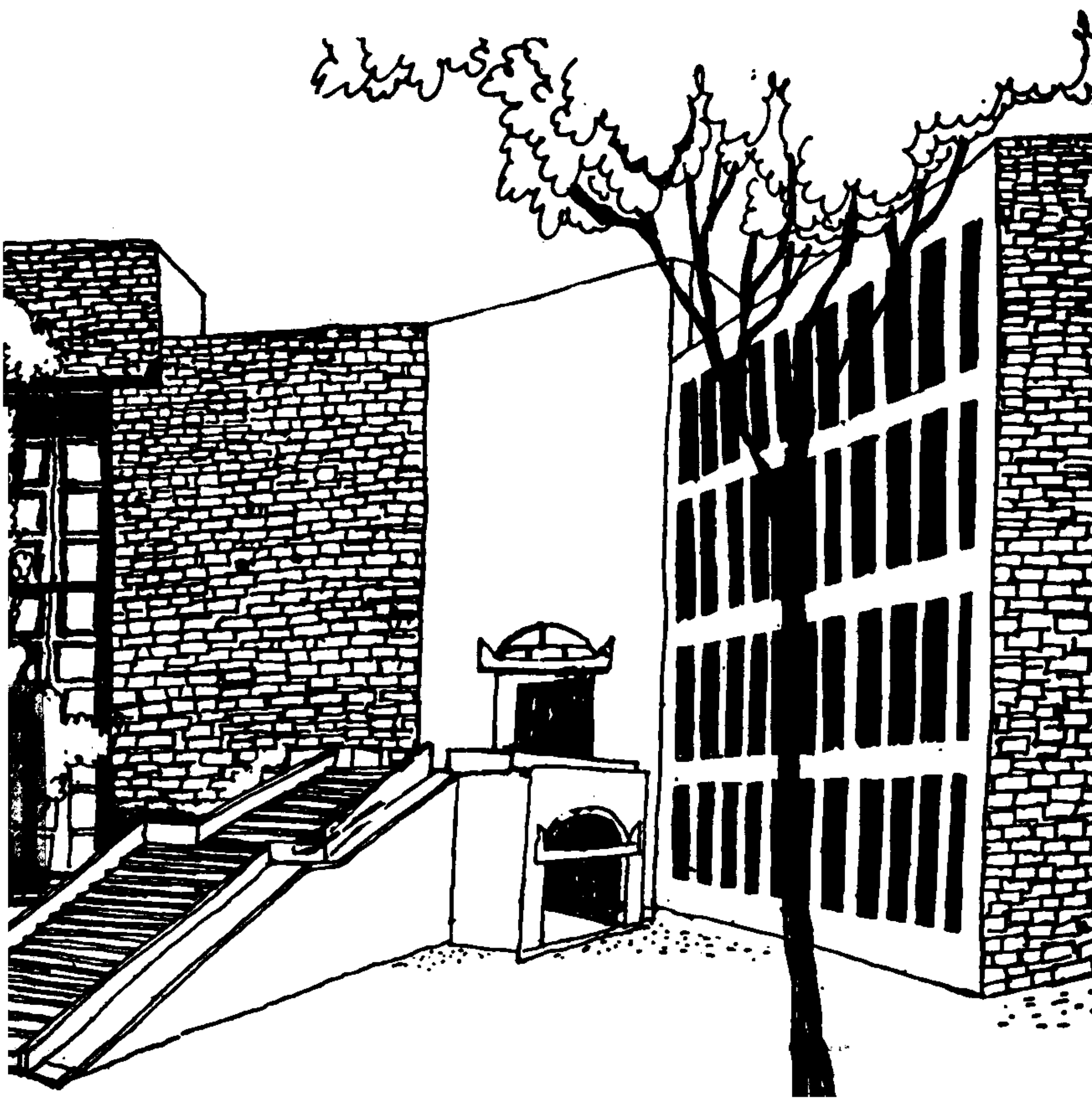

DIVIDEND RATE AND VARIATION IN SHARE PRICES : AN EXPLORATION INTO THEIR INTER-RELATIONSHIP

By

Ravindra H. Dholakia

&

Ramesh Bhat

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INDIAN INSTITUTE OF MANAGEMENT
AHMEDABAD-380015
INDIA

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RAVINDRA H. DHOLAKIA AND RAMESH BHAT

ABSTRACT

Return and risk are the two acknowledged characteristics affecting investment decision of investors in securities market. The literature on the relationship between these two characteristics provides ample evidence about the interdependencies between them. The present study takes a view that risk should not be considered a one dimensional variable. An attempt has therefore been made in the present paper to decompose this characteristic into risk in dividend and uncertainty in capital gains. Two alternative explanations for the nature of their interdependencies have been proposed. The study uses a sample of 269 companies and provides cross-section - one period analysis of dividend and share price variables. The empirical evidence supports the hypothesized relationships between the two dimensions of risk.

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INTRODUCTION

Securities market unlike many other markets in the economy has certain distinguishing characteristics which make it a field of evergrowing interest for the practitioners and researchers alike. These characteristics may be classified into three broad categories : (a) environment of the market; (b) nature of the commodity traded in the market; and (c) the nature of the prices prevailing in the market.

The efficient market hypothesis links the concepts of information from the environment, prices and economic profits in a specific way. The environment of the securities market may be more competitive in the sense that if market is efficient then economic or supernormal profits cannot be earned. In such a situation the securities prices fully reflect all relevant and available information provided by the environment. [For rigorous and formal statement of the Efficient Market Hypothesis, see Fama (1)]

The process of market operations are simple and straightforward. The investors are primarily guided by the tangible and intangible characteristics of the securities. The types of the tangible characteristics of the shares of different companies are more or less the same viz., dividends and capital gains (or losses) whereas the nature of intangible characteristics viz., risk and uncertainty may differ considerably.

The capital asset pricing model originally proposed by Sharpe (2), Lintner (3), and Mossin (4) epitomize the relationship between tangible and intangible characteristics by providing us with an explicit expression for the equilibrium expected returns on all securities in terms of their risk characteristics. The model suggests that the expected return of security is function of (i) the riskless rate of return; (ii) a market return per unit of risk; and (iii) the riskiness of each security. (For the assumption and interpretation of the asset pricing model see above references). The expression for the equilibrium expected returns on all securities may be stated as follows:

$$E(R_j) = R_f + \left[E(R_m) - R_f\right] \beta_j \qquad \ldots\ldots (1)$$

where

$E(R_j)$ = the expected return on jth security,

R_f = the riskless rate of interest,

$\left[E(R_m) - R_f\right]$ = the expected market return per unit of risk,

$E(R_m)$ = the expected return on a market portfolio which contains all assets in proportion to their total value,

β_j = the systematic risk of jth security.

This model provides a framework within which the risk measure can be interpreted more explicitly. Securities which are highly sensitive to general business condition are more risky. For such securities the β_j will be greater than unity. However, no attempt has been made in literature to decompose the intangible characteristic of security into risk of dividends and uncertainty in capital gains and also there is no explicit exposition to investigate their interrelationships. The present study is towards this direction.

THE OBJECTIVE

The price in the securities market, unlike many other markets, is highly volatile. It varies considerably not only from day to day, but also sometimes during a day. Stock exchange provides one of the best examples of active market of second hand goods. Because of its competitive nature, the advertisements and other selling efforts by different companies take the form of providing information to the investors at large rather than aiming to influence their preference function in general. Such information is typically provided through the financial statements, chairman's speech and other announcements about the plans, programmes and intentions of the company.

Out of the several interesting aspects of the share market analysis, one of the most important is the examination of price variation during a given time period. The shorter the time period chosen, the lesser would be the number of factors determining the variability in the share prices over the period. For example, if the period is taken to be a quarter year or less, the preference function of the investors can be assumed to be relatively more stable. Similarly, the government policy regarding taxation, expenditure, licensing, etc. over the relevant period may be assumed to be known. Under such circumstances the decision of an investor to buy a share of a company provides a very useful empirical observation to corroborate or question the validity of several hypotheses about investment behaviour. Since the investor's decision to buy a share is primarily determined by the tangible and intangible characteristics, however, the latter viz., risk of dividends and uncertainty in capital gains play a significant and crucial role in such decisions. It is in this direction that the present study purports to examine the relationship between the two characteristics of shares with the help of the empirical data on share prices and dividends for 269 companies whose shares were traded in the stock exchange in India during the first three quarters of the year 1986.

THE FRAMEWORK

In order to develop the framework for investigating the relationship between share price fluctuations and dividend* between the two variables under investigation. The rate of return on security j for period t includes both dividends and capital gains expressed as a fraction of the beginning of period price, as follows :

$$r_{jt} = \frac{D_{jt}}{P_{jb}} + \frac{P_{jt} - P_{jb}}{P_{jb}}$$

or

$$r_{jt} = d_{jt} + g_{jt} \qquad \ldots\ldots (2)$$

where

r_{jt}	:	the rate of return on jth security at t th point of time for the holding period b to t
D_{jt}	:	Dividend paid per share on jth security
P_{jt}, P_{jb}	:	Market price per share for the jth security at bth and t th point of time
d_{jt}	:	dividend rate
g_{jt}	:	capital gains rate

The expected rate of return for t th period may therefore be obtained as follows:

$$E(r_{jt}) = E(d_{jt}) + E(g_{jt}) \qquad \ldots\ldots (3)$$

* policy, we define the rate of return on share which provides linkage ....

The overall riskiness of the security j is determined by the variance of the rate of return distribution. Each company would be interested in minimizing this riskiness. In an intertemporal situation this would mean providing a stable and steadily increasing rate of return. At one particular point of time the impression of risky security can be avoided by providing a rate of return which is not significantly different from overall average market rate of return. Assuming, that all companies in the economy at a particular point of time attempt to provide rate of return equal to some constant (which may be the average market return) then

$$E(r_{jt}) = \bar{r} \qquad \ldots. (4)$$

and

$$\bar{r} = E(d_{jt}) + E(g_{jt}) \qquad \ldots. (5)$$

with this implication, equation (5) may be expressed as follows :

$$E(g_j) = \bar{r} - E(d_j) \qquad \ldots. (6)$$

since the variables are at one particular point of time the subscript t has been ignored.

In order to test this model, we need to find appropriate measures of expected capital gains $\left[E(g_j)\right]$ and expected rate of dividend $\left[E(d_j)\right]$ for each company in our sample. Ideally, $E(g_j)$ would be measured as the ratio of the difference between the selling price and the buyi . .ice.

Since the share prices keep on varying, the investors should consider the expected distribution of the share prices and its properties like expected value and variance. However, looking at the complictions and costs involved in computing the relevant alternatives, the properties of the expected distributions of share prices of different companies may be approximated by the expected range of share prices. When we take an aggregate of all investors, their expectations on an average come true. Hence, the expected value of capital gain has been measured in the following way:

$$E(g_j) = \frac{H - [(H+L)/2]}{[(H+L)/2]} \qquad \ldots\ldots (7)$$

where H and L represent, the highest and the lowest share price respectively during a particular period. What is assumed in our framework is that the measure of $E(g_j)$ is, on an average, half the maximum possible capital gain during the period. Simplifying the equation (7) we obtain

$$E(g_j) = (H-L) / (H+L) \qquad \ldots\ldots (8)$$

The above expression is standard statistical measurement of the relative range, a relative measure of the variation in any sequence of observations (in our case, share prices). Thus, it can be observed that the variation in share-prices determines the expected value of capital gains. In the absence of detailed data on share prices over the entire time interval, the relative range as in equation (8) can be used as a fairly satisfactory proxy to represent the relative magnitude of variation in share prices.

Moreover, the expected dividend rate, $E(d_j)$, for any period should ideally be measured with respect to the price at which an investor buys the share. However, when we take aggregation over all companies, the average buying price may be taken as the mid-point between the maximum and minimum observed during the period (the same method has been adopted in defining the capital gains). Thus we may define

$$E(d_j) = \frac{D_j}{(H+L)/2} \qquad \ldots\ldots (9)$$

where D_j is the dividend paid per share.

Defining the relevant variables of the simple model in this manner, we need to fit the following regression equation:

MODEL I

$$\tilde{g}_j = \alpha + \beta\tilde{d}_j + \tilde{u}_j \qquad \ldots\ldots (10)$$

where $\tilde{u}_j$ is the random error term with standard assumptions, and α and β are population parameters with the null hypothesis as (i) $\alpha = \bar{r}$, and (ii) $\beta = -1$.

The Alternative Explanation

Crucial to the above model is the assumption about the behaviour of one period rate of return. No attempt has been made to decompose the overall riskiness in the rate of return into the risk and uncertainty associated with its two components. This decomposition may be described as follows:

$$Var(\tilde{r}_j) = Var(\tilde{d}_j) + Var(\tilde{g}_j) + 2\,Cov(\tilde{d}_j, \tilde{g}_j) \quad \ldots.(11)$$

The above expression suggests that the total variation in the rate of return will not only be affected by the respective variations in dividends and capital gains but also by the covariance between them. The previous explanation suggests that the two characteristics are perfectly related and the relationship is negative. In this alternative explanation, we assume that the two characteristics are independent of each other. This will facilitate to test the hypothesis under two extreme situations of the relationships between the two variables. Hence the modified version of the equation (11) is

$$\text{Var}(\tilde{r}_j) = \text{Var}(\tilde{d}_j) + \text{Var}(\tilde{g}_j) \quad \ldots\ldots (11')$$

In an extreme situation, the risk in rate of return would be zero only when there is no risk associated with the dividend rate as well as there is no uncertainty in capital gains. This is rarely the situation particularly in case of investment in shares. In practice, the risk in dividends and the uncertainty associated with the capital gains are the characteristics which make the share of different companies different from each other. Both these, characteristics are assumed to be negatively desired for rational investor,in the sense that less of them is preferred over more. For a given level of dividend rate the investor will always prefer a security with minimum uncertainty in capital gains and vice versa. These relationships may be shown below in figure 1.

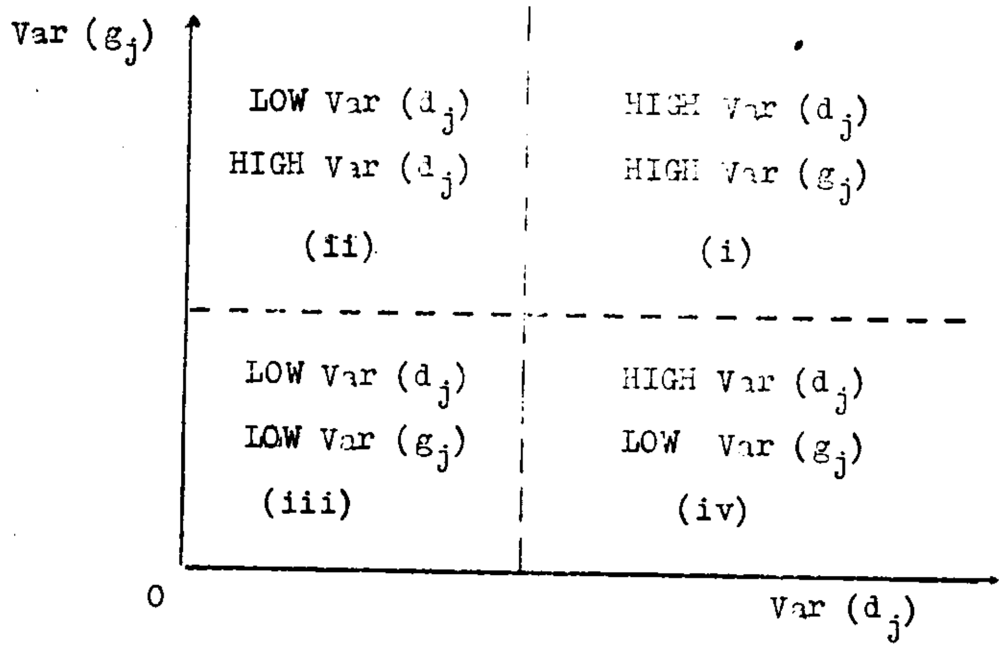
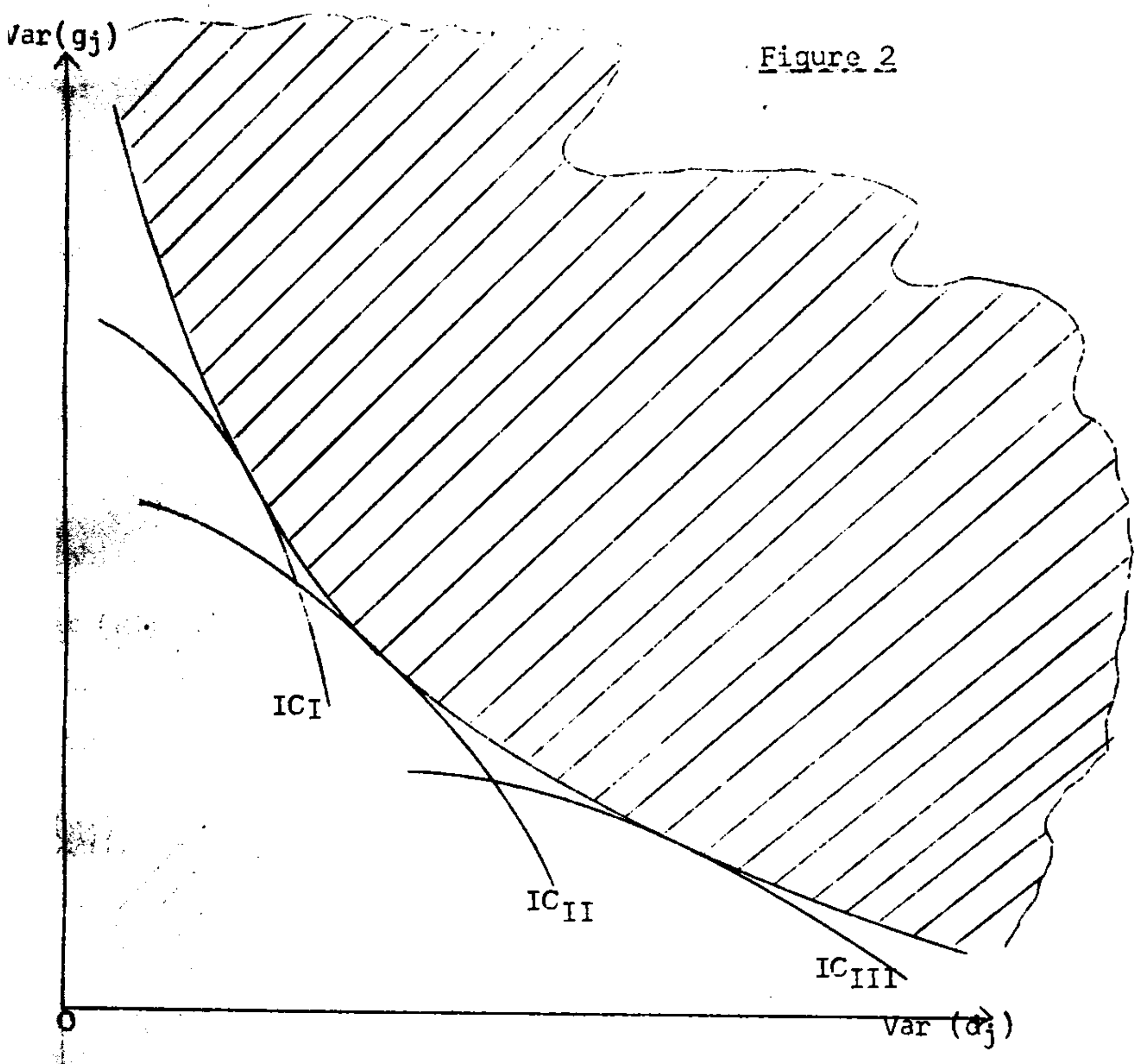


Figure (1)

From figure 1 it is clear that shares falling in category (i) are inferior to the ones in category (iii). In other words, shares falling in category (iii) would totally dominate the shares falling in category (i) by driving the latter out of market. However, we get the data only for the securities which are traded in the market. The shares falling in category (i) would automatically be ruled out if Var (g_j) and Var (d_j) are the only relevant characteristics of the shares for the choice by investors [See, Lancaster (5)]. Assuming it to be the case, the only possibilities are for observing shares in the rest of the categories.

Considering further that less of Var (g_j) would be preferred for a given level of risk in dividend rate, Var (d_j), the efficiency frontier between Var (d_j) and

Var (g_j) should be downward sloping and convex from below. Since, investors look upon Var (g_j) and Var (d_j) as negative characteristics, their indifference curves are downward



(Figure 2)

sloping and concave from below. Moreover, investors are interested in minimizing their disutility from Var (g_j) and Var (d_j) given their efficiency frontier. Hence, they would be in equilibrium at the point of tangency between the concave from below indifference curves and convex from below efficiency frontier (as shown in Figure 2). Different shares with different combinations of Var (g_j) and Var (d_j) are traded in the market because the utility or preference functions of investors between Var (g_j) and Var (d_j) differ.

This approach of defining the relevant characteristics of different shares in terms of the risk of dividends, Var (d_j) and uncertainty of capital gains, Var (g_j), requires a cross-section of time series data for share prices and dividends of different companies. Although the approach provides fresh insights into the interrelationships between the two characteristics, for the present purpose considering the constraints in terms of data availability and cost of carrying out such a detailed empirical investigation, we propose to simplify the analysis by redefining the two basic characteristics viz. d_j and g_j in terms of the first moments of their respective distributions rather than more realistic and logically more appealing alternative of measuring them by the second moments of their respective distributions. Thus, we consider here $E(d_j)$ and $E(g_j)$ as the measures of the relevant characteristics of shares of different companies.

It should be noted at this stage that expected value of capital gains, $E(g_j)$ is primarily determined by the magnitude of the variation in share prices over the relevant time interval. Higher the price variations, greater are the chances of getting the capital gains. Hence, the expected value of capital gains, $E(g_j)$, can be represented by the Var (p_j). If we carry out similar analysis of the interrelationship between the so-defined two characteristics of shares, we can summarize it in the diagramatic form as in figure 3. The most important difference between figure 1 and figure 3, is in the nature of the measured characteristics on the two axes in the respective figures. Whereas in figure 1 the measured characteristics represented negative desirability in the sense that less of them is preferred to more of them, in figure 3, on the other hand, the measured characteristics are positively desired in the sense that more of them is preferred to less of them. Extending the same logic of Lancaster's characteristics approach, we can easily see that shares falling in category (iii) are inferior to the ones in category (i). Given that we are dealing with the actually traded shares in the market, we do not expect to observe shares in category (iii) since they are likely to be totally dominated by the shares falling in category (i). Such a relationship between

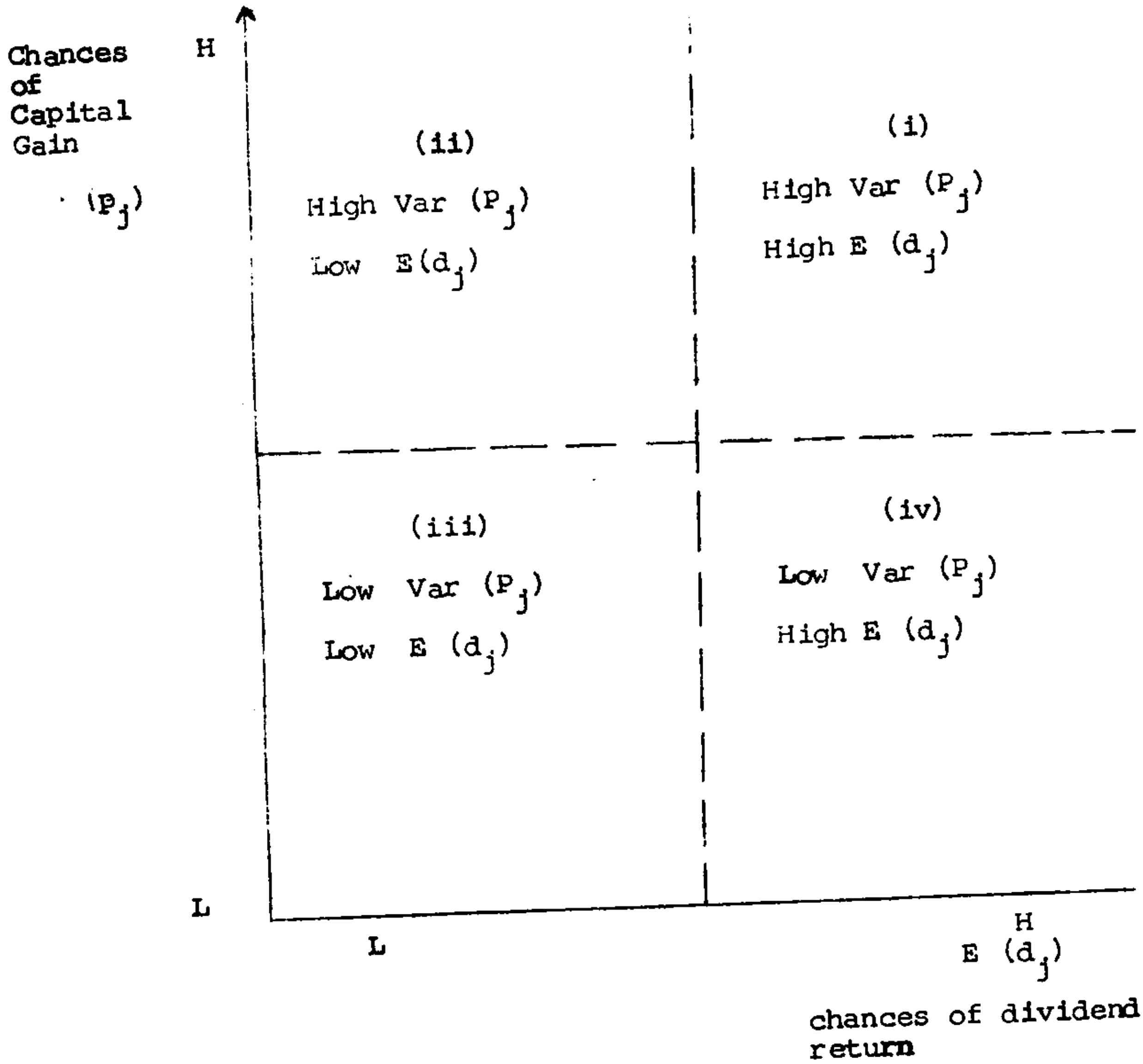

Chances of Capital Gain
(P_j)
H
L
(ii)
High Var (P_j)
Low $E(d_j)$
(i)
High Var (P_j)
High $E(d_j)$
(iii)
Low Var (P_j)
Low $E(d_j)$
(iv)
Low Var (P_j)
High $E(d_j)$
L
H
$E(d_j)$
chances of dividend return

Figure 3

the expected value of dividend and variations in share prices would represent what is termed as efficiency frontier in the Lancaster's approach. As we can readily observe from figure 3, the efficiency frontier between the two characteristics on the assumption that they are the only relevant characteristics for choice, will be downward sloping concave from below curve between $E(d_j)$ and $Var\ (p_j)$.

On this basis we propose to fit the following non-linear regression equation preferably of the following form :

MODEL II: $\left[\widetilde{Var\ (p_j)}\right]^2 = \lambda_0 + \lambda_1\ \widetilde{d_j} + \widetilde{u'}_j$ (12)

where $\widetilde{u'}_j$ is the random error term with standard assumptions and λ_0 and λ_1 would be respectively positive and negative. Since in this case we are assuming the differentiation of shares on the basis of two characteristics λ_0 cannot be interpreted as the average market rate of return.

Empirical Results

As mentioned earlier, we have carried out an empirical test of the models discussed above with the help of a sample of 269 companies whose shares were traded in the stock exchange during 1986. The reference period was less than a year. We estimated equation (10) and (12) with the help of standard ordinary least squares (OLS) method. The fitted regression equations are :

Estimates* of MODEL I : $g_j = \underset{(0.0117)}{0.2937} - \underset{(0.2919)}{0.7130}\, d_j$

$F(1,267) = 5.97$
DW = 1.93

Estimates of MODEL II: $Var\,(P_j)^2 = \underset{(0.0062)}{0.1017} - \underset{(0.2028)}{0.4516}\, d_j$

$F(1,267) = 4.96$
DW = 1.99

As far as the goodness of fit is concerned the estimates of both Model I and Model II are statistically significant at 5 per cent level. Moreover, if we carry out the standard t-test on the null hypotheses described with equation (10) in the previsision section, we find that we cannot reject the null hypothesis of the coefficient of d_j to be equal to -1 even at 30 per cent level of significance. Thus, our sample of 269 companies does not seem to contradict the hypothesis of a uniform expected rate of return during first three quarters of 1986, we can consider an interval estimate of the constant term in our fitted regression equation for Model I. At 5 per cent level of significance, the interval estimate works out to be $0.2708 < \bar{r} < 0.3166$.

The model II implies a concave from below curve, because its second derivative is always negative. Whether it is a downward sloping curve or not depends on the sign of the coefficient of d_j in the estimated equation. From the estimates of Model II, it is clear that the coefficient is negative and significant at 5 per cent level of

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* Figures in parantheses indicate the standard errors.

significance. The constant term is positive and highly significant statistically. However, as pointed out earlier, we cannot interpret the constant term in this equation because such a specification of the equation implies two different characteristics of shares playing role in their selection which may be inconsistent with the hypothesis of uniform rate of return ($\bar{r}$). With these two characteristics, the returns on different shares are likely to be different. The results for model II only indicate that the sample of 269 companies in India is not in consistent with our identification of only the two characteristics viz., the expected dividend rate ($E(d_j)$) and expected capital gains which is a function of variation in prices (Var (P_j)), as the most relevant ones for the choice of shares by the investors. However, we should be cautious in drawing any sharp conclusions. Thus there might be other relevant characteristics of the shares like the past performance of the company, management and the future growth prospects. These might be crucial over and above the two characteristics of expected dividend rate and expected capital gains for the decision by the investor.

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