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THE INFORMATION CONTENT OF ANNUAL DIVIDEND ANNOUNCEMENTS

The University of Iowa PH.D. 1979

University Microfilms International 300 N. Zeeb Road, Ann Arbor, MI 48106 18 Bedford Row, London WC1R 4EJ, England

THE INFORMATION CONTENT OF ANNUAL DIVIDEND ANNOUNCEMENTS

by

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A thesis submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy
in Business Administration
in the Graduate College of
The University of Iowa

December, 1979

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PH.D THESIS

This is to certify that the Ph.D. thesis of

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I. INTRODUCTION

It is a familiar proposition in the financial management literature that dividends convey important information to capital market agents.[1] There is some theoretical support for the hypothesis that dividends do contain information useful to investors. However, the empirical evidence to date is inconclusive and contradictory.[2]

The financial management literature typically contends that dividends are used by investors in forming expectations (or revising expectations) of a firm's future performance. For this to be useful to investors, this must mean that there is informational value to the dividend that is not contained in other concurrent informational events such as earnings announcements.

Considerable resources are utilized annually by accounting firms, by professional accounting bodies (i.e. CICA, AICPA, FASB) and by universities in the investigation of external reporting issues. These questions are essentially questions of choice between accounting alternatives.

Gonedes and Dopuch (27) and May and Sundem (36) have argued quite convincingly that the use of security prices to assess the desirability of accounting procedures is invalid. However, such studies can be used in assessing the <u>effects</u> of alternative accounting procedures or regulations. Knowledge of these effects is essential if we are to assess"...

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1 See for example, Van Horne (48), p. 270.
2 Watts (49), Pettit (43) and (44), and Griffin (28), for example.
3 Gonedes & Dopuch (27).

what data are impounded in prices and how prices might be altered if the information set were altered."[4]

With knowledge of the likely effects, policy makers can approach their choice problems with information on what the likely consequences of their choices will be. Measurements of information content are essentially measurements of the effects of certain events.

The validity of the measurement is, therefore, very important. Since security price association with the information event is the usual measure of information content, it is essential that confounding and competing information sources be controlled. Non-accounting events may contain information other than that contained in the accounting event. Thus, part (or all) of the security price reaction may be attributable to the non-accounting information.

The information contained in the non-accounting events could create so much noise in the model that real differences between accounting information variables could be difficult to detect. That is, significant content differences could appear not significant given the presence of the non-accounting information.

Dividend announcements are a non-accounting event that could very well be a serious confounding element in accounting information content studies. There are theoretical reasons to suspect that they do contain information, but it has not been established empirically whether or not they contain information other than that contained in earnings. If they

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4 Beaver (8).

do, then studies into the amount and timing of the information content of accounting numbers must take this into account.

The question of whether or not dividend announcements contain information other than that contatined in earnings has obvious relevance in the area of finance. The separation or independence proposition cited below seems inconsistent with the observed relationships between security prices and dividends. If the relationships can be explained by the information content of dividends hypothesis, then the independence proposition and the observed relationships can be reconciled. If the hypothesis is rejected, then the inconsistency between the observed relationships and the independence proposition may suggest a reexamination of the independence proposition.

The research hypothesis examined in this study is the hypothesis that dividends contain information other than information already contained in earnings.

Theoretical Background

The assumption of perfect capital markets has led to some interesting propositions; one in particular that bears directly on the question of dividend information. Modigliani and Miller (39,40) formulated an independence proposition or separation principle that states that once a firm has established or decided upon its operating policies (i.e. a set

5 Friend and Puckett (21).

of production-investment decisions), then the means chosen by the firm to finance these policies in a taxless world will have no effect on the value of the firm or on shareholders' wealth.[6]

The holder of a security of firm i then would be indifferent to the dividend policy adopted by firm i in that any dividend change at time t, say, would be exactly offset by a change in capital gains at time t. This can even be extended to future dividend policy, so that we can state that for a given set of operating decisions, the current value of the firm (or of a security of that firm) is independent of dividend decisions for all future periods.

In a world of corporate taxes, the independence proposition still holds. Consider two identical firms, with identical pre-tax and pre-interest earnings and let these two firms differ only in capital structure such that one firm has more debt than the other. It can be shown that the market value of the securities of the high debt firm at the beginning of the earnings period exceeds that of the securities of the lower debt (unlevered) firms' securities. The difference in these market values, however, is exactly equal to the beginning of the period market value of tax saving on the levered firm's income.[7]

Thus:

> ". . . . . there are no advantages or disadvantages to the investor who purchases the shares of the levered firm rather than the equivalent position involving personal debt

6 Fama and Miller (20), p. 80.
7 Fama and Miller (20), p. 173.

and the shares of the unlevered firm. Likewise the reader should convince himself that there are no advantages or disadvantages in holding the shares of the unlevered firm rather than the equivalent unlevered position involving the bonds and shares of the levered firm."[8]

and further:

". . . . . in a market equilibrium the market value of a levered firm must be equal to the value of an equivalent unlevered firm from the same risk class plus the current market value of all anticipated future corporate tax savings, including those on debt to be issued in the future as well as those on currently outstanding debt, that result from the tax deductibility of corporate interest payments."[9]

The implication that follows from the above discussion is that in a taxless world or in a world in which only corporate taxes exist, there is no reason to expect dividend policy to have an effect on security prices.

Empirical studies, however, seem to claim that dividend policy exerts a definite influence on stock prices. Durand (13) presented results of cross-sectional studies in which security prices were correlated in various ways with current income and dividends. In all cases, dividends were highly positively correlated with price, and this high correlation was interpreted as evidence that dividend policy

8 ibid.
9 ibid.

influences security prices.

There are two possible explanations for this unexpected association, given the independence proposition. One explanation turns on the existence of personal income tax regulations which differentiate between dividend income and income in the form of capital gains. That is, the personal tax rate on dividends is less than that on capital gains. Thus an investor may well prefer capital gains to dividends. An unexpected decrease in dividends given no unexpected change in earnings say, could be accompanied by an unexpected increase in a security's price because of this differential tax rate. The main point of this discussion is that evidence of a direct effect of dividend policy on security prices may be explainable due to the existence of differential tax rates on dividends and capital gains. The effect, however, should be that security prices decrease when dividends increase. This suggests a negative association between dividends and stock prices in a world where this differential tax rate exists. Empirical evidence to date, including all the studies discussed in Chapter II, indicate a positive association.

The effects of differential tax rates are difficult to analyse, however, because the tax benefits of capital gains vary with the tax bracket of individual investors. Also, a large proportion of investors (i.e. non-profit institutions) pay no taxes and are thus indifferent between dividends and capital gains.

The magnitude of the effects of these government induced market imperfections are speculative. This study assumes that the magnitude of such effects is negligible. However, given the methodology employed, any of these effects are expected to bias the results against acceptance of the research hypothesis that dividends do possess information content. This bias will be discussed below. It should also be noted here that such bias as might exist is also present in all other studies to date that have examined the same question.

If this proposition holds then a change in dividend policy by a firm should not result in a change in the value of the securities of that firm, except for the possible adjustment mentioned that dividend increases (decreases) will be accompanied by security price decreases (increases).

There is an alternative explanation that is compatible with both the observed positive association between security prices and dividends, and the existence of the independence proposition.

Lintner (33) showed empirically that companies tend to follow a policy of dividend stablization. That is, the ratio of dividends to earnings, (payout ratio), tends to be constant over long periods of time, though it may deviate quite markedly in any given period.

In a short period of time, like a year, earnings are likely to be effected by a great many random disturbances and temporary distortions. If these temporary distortions are recognized as such by the market, then investors will adjust for them by not incorporating these temporary distortions into future earnings assessments. This means that these temporary distortions should have very little effect on security prices.

To the extent that the management of the firm also recognizes these distortions and disturbances for what they are, they will not change dividends. Dividends would be changed, to achieve the target payout, only if management recognized current reported earnings change as a permanent one.

Given that the value of the firm is a function of expected future earnings, and given that:

1. current earnings are subject to random fluctuation and/or temporary distortion, and
2. firms follow a policy of dividend stabilization, in that the ratio of dividends to expected earnings is fairly stable,

then, dividends may contain considerable information about expected future earnings. In other words, dividend policy may provide users with an assessment of management's belief about the permanency or transiency of current earnings changes.

Thus the apparent effect of dividends on security prices may only reflect the role of dividends as a proxy measure of expected future earnings. The information content of dividends, given this stabilization policy that the majority of publicly held corporations appear to follow, may be considerable. It may even be greater than that of current earnings.

Research Question

The overall research question can be stated as follows:

Is there information contained in annual dividend announcements over and above that contained in annual earnings announcements?

Summary of Remaining Chapters

Chapter II contains a review of the literature relevant to the dividend information hypothesis. In particular this review focuses on empirical studies done by Watts (50), Pettit (43), Griffin (28), and Gonedes (22).

Chapter III presents a detailed description of the research design and the methodology employed, including detailed theoretical justifications for the methodology.

Chapter IV presents theoretical and empirical information on the estimation equations used to generate the inputs for the methodology described in Chapter III.

Chapter V presents the empirical results as well as their analyses.

Chapter VI presents a summary of results described and analysed in Chapter V, as well as conclusions drawn from these analyses.

II. LITERATURE REVIEW

Introduction

This chapter contains a review of the literature relevant to the issue of whether or not dividends contain information over and above that contained in earnings.

The literature reviewed is divided into three major categories. These three categories are 1) literature providing theoretical background for the proposition that dividends contain information over and above that contained in earnings, 2) literature dealing with the measurement of information content, and 3) empirical studies on the dividend information proposition.

Theoretical Background

1. Dividend Policy and Stock Prices:

The methodology employed in this study measures the degree of association between security returns and dividends. If the process that generates security returns is dependent on the process that generates dividends then the conclusion is that dividends have information content.

Such a conclusion is supportable if the reason for this association can not be attributed to other factors. This apparent association has been well documented empirically in the finance literature. This relationship between security prices and dividends was explained, however, as a change in the value of the firm brought about by a change in dividend policy. That is, it was believed that the value of a firm's equity securities could be effected by a management decision to alter the mix of internal to external financing.[1]

Modigliani and Miller (hereafter MM) took issue with this in a series of articles (37) (39) (40). They demonstrate that given an investment policy for the firm, the value of the firm is not affected by whether it is financed internally by retaining earnings and consequently by not paying this retained amount out in dividends, or financed externally by borrowing or new equity issues and paying the retained amount out in dividends. Thus, given a firm's investment policy the value of the firm is independent of dividend policy.[2]

While the proof of this proposition will not be included here as it is well publicized in the contemporary finance literature it is perhaps worthwhile to outline at least some of their most bothersome assumptions and to discuss some of the counter arguments brought forth.

MM assume, initially, a world with perfect markets, rational behaviour and perfect certainty.[3] The assumption of perfect markets

1 See for example, Durand (13) p. 649.
2 Modigliani and Miller (37) p. 430.
3 See Fama and Miller (20) Chpt. 2 and 4.

contains, among other things, the assumption that "there are no tax differentials either between distributed and un-distributed profits or between dividends and capital gains."[4]

Violations of these assumptions are expected and constitute market imperfections brought about by the imposition of corporate tax laws and personal income tax laws.

In the case of corporate income tax, a levered position might be seen to be preferable to an unlevered position because interest payments are tax deductible by the firm, while dividend payments are not. It can be shown, however, that the difference in the period one value of two firms identical in all respects except that one has debt while the other does not, will be exactly equal to the period one value of the future tax savings of interest payments. Thus an investor would be indifferent to a period one position of the levered firm and an equivalent position involving personal debt and the shares of the unlevered firm.

The case of personal income tax is not so clear. Because capital gains and dividends are taxed at different rates in the hands of the recipient one might expect a preference for the one attracting the least tax (i.e. capital gains). It is important to note at this point that for a market imperfection to have an effect on dividend policy the market imperfection must be systematic. That is, investors must show a systematic preference for capital gains over dividends. If this is not

4 Modigliani and Miller (37) p. 412.

5 A more complete description of this process can be found in Fama and Miller (20) p. 172.

systematic, but random, then we should expect, on average, that the effects will cancel out.

It is not at all clear that all investors prefer capital gains to dividends. MM[6] cite examples of significant investor groups where this preference may not be expected to hold and may even be reversed. Friend and Puckett (21) observed that

> ". . . . irrespective of investor preferences between dividends and capital gains, payout policies are such that at the margin a dollar of retained earnings should be approximately equal in market value to the dollar of dividends foregone."[7]

It is also interesting to note that a systematic preference for capital gains over dividends should be evidenced by increases in security prices when dividends are decreased (or at least not increased). An unexpected decrease (increase) in dividends might be expected to be accompanied by an abnormal security price increase (decrease). This does not seem to be the case. In fact, the opposite appears to be indicated by empirical studies.

The conclusion drawn from apparent market price reactions to dividend changes and reinforced by the findings discussed in the previous paragraph have led Modigliani and Miller (37) to formulate an explanation, compatible with their irrelevance or separation proposition. With

6 Modigliani and Miller (37), p. 432
7 Friend and Puckett (21), p. 660.

respect to these security price movements they wrote that:

> "Such a phenomenon would not be incompatible with irrelevance to the extent that it was merely a reflection of what might be called the "informational content" of dividends, an attribute of particular dividend payments hitherto excluded by assumption from the discussion and proofs. That is, where a firm has adopted a policy of dividend stabilization with a long-established and generally appreciated "target payout ratio," investors are likely to (and have good reason to) interpret a change in the dividend rate as a change in management's views of future profit prospects for the firm."[8]

2. Dividend Policy Formulation:

In the May, 1956 issue of the American Economic Review, John Lintner (32) published the results of an empirical study he had done on corporate dividend policy. He used the results of this study to formu late a theoretical model of corporate dividend behavior. Lintner's wor is relevant to the current study in a number of ways. First, his theoretical model of dividend behavior is used, in a slightly different form, to formulate expectations of dividend changes. This allows the

8 Modigliani and Miller (37), p. 430.

estimation of unexpected dividend changes, an information variable used in this study and in the studies of Watts (50) and Gonedes (22).[9]

Second, Lintner provides insights into the factors that corporation leaders consider when formulating dividend policy. In light of the Modigliani and Miller work described above, these factors can be used to formulate a positive theory as to why dividend changes might might contain information other than that contained in earnings changes.

Lintner looked at available data on 600 listed companies and ultimately chose 28 for in-depth analysis. The basis for selection was the existence of circumstances in a company's recent history that one might expect to have an important bearing on dividend policy (e.g. recent growth, use of external financing, history of dividend changes, etc.)

He then interviewed corporate management in each of the twenty-eight firms. The purpose of the interviews was to determine the factors that entered most actively into decisions to change dividend rates or not to change them (when a change might have been under active consideration).

On the basis of these field observations Lintner asserted that several features of dividend policy formulation stood out most clearly.[10] One of these features was that, almost without exception, the first thing a company considered, in trying to decide a question of dividend policy, was the existing dividend rate. That is, the first question to

9 This variable is used in Version 2 of this study. See Chapter III.
10 Lintner (32), p. 99.

be answered was whether or not the existing rate should be changed, and not the determination of a new rate per se.

He also found that the prevalent opinion among management was that shareholders prefer a reasonably stable dividend rate and in fact believed that the market put a premium on this stability. This belief, he found, was so strong that most companies sought to avoid dividend changes that might have to be reversed in the near future.

Lintner proceeded to make a logical link between this reluctance to change and the importance of current earnings in dividend policy decisions when he said:

> "Within this context of the decision-making process, it became clear that any reason which would lead management to decide to change an existing rate-and any reason which would be an important consideration in determining the amount of the change-had to seem prudent and convincing to officers and directors themselves and had to be of a character which provided strong motivations to management. Consequently, such reasons had to involve considerations that stockholders and the financial community generally would know about and which management would expect these outside groups to understand and find reasonably persuasive, if not compelling. Current net earnings meet these conditions better than any other factor."[11]

11 Lintner (32), p. 100.

The mechanism by which top management conservatism and effort to avoid erratic changes in dividend rates and the consideration of current earnings in dividend policy are integrated was found to be through a policy called partial adaptation. That is, companies formulated a target payout ratio where this ratio is defined as dividends over earnings. ". . . this normal pay-out ratio was considered to be a target or an ideal toward which that company would move, but not a restrictive requirement dictating a specific percentage payment within each year."[12] Companies tended to adjust dividend rates only partially to approach the target payout when an earnings change occurred; thus, partial adaptation.

There were two other interesting findings in his study that lead rather directly into the formulation of his model. One was that dividends were uniformly considered by companies in terms of annual periods. The second was that target payout ratios and speed of adjustment factors (i.e. the degree of partial adjustment) varied greatly across firms, but remained relatively constant within a firm over time.[13]

The first point dictates the use of a dividend change expectation model using annual factors (as opposed to quarterlies). The second point suggests a linear form for the model. This second point also suggests that averaging across firms may obscure any effects looked for in any analysis relating to dividend policy. This latter point is a major criticism that can be applied to all existing studies on the information content of dividends.

12 Lintner (32), p. 102
13 Ibid

The model developed by Lintner can be expressed as:[14]

$$\Delta D_{iT} = b_{0i} + b_{1i}E_{iT} + b_{2i}D_{i,T-1} + d_{iT}$$

where:

D_{iT} = Dividends per share for firm i for year T

$\Delta D_{iT} = D_{iT} - D_{i,T-1}$

E_{iT} = Earnings per share for firm i for year T

d_{iT} = residual

b_{0i}, b_{1i}, b_{2i} = parameters

This model expresses dividend change as a linear function of current earnings and last period dividends. b_{1i} represents the product of the speed of adjustment factor and the target payout ratio, both relatively constant over time. b_{2i} represents the speed of adjustment factor (see footnote 14).

Lintner tested this model using his small, non-random sample and found it to be very strong. More rigorous testing done later by Fama and Babiak (17) resulted in slight modifications to Lintner's model.

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14 The actual formulation in Lintner's notation was:

$\Delta D_{iT} = a_i + c_i (D^*_{iT} - D_{i,T-1}) + u_{iT}$

where D^*_{iT} represented the amount of the current dividend that would be expected if the target payout ratio, r_i, were applied to current earnings, E_{iT}. Thus $D^*_{iT} = r_i E_{iT}$. Substituting into his equation we get: $\Delta D_{iT} = a_i + c_i r_i E_{iT} - c_i D_{i,T-1} + u_{iT}$

which is the same as the equation in the text with: $b_{0i} = a_i$

$b_{1i} = c_i r_i$ (i.e. the speed of adjustment factor (c_i) times the target payout ratio (r_i)

$b_{2i} = -c_i$

In particular, removal of the constant term and adding last period earnings to the model predicted dividend change better than did Lintner's model. The Fama-Babiak model was used by Watts (50) and Gonedes (22) and is used in Version 3 of this study (see equation 4).

The apparent reluctance of companies to change dividends especially if such a change might have to be reversed in the near future, the demonstrated explanatory power of current and "reasonably forseeable profits",[15] the observed market reactions to dividend changes, and assumed validity of the separation proposition can be used to formulate a theory on the information content of dividends.

An unexpected change in dividends may carry information as to management's belief as to the permanent nature of an earnings change. That is, as dividend policy tends to remain constant over time within firms, a dividend change that might seen inappropriate given current earnings may cause market agents to revise their assessments of expected future earnings. Abnormal security price movements, associated with changes in dividend policy, reflect the additional information added by the unexpected dividend change over and above that already transmitted by current earnings.

Measurement of Information Content

Ball and Brown (4) examined the association between security prices and accounting income numbers. They constructed a multisecurity, multiperiod index that they argued measured the strength of the assoc-

15 Lintner (32), p. 103.

iation between security prices and accounting income numbers.

Specifically, an expectations model of security returns was used to estimate unexpected security returns at the end of month t. That is, the model was used to form expectations at t-1 of market returns over period t and these expectations were compared to actual returns at time t. The difference between the expected and actual return was designated the unexpected return.

A similar process was followed for accounting earnings. That is, an accounting earnings expectations model was formulated. Earnings expectations were formulated and used to estimate unexpected accounting earnings numbers by comparing the expected values with the realized values one period in the future.

Given an efficient market, in the semi-strong sense, security prices at t-1 say, will on average reflect all publicly available information at t-1. During the period t-1 to t, security price movements will adjust instantly and in an unbiased manner to new, publicly available information. Thus the difference between the security's value at t-1 and at t can be argued to reflect the effects of new information released to the market during the period t-1 to t. If the effects of market wide and industry wide induced security price movements can be removed from this difference then the remainder can be argued to contain the effects of firm specific information released during this period t-1 to t.

Thus series of abnormal security returns are interpreted to be a random variable serving as a surrogate for the amount of firm specific information used by the market in setting equilibrium prices. Another series representing unexpected changes in reported earnings represents firm specific information. To the extent that these two series are associated or move together, it is inferred that the market perceives the accounting numbers to be related to the information used in setting equilibrium security prices.

The validity of such inferences is highly dependent upon the extent to which the expectations models employed serve as proxies for those used by the market.

The strategy employed by Ball and Brown, and used in some variant form in the existing empirical studies into the dividend information proposition, used the above strategy. Briefly, the Ball and Brown strategy was to cumulate abnormal market returns over the twelve months prior to the release of the accounting information (i.e. unexpected accounting earnings), for all firms in their sample over all years in the study.

The unexpected earnings numbers for all firms for all years were then partitioned into two sets, those containing positive signs and those having negative signs. If earnings have information content in that they are a part of this information set used by market agents in forming their expectations of expected future security returns then unexpected positive earnings changes should be associated with positive abnormal security returns. The converse should also hold.

The set of abnormal security returns was partitioned into two sets on the basis of the sign of the related unexpected earnings sign (forecast error). The abnormal security returns for each set were cumulated and averaged over the number of firm/years in each set.

Consider equation 4 in this study (page 63) which states:[16]

$$CR_{iT} = \sum_{t=-11}^{0} \hat{u}_{it} \qquad \text{(Equation 4)}$$

$$i = 1, \ldots M$$

Where:

CR_{iT} = Cumulative residual at the end of year T for firm i

$\hat{u}_{it}$ = Abnormal security return for firm i during month t.

$E\,(u_{it}) = 0$

$E\,(CR_{iT}) = 0$

Now consider:

$$\hat{e}_{iT} = E_{iT} - E\,(\hat{E}_{iT})$$

Where $\hat{e}_{iT}$ = unexpected accounting earnings for firm i during year T

E_{iT} = reported accounting earnings at the end of year T for firm i

$E\,(\hat{E}_{iT})$ = expected accounting earnings of year T for firm i

16 This is not the exact form of the Ball and Brown formulation but is similar enough so that explanations are relevant, plus it requires no new notation.

The statistic constructed by Ball and Brown was similar to:

$$CAR = \frac{1}{MT'} \sum_{i=1}^{M} \sum_{T=1}^{T'} CR_{iT}$$

where CAR means cumulative average residual. Note that by construction, as discussed below E(CAR) = 0.

This statistic was then computed for those firm years where $\hat{e}_{iT} > 0$ and again for those firms where $\hat{e}_{iT} < 0$, yielding two CAR's.

Ball and Brown (4) found that $CAR(\hat{e}_{iT}+) > 0$ and $CAR(\hat{e}_{iT}-) < 0$.

Thus they concluded that unexpected earnings and abnormal security returns were related and therefore that accounting earnings contained information.

The remainder of this section will discuss literature dealing with:

1. The estimation of abnormal security returns, and
2. The adequacy of the CAR as a measure of association.

1. The estimates of abnormal security returns:

The estimation of abnormal security returns requires a model of equilibrium pricing of risky capital assets. The most widely accepted and used models are those of Sharpe (46), Lintner (32), and Black (9). These models postulate a linear relationship between risk and the expected value of the rate of return.

The two most widely used models can be derived from the basic model of Black (9) whose model states that:

$$E(\tilde{R}_{it}) = E(\tilde{R}_{zt}) + [E(\tilde{R}_{mt}) - E(\tilde{R}_{zt})] \beta_i$$

where:

E = the expectation operator

$\tilde{R}_{it}$ = rate of return on asset i during t

$\tilde{R}_{zt}$ = rate of return on the "efficient" or minimum-variance portfolio whose return is uncorreleated with that of market portfolio, R_{mt} . (i.e. $Cov(\tilde{R}_{zt}, R_{mt}) = 0$)

β_i = the ratio of the covariance of $\tilde{R}_{it}$ and $\tilde{R}_{mt}$ to the variance of $\tilde{R}_{mt}$, (i.e. the relative risk of security i in the market portfolio).

A second version of this model has been proposed by Sharpe (46), Lintner (32). If we assume that $\tilde{R}_{zt}$ has no variance and can be replaced by a known number then the above model becomes:

$$E(\tilde{R}_{it}) = R_{ft} + [E(\tilde{R}_{mt}) - R_{ft}] \beta_i$$

Removing expectations and rearranging yields:

$$\tilde{R}_{it} = (1-\beta_i)R_{ft} + \beta_i\tilde{R}_{mt} + \tilde{e}_{it}$$

But as R_{ft} is known and constant then

$$(1-\beta_i)R_{ft} = \alpha_i$$

Thus $\tilde{R}_{it} = \alpha_i + \beta_i\tilde{R}_{mt} + \tilde{e}_{it}$

This model is called the one factor model as it expresses the return on security i during period t as a function of $\tilde{e}_{it}$ (the error term for security i during period t) and <u>one</u> market wide factor, $\tilde{R}_{mt}$.

If it is not assumed that $E(\tilde{R}_{zt}) = R_{ft}$ then removing expectations yields:

$$\tilde{R}_{it} = \tilde{R}_{zt} + [\tilde{R}_{mt} - \tilde{R}_{zt}]\ \beta_i + \tilde{u}_{it} \qquad \text{(Equation 2)}$$

or more conventionally:

$$\tilde{R}_{it} = \tilde{a}_{0t} + \tilde{a}_{1t}\beta_i + \tilde{u}_{it} \qquad \text{(Equation 3)}$$

where:

$\tilde{a}_{0t}$ = return on one market wide factor ($\tilde{R}_{zt}$) during period t

$\tilde{a}_{1t}$ = return on another market wide factor ($\tilde{R}_{mt} - \tilde{R}_{zt}$) during period t

$\tilde{u}_{it}$ = disturbance term.

This latter formulation expresses the return on security i during period t as a function of the disturbance term and two market wide factors $\tilde{a}_{0t}$ and $\tilde{a}_{1t}$. Hence the label, "two factor model".

Of the two models outlined above, the two factor model appears to have the most appeal. Black, Jensen and Scholes (10) found that estimates of $\tilde{R}_{zt}$ seem to be significantly greater than R_{ft}. Also it has been found that there is a period to period variation in $\tilde{R}_{zt}$; one that is more than what one would expect if the reason were simply sampling error.[17]

The implications of this latter finding are that there is another market wide factor (other than $\tilde{R}_{mt}$) that influences security returns. Thus the $\tilde{e}_{it}$ from the one factor model may not be as firm specific as the $\tilde{u}_{it}$ from equation 3. Thus in a study, such as this one, where the effect of a specific event on a security's return is to be isolated, the effect can probably be studied more precisely using $\tilde{u}_{it}$ than $\tilde{e}_{it}$.[18]

The methodology employed in this study requires the estimation of $\tilde{u}_{it}$ for all i over the study period. The usual way to do this has been to use the one factor model and observations on R_{it} and R_{mt} over months prior to the study period. Regressions were run in order to derive estimates of β_i. β_i was then used in either the two factor model or the one factor model to compute estimates of $\tilde{u}_{it}$ or $\tilde{e}_{it}$ respectively.

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17 Fama and MacBeth (18),

18 Fama and MacBeth (18), p. 624.

There are two problems with that approach. One problem is that it has been shown that β_i is not stationary.[19] If β_i is not stationary and a methodology which assumes stationarity is used then the market residuals (i.e. abnormal returns) would be misestimated. This study compensates for this possibility by obtaining different estimates of for each year in a manner described in Chapter IV.

The other problem arises when one model is used for estimation and another for prediction. Ball (1) used the two factor model to calculate abnormal returns in a prediction period but used the one factor model to compute estimates of β_i over an estimation period. Brenner (10 a) shows that this inconsistent use of models introduces bias into the residuals computed during the prediction period.[20] In this paper the two-factor model is used to estimate β_i and also to quantify abnormal security returns.

2. <u>The adequacy of the CAR as a measure of association</u>:

As explained above, the CAR is a multisecurity, multiperiod statistic that is interpreted as a measure of the association between security prices and information events. The mechanics of its construction will not be repeated here, but it is important to remember that the sign of the forecast errors is the basis on which the cumulative residuals are classified into two groups. If there is, in fact, an

19 Ball (2), p. 19.
20 Brenner (10a), p. 63.

association between the information and security returns and if there is bias in the earnings expectations model, then the resulting statistic will be biased againt observing this association.

More specifically, consider a positive income forecast error (e_{iT}+). If there is information content in earnings we should expect the related cumulative residual (CR_{iT}) to be greater than zero. Thus the CAR+ will be increased (above its expected value of zero), helping to disclose the information content.

Alternatively, consider that same earnings forecast error. This time, however, consider the possibility of an error in the sign of the error. If the computed $e_{iT} < 0$ when it should be greater than zero, AND there is information content then the result will be a bias in both CAR+ and CAR- towards zero.

Marshall (35) argues that there may be differences in the joint distributions of security returns and earnings between firms. Thus a small negative forecast error may be associated with a postive abnormal return for firm i <u>given</u> information content while a small positive forecast error may be associated with a negative abnormal security return for firm j (i = j) also given information content. That is, the joint distributions may not be centered at (0,0) for all firms.

Thus the presence (or lack of it) of information content may be lost in the cross-sectional statistics (the CAR or API). A closer examination of the relevant properties of these two statistics is in order at this time.

The API (n_j) as normally advanced is argued to be a metric that measures one or both of the following:

a. A measure of the association between abnormal security returns (Z) and an information variable, Y_j that is generated by an information systen n_j. If $API(n_j) > API(n_k)$, $j \neq k$ then $n_j \succ n_k$ because Y_j is more closely associated to Z than is Y_k.

b. A measure of the private value of information. $API(n_j)$ is interpreted as the abnormal return that could be earned by an investor who had private and costless access to Y_j through n_j prior to the realization of Y_j. Thus if $API(n_j) > API(n_k), j \neq k$, then again $n_j \succ n_k$.

If such interpretations are valid, then policy decisions concerning alternate n_j's can be made, and justified. Such questions (e.g. accounting alternative choices, disclosure or non-disclosure problems, etc.) abound, and the efforts extended in trying to answer these questions are not costless.

Marshall argues, and in fact demonstrates through a counter example, that the above interpretations are unjustifiable. He shows that the API's value as either a measure of the private value of n_j or as a measure of association between Z and Y_j, depends upon the joint distribution of returns (Z) and the information variable in question (Y_j). This joint distribution may be different for each firm. Thus a cross-sectional approach to the information content issue may find that the effects that the research is looking for are disguised or lost in the cross-sectional statistic (i.e. the API).

Magee used an (accounting) earnings model to generate earnings forecast errors ϵ_{jT} for each firm , for the years 1953 through 1967 (15 forecast errors per firm, n = 268).

Using the market model, he computed monthly residuals, u_j for all firms over the same 15 year period. For each firm/year he then computed a cumulative average residual (CAR_{jT}) where:

$$CAR_{jT} = \sum_{s=t-8}^{t+3} u_{js}$$

where t = 0 is the fiscal year end month. He then regressed CAR on ε_{jT}.

$$CAR_{jT} = b_{0j} + b_{1j}\,\varepsilon_{jT} + v_{jT}$$

He then tested:

$$H0\ b_{1j} = 0$$

$$H1\ b_{1j} \neq 0 \qquad \text{For all } j$$

Rejection of the null implied that a significant portion of CAR_{jT} was explained by the information variable ε_{jT}.

It is important to note here, that because of the firm by firm analysis, no prior assumptions have to be made about the meaning of the information conveyed by ε_{jT}. That is, it is not necessary to assume that $\varepsilon_{jT} < 0$ implies bad news etc. Thus no partitioning on ε_{jT}, or pre-determined but arbitrary trading rules need be formulated on ε_{jT}.

This study will use an approach similar to that of Magee (34).

This model has the added attraction that it considers the size of the forecast error. The other studies into information content issues do not.

Empirical Studies of the Information Content of Dividends

There are four empirical studies that deal, primarily, with the issue of whether or not dividends contain information other than that contained in earnings. These studies are discussed next.

Ross Watts

Watts examined the association between the signs of the unexpected change in dividends and the abnormal rate of return as reflected in stock price changes. His sample consisted of 310 firms common to COMPUSTAT and CRSP for which dividend and earnings data were available for the twenty-three year period ending in 1967.

Using the following dividend model:

$$\Delta D_{iT} = b_{1i} D_{i,T-1} + b_{2i} E_{iT} + b_{3i} E_{i,T-1} + \hat{d}^{3}_{iT} \quad \text{(Equation 7)}$$

where:

$\Delta D_{iT} = D_{iT} - D_{i,T-1}$

D_{iT} = Dividends per share for firm i during fiscal year T

E_{iT} = Annual earnings per share for firm i for fiscal year T

$\hat{d}^{3}_{iT}$ = Error term

hereafter referred to as the Fama Babiak (FB) model, Watts computed $\hat{d}^{3}_{iT}$ for each firm in the sample for each year in the test period.

Using the market model, monthly residuals were computed for all i over all T, designated v_{im} in his study. With m = 0 as the information month defined as the last month of the fiscal year, and a trading rule based on the sign of $\hat{d}^3_{iT}$ from equation 7 he computed an API cumulated from m = -11 through m = +12 for all firm/years. The resulting cumulated statistics were averaged over all firms having $\hat{d}^3_{iT} < 0$ and for firms having $\hat{d}^3_{iT} > 0$, resulting in two series of average API's.

Under the information hypothesis API- = API($\hat{d}^3_{iT} < 0$) < 1 at m = 0 and API+ = API ($\hat{d}^3_{iT} > 0$) > 1 imply information content in dividend change announcements. The null hypothesis that API- = API+ could not be rejected leading to his conclusion that the relationship between the dividend residual of the year and the market residual is very small, implying little information content to dividends.

<u>Criticisms</u>

1. Classification:

The sign of $\hat{d}^3_{iT}$ was used to classify firms into two homogeneous dividend groups. This classification scheme is critical to the determination of the resulting API statistics. Any misclassification will bias both API- and API+ towards unity, and therefore bias the results in favor of rejection of the information hypothesis. It is the contention of this study that substantial misclassification did in fact take place. Consider the large number of situations where $\Delta D_{iT} = 0$. The mean estimated cross-sectional coefficients of the FB model taken from Watts, Table 3 are:

$\overline{b}_1 = -0.321$

$\overline{b}_2 = 0.227$

$\overline{b}_3 = 0.017$

There are potentially a large number of firm years in which the total change in dividend payment is exactly equal to zero. For the sample used in this study, for example, the average number of firm/years in which $\Delta D_{iT} = 0$ was 40% (see Table 7). There is no reason to believe that the sample chosen by Watts would differ significantly from the current sample in this respect.

For those firm/years in which $\Delta D_{iT} = 0$ the signs of the $\hat{d}^3_{iT}$ will evolve as follows:

a. $\hat{d}^3_{iT} > 0$ when $0.321D_{i,T-1} > 0.227E_{iT} + 0.017E_{i,T-1}$

b. $\hat{d}^3_{iT} > 0$ $\quad 0.321D_{i,T-1} < 0.227E_{i} + 0.017E_{i,T-1}$

Thus small current period earnings relative to last period dividends (and hence to current period dividends) could result in $\hat{d}^3_{iT} > 0$ and, therefore good news. Conversely, large current earnings relative to dividends could result in $\hat{d}^3_{iT} < 0$, (bad news).

Other studies have documented a positive relationship between earnings and stock price changes.[21] Large positive income changes

21 Ball and Brown (4), for example.

could, however, generate $\hat{d}^3_{iT} < 0$ under a substantial number of circumstances. Thus it is possible that the earnings and dividend effects are confounded for a substantial number of firms, thus biasing the API statistics in favor of acceptance of the null.

2. Market Model:

Watts used residuals of the market model as estimates of the firm specific stock price activity. This model recognizes only one market-wide factor.[22] The two-factor model recognizes a second market wide factor. Use of this model should allow greater precision in measuring stock price movements that can be associated with a firm specific event.

3. Inter-firm Differences:

Marshall (35) has demonstrated that the API's value as a measure of association between security returns and an accounting variable depends on the joint distribution of the returns and those variables. Further, this joint distribution could differ between firms. Therefore, the interpretation of API's averaged across firms is difficult, and thus any inferences drawn from such interpretations, suspect.

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22 This is discussed further in the research methodology section.

R. Richardson Pettit

Pettit (43 and 44) also used an API metric to measure the information content of dividends. He classified his sample into seven dividend categories (20) or eight dividend categories (21), and into two (20) or four (21) income categories. The logic behind this was to obtain homogeneous dividend groups and homogeneous income groups such that the API statistic could be interpeted as a measure of the information content of the dividend announcement alone; the earnings effect having been controlled for by the income category groupings.

More specifically, quarterly dividend announcements were categorized as follows:

category #

1 no change-no change made in last 11 months
2 no change-change made in last 11 months
3 omitted dividend
4 reduced
5 less than 10 percent increase
6 10 percent to less than 25 percent increase
7 25% increase and over
8 initial dividend payment

Expected quarterly earnings for each announcement firm were estimated and netted against reported quarterly earnings yielding an unexpected earnings number for each firm in the sample. The firm/quarters were then grouped on the sign of the unexpected earnings number in the original study (43). The follow-up study by Pettit (44), divided the sample on the basis of the quartile rankings of the unexpected quarterly earnings numbers.

Unless otherwise specified, the discussion below pertains to the second Pettit study, (44). The conclusions of this study are essentially the same as those of the original study, however, the second study attempted to maintain better control over potentially confounding information variables. In that sense the second study was a more complete statement of Pettit's work on the dividend information issue.

Figure 1 below summarizes the partitioning scheme employed by Pettit. Also included in Figure 1 are the API values at t=0 and the number of firm/month observations used in the computation of the API in each cell. The API is cumulated from t=-20.

Decreases in the value of the API statistics as you go down a given column indicate information content in earning. If dividend categories are properly specified, resulting in homogeneous groupings with respect to dividend classifications, then changes in API values, within each dividend category but across earnings quartiles, are attributed to

Figure 1

API Values at Dividend Announcement Month (t=0)*

Earnings Quartile	Dividend Category 1	2	3	4	5	6	7	8
1 Highest	0.9438	1.1089	0.8133	0.6040	1.0225	1.1399	1.3533	1.3362
	(2,045)	(2,485)	(8)	(14)	(81)	(113)	(42)	(7)
2	0.9187	1.0668	0.7851	0.7442	0.9423	1.1105	1.5379	2.1565
	(2,035)	(2,162)	(6)	(4)	(67)	(115)	(98)	(7)
3	0.9135	1.0328	0.6103	0.7186	0.9816	1.0827	1.3879	1.2492
	(2,268)	(2,476)	(4)	(5)	(73)	(126)	(47)	(17)
4 Lowest	0.8798	1.0313	0.8787	0.7396	0.9752	1.1063	1.2299	1.1156
	(2,417)	(2,143)	(9)	(6)	(86)	(102)	(27)	(8)

* This is a summary of Table 2 in Pettit (44) p. 93.

Numbers in parentheses are number of observations.

earnings. Thus, for columns one and two (i.e. no dividend changes), the earnings classification scheme does seem to account for earnings announcement effects.

For other dividend categories, the earnings effect is either non-apparent (as in columns 5, 6, 7), or the number of observations are so small that conclusions are highly tentative.

Thus Pettit concludes that there is no substantial evidence of an earnings effect for the cases in which dividends did change (i.e. categories 3-8 inclusive). He does conclude, however, that there is strong support for a dividend effect in dividend categories 3, 4, 6, 7, and 8.[23]

Reference to Pettit (44) Table 2 does demonstrate a dividend effect. This table shows, for each cell, the API values for each of month -3 through +3. For dividend categories 3 and 4, the API consistently decreases from month -3 through month +3, for all earnings categories. This decrease is consistent with these dividend announcements conveying unfavorable news to the market.

Just as consistently, the API values systematically increase in dividend categories 6, 7 and 8 over the seven month period shown, for each earnings category.

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23 Pettit (44), p; 94.

Criticisms

1. Earnings Misspecification

If the earnings variable used is misspecified in the sense that partitioning on that variable does not result in homogeneous groupings in terms of expected security price returns, then the control feature is lost. If the earnings forecast used in estimating the earnings variable is a good surrogate for the market's forecast, then API changes within dividend categories may be explained by arguing that dividends act as a surrogate for the market's earnings variable.[24]

The earnings model used by Pettit in both studies is explained by Pettit as follows:

> " An expectational model was constructed in the following way: quarterly net earnings per share adjusted for all capital changes were regressed against time, and a seasonal component was estimated. Usually four years of quarterly data from 1964 through mid-1968 were used. The seasonally adjusted earnings per share were regressed against Standard and Poor's earnings per share index. A standard normal variate was calculated by

$$Z = \frac{\begin{pmatrix}\text{actual seasonally}\\ \text{adjusted e.p.s.}\end{pmatrix}_t - \begin{pmatrix}\text{estimated}\\ \text{e.p.s.}\end{pmatrix}_t}{\text{standard error of regression estimate}}$$

24 Watts (50) p. 106

This earnings model cannot be considered to be well specified. It is undoubtedly autocorrelated and probably suffers from an omitted industry variable. As a result, both the numerator and denominator of the equation are understated. For my purposes (of investigating the impact of information supplied by dividends) this misspecificiation should be of only minor importance. The cost of correcting the model was deemed to be too high."[25]

There are two problems with this model which make the earnings misspecification problem highly likely. One is the problem of hindsight. The parameters required are estimated using the 18 quarterly earnings being forecast. Thus these parameters, estimated with the actual earnings members are being used to forecast the same numbers. For this reason the model used by Pettit will differ from the market's forecast model.

Secondly, the earnings variables generated by Pettit's model are, "undoubtedly autocorrelated."[26] This clearly leads to a difference between this model and the one used by the market. Thus if the earnings forecast of period t is related to that of period t-1, an efficient market would have reacted to Pettit's period t forecast in period t-1.

2. Use of Quarterly Dividends

Lintner (32) found that dividends were uniformly considered by com-

25 Pettit (43) p. 998, 17.10
26 Pettit (43) This is acknowledged by Pettit but dismissed as trivial.

panies in terms of annual periods. Given this result then we would expect that 3/4 of the quarterly dividend announcements would not only fall into the no change category, but that no change would be expected. There, of course, may be no change announcements that convey information, but 3/4 of all quarterly dividend announcements should be expected to convey no information.

These contentless announcements are all confined to Pettit's categories 1 and 2. As the API is a cross-sectional summary statistic, any information content in zero change announcements may be hidden due to the dampening effect of presence of this large number of firm/quarters for which the expected change in dividends is the same as the actual change. That is, if 3/4 of the quarterly dividend announcements have no information but 1/4 potentially do, its detection in that latter group is made more unlikely by the presence of the former group.

This dampening effect is illustrated on Table 1 in Watts (50). Table 1 displays the change in the performance index for month 0. The data is from Pettit (44) p. 93. The change in the API value for the zero-change categories is consistently smaller, for all earnings categories, than it is for the change categories.

The change in API over the months -3 through 0 is also consistently smaller for the zero dividend change categories. This period is relevant because all the API change attributable to a dividend announcement should emerge after the last quarterly dividend announcement, but no later than the date of the current announcement (i.e. during t = -3, -2, -1, 0).

3. Use of Regular Dividends

Watts (49), Griffin (28) and Gonedes (22) all used total annual dividends (i.e. regular plus extra dividends). Pettit, in both studies, used regular quarterly dividends. The propriety of using regular dividends only as opposed to total payout depends upon the intention of managements in making the distinction between regular and extra dividends. There are two extreme cases which would lead to different decisions with respect to this issue.

At one extreme, the extra dividend could be truly extra in the sense that it represents an abnormal distribution, presumably out of abnormal current earnings. Under these conditions the extra dividend would contain no information about expected future earnings. The dividend specification then would properly be regular dividends only. The use of total dividend payout under these circumstances would result in misclassifying firms which declared special dividends. This in turn would bias the results against acceptance of the hypothesis that dividends contain information other than that contained in earnings.

At the other extreme, the extra dividend may be used by firm managers as part of the adjustment process. That is, the documented reluctance of firms to increase dividends if the dividend may have to be reduced in the future, may explain the use of extra dividends. The extra dividend may be perceived by management as a means of adjusting to target payout that will allow a future retreat from that adjustment if necessary.

In this case, then the extra dividend does contain information on managements' expectations of future earnings. As these expectations are realized, the "extra" dividend will then become part of regular dividends. The market, however, would react, for the most part, to the declaration of the extra dividend. Thus a classification scheme based on regulars only will show the dividend change in a time period subsequent to the period in which the information was received by the market. Again, the result will be to bias the results against acceptance of the dividend information hypothesis.

Unfortunately, Pettit gives no information on the permenance or impermenence of these extra dividends in his sample. It is essentially an empirical question. If the extra dividends are recurring extras, then the latter situation seems the most reasonable. If the extras do not recur, then Pettit's use of regulars only is most appropriate.

4. Other Criticisms

The criticisms cited in the critique of Watts, namely, the use of the market model; and the effect of inter-firm differences on the interpretation of the API also apply to both of Pettit's works.

Paul Griffin

Griffin's study (38) is relevant to this one because he attempts to get at the issue of the joint effect of information variables versus the marginal effect of each one. The information variables used by Griffin were earnings, dividends, and analyst forecasts of earnings.

The three information variables were defined as follows:

1) Earnings variable:

This information variable was defined as the unexpected change in annual earnings per share. That is, the earnings information variable for year t is designated E_t, where

$$E_t = e_t - e_{t-1} - E\ (e_t - e_{t-1})$$

And where:

E_t = information variable for year t

e_t = reported earnings per share for year t

E = expectations operator

$$E(e_t - e_{t-1}) = 1/3 \sum_{i=1}^{3} (e_{t-i} - e_{t-i-1}) = \theta_t$$

This expectations model states that the expected change is earnings per share in year t equals the average of the changes in the previous three years.

2) Dividend variable:

This variable was defined as the unexpected change in total annual dividends per share. The expected dividend change was specified as zero. Thus the observed change in dividends in period t is the dividend information variable.

$$D_t = d_t - d_{t-1}$$

Where:

D_t = dividend information variable for year t

d_t = total cash dividends for year t

3) Analyst Forecast variable:

Two specifications of the analyst earnings forecast variable were used by Griffin.

One specification, designated "Earnings-Consensus Forecast" defined the forecast error variable for year t as the difference between reported earnings for year t, and the analyst forecast of year t earnings made at time t-1. That is,

$$F_t^1 = e_t - f_t$$

Where:

F_t^1 = Earnings Consensus Forecast error variable for year t

e_t = reported annual earnings for year t

f_t = analyst forecast of year t earnings made of time t-1

The second specification of the analyst earnings forecast variable, designated Consensus Forecast Change, defined this variable as:

$$F_t = f_{t+1} - f_t - \theta_t$$

Where:

F_t = Consensus Forecast Change variable for year t

f_{t+1} = analyst forecast of year t+1 earnings made at year t

f_t = analyst forecast of year t earnings made at year t-1

$\theta_t = E\ (e_t - e_{t-1})$ as defined for the earnings variable alone.

As in the other studies, firms are categorized on some attribute of the information variable. In this case, the sign of the variable is again used. For instance, stocks are divided into two groups on the basis of the sign of the earnings forecast error. Then an API(E) across each group is calculated. These statistics are compared to similar statistics computed on the same sample when the sample is split according to the sign of the dividend forecast error, say, yielding API(D). He could not reject API(E+) = API(D+) and API(E−) = API(D−) (hypothesis 1).

He then tested a second hypothesis similar to:

H2: API(E+) = API(E+, D+)

He was able to reject this hypothesis in favor of the alternative that API(E+) < API(E+,D+). It is difficult, however, to interpret this result. While Griffin's conclusion was that this demonstrated that dividends contained information other than that contained in earnings, there is an alternative explanation.

Unexpected dividend changes are postively associated with security price changes, Watts (49), as are unexpected earnings changes, Ball and Brown (4). By partitioning out the set of securities exhibiting E+D− behaviour, he has removed those securities where the degree of association between security price changes and unexpected earnings changes would, a priori, be expected to be weakest.

It is possible that such a partitioning has resulted in two sets of securities where the size of the earnings forecast error is systematically larger in one than in the other. Thus the increase in the API may reflect the greater informational content of the earnings of the large earnings forecast error firms, and not of dividends.

Nicholas Gonedes

Gonedes (22) reported on the results of a study he made on the information content of earnings, dividends and extraordinary items. He concludes that dividend and extraordinary item signals released during period t do not contain information that is not already impounded at the beginning of period t, but that earnings signals do contain such information.

There are three major observations on the results and methodology employed that make the conclusions suspect. The first, and most critical point, centres around the portfolio formation strategy employed. Since portfolios were formed based upon the values of the income signal initially, the remaining dividend and extraordinary item partitionings are portfolio specific. It can be shown that subsequent comparisons between portfolios on either the dividend or extraordinary item signal will be biased towards understating their information content relative to the information content of the earnings signal.

The second point is that the results shown in Gonedes' Table 3 give some preliminary indication that there may be information content in the dividend signal.

The third point concerns the dividend information variable. By construction this variable (i.e. the residuals from the Fama Babiak model; the same model used by Watts (49)) should reflect dividend information other than that contained in current earnings. Therefore, tests of whether this variable has the same (i.e. substitute) information as current earnings should, a priori, fail to reject the null.

The first two points warrant some elaboration.

1. Portfolio Formation

Consider the portfolio formation scheme as outlined by Gonedes (22, p. 48). At each portfolio formation date his sample of N firms is divided into three groups of N/3 firms, based on the size of the estimated income forecast errors. Let θ_{kjt} represent the value of information attributes k (i.e. forecast error k) for firm j at portfolio formation date t, where k = 1, 2, 3 refer to earnings, dividends and extraordinary items respectively. The set of N firms is partitioned into three equal groups of N/3 firms on the size of the earning attribute value (k=1) such that $(\theta_{1jt} = H) > (\theta_{1jt} = M) > (\theta_{1jt} = L)$ for all j; where H, M, L refer to the upper, middle and lower thirds of the distribution of θ_{1t}, respectively. θ_{1t} represents the set of earnings attribute values for all sample firms (j = 1, . . . , N).

Consider, however, the results after the next portfolio formation step. In this step the dividend forecast error is used to partition the sample into 6 equal size portfolios, each containing N/6 firms. The equal sizes are maintained by separating firms using the median value of the dividend forecast error, within each earnings group. Of course, the median values of the dividend forecast error within one earnings group need not be the same as the median dividend forecast error in another group.

That is, $\theta_{2t} = H$ and $\theta_{2t} = L$ are really conditional on the value of θ_{1t}. The six portfolios at this stage exhibit the following relationship:

$(\theta_{2jt} = H|\theta_{1jt} = H) > (\theta_{2jt} = L|\theta_{1jt} = H)$ For all j in $\theta_{1t} = H$

and $(\theta_{2jt} = H|\theta_{1jt} = M) > (\theta_{2jt} = L|\theta_{1jt} = M)$ For all j in $\theta_{1t} = M$

and $(\theta_{2jt} = H|\theta_{1jt} = L) > (\theta_{2jt} = L|\theta_{1jt} = L)$ For all j in $\theta_{1t} = L$

But it is not necessarily true that:

$(\theta_{2jt} = H) > (\theta_{2jt} = L)$ For all j

The relationship is indeterminate because the partioning on θ_{2t} is dependent upon the level of θ_{1t}.

Thus merging portfolios on the basis of θ_{2t} classification (i.e. AHA, ALA as in Gonedes Table 11) does not permit unambiguous statements about the information content of dividends. There very well may be firm/year observations contained in portfolio AHA with dividend forecast errors that are <u>less than</u> dividend forecast errors in the portfolio ALA.

Even if the dividend forecast error possessed the same information as earnings, these potential misclassificaitons would show dividends to possess less than earnings.

For extraordinary items the potential bias is even greater. $\theta_{3t} =$ H and $\theta_{3t} = L$ are conditional not only on θ_{1t} but also on θ_{2t}. Thus:

$[\theta_{3jt} = H|\theta_{1jt} = H, (\theta_{2jt} = H|\theta_{1jt} = H)] > [\theta_{3jt} = L|\theta_{1jt} = H, (\theta_{2jt} = H|\theta_{1jt} = H)$

For all j in $[\theta_{1t} = H, (\theta_{2t} = H|\theta_{1t} - H)]$

and

$[\theta_{3jt} = H|\theta_{1jt} = M, (\theta_{2jt} = H|\theta_{1jt} = M)] > [\theta_{3jt} = L|\theta_{1jt} = M, (\theta_{2jt} = H|\theta_{1jt} = M)]$

For all j in $[\theta_{1t} = M, (\theta_{2t} = H|\theta_{1t} = M)]$

etc.

But again we cannot say that:

$(\theta_{3jt} = H) > (\theta_{2jt} = L)$

For all j

Nor can we say that:

$(\theta_{3jt} = H | \theta_{2jt} = H) > (\theta_{3jt} = L | \theta_{2jt} = H)$

For all j in $\theta_{2t} = H$

or that

$(\theta_{3jt} = H | \theta_{2jt} = L) > (\theta_{3jt} = L | \theta_{2jt} = L)$

For all j in $\theta_{2t} = L$

To summarize the above, we can say that $(\theta_{1jt} = H) > (\theta_{1jt} = M) > (\theta_{1jt} = L)$ for all j. But we cannot say that either:

$(\theta_{2jt} = H) > (\theta_{2jt} = L)$ For all j

or $(\theta_{3jt} = H) > (\theta_{3jt} = L)$ For all j

Thus the comparisons of the mean returns or mean return differences for portfolios for information classes HAA, MAA and LAA are meaningful and unambiguous. Comparisons of AHA versus ALA, and AAH versus AAL are not so easily interpreted.

Thus the only valid conclusion, given the results of this study's analyses is that earnings appear to reflect information beyond that already available at the beginning of period t. However, whether dividends and/or extraordinary items reflect the same, or some portion of, or indeed more, information than earnings is not known.

2. A Reexamination of Table 3

At "face value" the mean returns in Gonedes (22) column 3 of Table 3 (p. 52) do indeed seem to indicate that the classification on the earnings attributes are the most significant. However, there is a possible arrangement of these mean returns that seems to indicate a consistent pattern for dividends.

If dividends are being investigated, the mean returns would be logically ordered as follows:

	Information Class	Portfolio Pair	10^2 X Est. Mean $\hat{\mu}(\tilde{R})$
	HHL	1	1.95
	HHH	2	2.01
$\theta_2 = H$	MHL	5	1.22
	MHH	6	1.17
	LHL	9	.31
	LHH	10	.34
	HLL	3	2.07
	HLH	4	2.01
$\theta_2 = L$	MLL	7	1.28
	MLH	8	1.33
	LLL	11	.43
	LLH	12	.53

The rearranged mean returns do demonstrate a relationship that suggests that perhaps there are systematic differences between the mean returns of high and low dividend portfolios. From Gonedes Table 3 or from the portion reproduced above, note that in <u>all</u> cases the mean return for the portfolio differing only on the value of θ_2 , is greater for θ_2 = L than it is for θ_2 = H.[27]

If the extraordinary item effect is averaged out, this relationship is even more apparent. That is, for the mean returns from Table 3 and for the mean return differences from Table 5 we have:

	Information Class	10^3 X Est. Mean $\hat{\mu}(\tilde{d})$	10^2 Mean $\hat{\mu}(\tilde{R})$
	HHA	8.37	1.98
θ_2 = H	MHA	.51	1.20
	LHA	-10.06	.33
	HLA	9.06	2.04
θ_2 = L	MLA	.75	1.31
	LLA	-6.93	.48

Conclusion

The sequence followed in partitioning securities into information class portfolios of equal size, biased the results in favour of rejection of the hypothesis that dividends and extraordinary items have

27 The arguments in this critique involve means and their differences only, not the significance of those differences. Also, it should be noted that while all mean differences are systematically of the same sign, that sign is the opposite to what theory would suggest, given dividend information.

informational impact. Perhaps because this bias is greater for extraordinary items than for dividends, the data shown in this study suggest that there may be a dividend effect.

General Criticisms

The major problem in all of the three studies reviewed involve the following, non-independent factors:

1. Estimation and use of the information variables,
2. Estimation of the abnormal market return,
3. Computation and interpretation of an API (or API like statistic), conditional on the information variable(s), and
4. Controlling for confounding sources of information.

This study will try to overcome these problems in the following ways:

1. Analyst forecasts of both earnings and dividends will be used instead of time series models to obtain estimates of the forecast errors.
2. The two-factor asset pricing model will be used to estimate the period by period abnormal market return.
3. The API: This study will conduct tests using a method that assumes that the joint distribution of security returns, dividends and earnings differs across firms.

4. Controlling for confounding sources of information:

The main sources of information are assumed to be earnings and dividends. Both will be considered using a methodology that allows inferences on information content of dividends other than that supplied through earnings. This will be explained in detail in the Research Methodology section.

The basic research question is whether dividend announcements contain information over and above that contained in earnings announcements.

The literature on this question, surveyed above has shown, among other things, that:

1. Dividend policy tends to remain constant across time within a particular firm,
2. Dividend policy, theoretically, is not a direct factor in the determination of the value of the firm,
3. Security price changes are associated with dividend changes,
4. A possible explanation for the seeming paradox presented by 2 and 3 above is that dividends contain information other than that contained in other events (earnings announcements for example).
5. Existing studies into the information content of dividends issue have not yielded conclusive results.

The purpose of this study is to examine whether dividends contain information over and above the information contained in earnings using a methodology that avoids the pitfalls of prior work. The methodology is described in the next chapter.

III. RESEARCH DESIGN AND METHODOLOGY

Selection of Sample

This study covers the years 1956 through 1975. This time period is dictated by two factors. First, the Compustat tapes cover a twenty year period. Second, an important source of data is an investment service, namely, Value Line Data Services. This service has published the data required for this study since 1955 only.

The following selection criteria are used for the selection of the sample firms:

1. Monthly security return data is available, continuously, for the years 1947 through 1975,
2. The fiscal year end is December 31 for each year during the study period (i.e. 1956 through 1975).
3. The company is one of the firms covered continuously by Value Line Data Services from 1955 through 1975, and
4. Annual earnings per share and dividends per share are continuously available on the Compustat tape for 1956 through 1975.

These criteria result in a sample made up of firms common to all three sources of firm specific data. This intersection set contains 202 firms; a sample that should be large enough for this study.

Criterion 1 restricts the sample to NYSE firms. Although this does introduce some bias into the sample, this set of firms constitutes an extremely large set in terms of economic resources. For instance, the

Compustat population contains over 90% of the total market value of common equities of publicly held corporations in the United States. Thus Criteria 1 and 4, while somewhat restrictive, still leave a relevant population for study.

Criterion 2 insures the largest set of common year-end firms on the NYSE, a factor that could be important given the sample reducing effects of criteria 3 and 4. Criteria 3 and 4 are imposed for reasons of data availability.

These criteria do impose bias on the sample selected. There is a survivorship bias because of the term of continuous existence. There is also a size bias in that firms selected tend to be large relative to unselected firms. Because of data requirements, however, it is difficult to avoid these biases, and they must be considered in the interpretation of results.

Data Collection

The steps described in subsequent sections of this chapter required the following data, collected from the following sources:

1. Reported Earnings and Dividends:

Final annual earnings per share, and dividends per share were obtained from Standard and Poor's Compustat Annual investment tapes.

Thus for each firm i, there were twenty earnings and twenty dividend numbers, denoted as follows:

E_{iT} = Final Annual earnings per share for firm i for fiscal year T,

D_{iT} = Annual dividends per share (including extra dividends but excluding stock dividends) for firm i, announced during fiscal year T.

i = 1, 2, . . . , 202

T = 1956, . . . , 1975

2. Market Index of Earnings and Dividends:

A market index was constructed, for both earnings and dividends, from the earning and dividend numbers obtained in 1 above.

Specifically:

$$E_{MT} = \frac{1}{n}\sum_{i=1}^{n} E_{iT} \qquad \text{For } T = 1956, \ldots, 1975$$

$$D_{MT} = \frac{1}{n}\sum_{i=1}^{n} D_{iT} \qquad \text{For } T = 1956, \ldots, 1975$$

Where:

E_{MT} represents a market index for earnings for year T, and

D_{MT} represents a market index for dividends for year T.

n = number of sample firms (i.e. $n = 202$)

3. Market Returns:

The CRSP monthly tapes are the source of monthly security returns for each firm in the sample, where:

$$R_{iT} = \frac{P_{it} + D_{it} - P_{i,t-1}}{P_{i,t-1}}$$

= Rate of return on security i during month t

And:

P_{it} = Price of security i at the end of month t

D_{it} = dividend per share paid during month t

t = months covered in the study (i.e. months from January 1947 through December, 1975).

4. Dividend and Earning Forecasts:

Value Line Data Services are the source of these forecasts denoted:

EF_{iT} = Analyst forecast of annual earnings per share for firm i for year T,

DF_{iT} = Analyst forecast of annual dividends per share for firm i for year T,

T = 1956, . . . , 1975

These forecasts are published four times a year for each firm. The forecasts used in this study are the first forecasts made in year T, made after disclosure of the actual number for year T-1. That is, EF_{iT} is the first analyst forecast of year T earnings made conditional on knowledge of actual earnings of year T-1. DF_{iT} is the first forecast of annual dividends of year T conditional on knowledge of actual dividends of year T-1. These forecasts are typically made during March, April, or May of year T.

The data described above are inputs to the estimation operations that are described next.

Estimating Inputs to the Statistical Model

This section is quite lengthy, as there are three versions of the basic statistical model; each requiring some different inputs. The basic statistical model is stated next, in general form. The various components of the model are then described in some detail and then the three forms or versions of the basic statistical model are presented.

The basic model can be stated, in general form, as follows:

$$CR_{iT} = a_{oi} + a_{1i}\varepsilon_{iT} + a_{2i}\delta_{iT} + \omega_{iT}$$

(Equation 1)

Where: a_{oi}, a_{1i}, a_{2i} are regression coefficients.

ω_{iT} is the error term

And:

(a) CR_{iT} = Cumulative error from the two-factor asset pricing model, cumulated monthly over year T for firm i.

(b) ε_{iT} = Unexpected annual earnings change per share estimate for firm i during year T. There are two different forms of this estimate based on two different earnings expectations models,

(c) δ_{iT} = Unexpected annual dividends change per share estimate for firm i during year T. There are three different forms of this estimate.

Estimating the Cumulative Residual (CR_{iT})

The two-factor asset pricing model can be used to describe R_{it} as:

$$\tilde{R}_{it} = \tilde{R}_{zt} + \beta_i \, (\tilde{R}_{mt} - \tilde{R}_{zt}) + \tilde{u}_{it} \qquad \text{(Equation 2)}$$

Where:

$\tilde{R}_{it}$ = rate of return on security i during period t

β_i = the ratio of the covariance between R_{it} and R_{mt} to the variance of R_{mt},

$\tilde{R}_{zt}$ = rate of return on the efficient portfolio whose return is uncorrelated with the return on the market portfolio, R_{mt},

$\tilde{R}_{mt}$ = rate of return on the market portfolio in period t,

$\tilde{u}_{it}$ = the disturbance of the ith security at time t.

This model states that the periodic return on asset i is a function of the disturbance term and two market wide factors $\tilde{R}_{mt}$ and $(\tilde{R}_{mt} - \tilde{R}_{zt})$. Equation 2 can be rewritten in terms of estimates of the variables yielding:

$$\tilde{R}_{it} = \tilde{a}_{ot} + \tilde{a}_{1t}\,\hat{\beta}_i + \tilde{u}_{it} \quad \text{(Equation 3)}$$

Where:

$\tilde{R}_{it}$ = rate of return on asset i in period t,

$\tilde{a}_{ot} = \tilde{R}_{zt}$

$\tilde{a}_{1t} = (\tilde{R}_{mt} - \tilde{R}_{zt})$,

$\hat{\beta}_i$ = estimate of β_i,

Fama and MacBeth (18) conclude that there is a period to period variation in $\tilde{a}_{ot}$ (systematic) and thus that $\tilde{a}_{ot}$ is a market factor that should be considered as well as $\tilde{R}_{mt}$. Thus the residual generated by the one-factor (Market) model may contain variation in this second market wide factor and is thus not entirely specific to the firm. Use of the residuals from the two-factor model should allow more precision in measuring firm specific events.

This study assumes that the two factor model is the "correct" model in that it more closely represents the underlying process than do alternative available models. This assumption is given support by Gonedes and Dopuch (27) who state: "Given the available evidence, we therefore ascribe relatively more descriptive validity to those studies . . . that are based upon the two-parameter asset pricing model."[1]

Brenner argues that the correct model, once identified, should be used during both the estimation period and the association test period (i.e. the prediction period). Consequently, the two-factor model is used here in both the estimation and prediction period.

Equation 3 above is modified such that:

$\tilde{R}_{it} - \tilde{a}_{ot} = \tilde{a}_{1t} \ \beta_i + u_{it}$ (Equation 3(a))

CR_{iT} is mathematically computed as:

$$CR_{iT} = \sum_{t=-11}^{0} \hat{u}_{it} \qquad \text{(Equation 4)}$$

Where:

t = 0 is March year T

T = 1956, . . . , 1975

1 Gonedes and Dopuch (27), p. 115.

The summation limits on equation 4 result in a cumulative residual representing the abnormal rate of return on security i for the year ended March 31, year T. March is selected as the cut-off month (or information event month) for the following reasons:

1. By the end of the third month after the year end virtually all firms have released both earnings and dividend announcements. Oppong (42) found that of 579 firm-years selected for his study, only 10 announced earnings later than March, and those 10 announced in April.

2. Value Line Data Services publish information including the dividend and earnings forecasts needed for this study, on a quarterly basis. Value Line puts out a weekly publication covering 1/13 of the firms included in their survey. Thus every firm is covered one time each quarter. This means that Value Line forecasts obtained from publications during March, April, or May of year T should contain year T forecasts that are conditional on knowledge of year T-1 earnings and dividends.

Therefore, CR_{iT} should contain all of the firm specific security price reaction that may be attributable to ε_{iT} and δ_{iT}.

The $\hat{u}_{it}$'s that are used in equation 4 are computed using the following two-stage process:

Stage 1 (estimation period):

$\beta_{i,T-1}$ is estimated by an OLS regression of $R_{it} - \hat{a}_{0t}$ on 72 values of $(R_{mt} - a_{0t})$ or a_{1t} prior to the prediction period (t = -83, . . . , -12), with the constant term suppressed.

Stage 2 (prediction period):

$\beta_{i,T-1}$, estimated in stage one is used to generate estimates of the residuals from equation 3(a) for t = -11, . . . , 0.

The Stage 1 procedure is then repeated to obtain an estimate for β_{iT} using 72 observations again but deleting the oldest 12 observations and adding on 12 new ones. Using the numbering scheme above then, for T = 2, the estimation period would be t = -71, . . . , 0 and the output of the estimation procedure would be β_1. β_1 would then be used in equation 3(a) to determine u_{it}, for t = 1, . . . , 12.

This procedure is repeated for each of the twenty years in the study period for each firm. The u_{it} from stage 2 are then used in equation 4 to compute CR_{iT}.

The two stage approach is used because there is some evidence in the research literature that β_i is not stationary over time.[2] To assume that β_i is stationary, if in fact it is not, could seriously alter the estimates of u_{it} obtained from equation 3(a). Also, because the methodology employed in this study does not average the estimates of u_{it} across firms, the alteration in these estimates will not be offset by changing β's in other firms in the sample.

The two stage method outlined above at least partially compensates for this suspected nonstationarity. This procedure is the "moving window" approach used by Griffin (26). Significant changes in β_i from year to year will be reflected somewhat slowly using this technique as the effect of the additional 12 observations that provide the new information will be dampened by the 60 "old" observations.

Another procedure, also used in the Griffin study (26), uses observations, for estimation purposes, on either side of the prediction period. That approach is not used in the current study because using observations subsequent to the prediction period would require the deletion of at least three years from the study period.

In summary, equation 3(a) is used to estimate $\beta_{i,T-1}$. $\beta_{i,T-1}$ is then used, also in equation 3(a) to estimate u_{it} over the prediction period. The u_{it}'s are cumulated (equation 4) and a series of twenty CR_{iT}'s are produced for each firm i.

2 Ball (1), p. 19.

Unexpected Annual Earnings Per Share Change Estimates

The basic statistical model requires estimates of unexpected earnings per share change for each firm for each year of the prediction period (T - 1956, . . . , 1975). ε_{iT} is referred to as the earnings information variable as it is this element of a firm's reported earnings that is a "surprise" (unexpected), and thus not fully anticipated by the market. Thus, if earnings announcements contain information in that they are used by market agents, then the unexpected earnings change should be associated with the unexpected price movements during the realization period for the two random variables.

Because the model actually used by the market to formulate earnings expectations is not known, proxies for the "true" expectations are used. For earnings, two different models are used, namely:

a. ε_{iT} is obtained by comparing reported annual eranings per share change with a forecast of annual earnings per share change made by Value Line Data Services. The difference, designated $\hat{e}^1_{iT}$ is used in Version 1 of the basic statistical model. Thus:

$$\hat{e}^1_{iT} = E_{iT} - EF_{iT} \qquad \text{(Equation 6(a))}$$

Where:

EF_{iT} = First annual earnings forecast of year T earnings of firm i made by VL conditional on knowledge of reported earnings of year T-1. This forecast is typically published in March, April, or May of year T.

b. ε_{iT} is obtained by regressing reported earnings change for firm i on the constructed market index of earnings-per-share change. The residuals from these regressions, designated $\hat{e}^2_{iT}$ are used in Versions 2 and 3 of the basic statistical model. The regression equation is as follows:

$$\Delta E_{iT} = a_i + b_i \Delta E_{mT} + \hat{e}^2{}_{iT} \qquad \text{(Equation 5(a))}$$

Where:

ΔE_{iT} = Annual reported earnings per share change for firm i for year T

$= E_{iT} - E_{i,T-1}$

E_{mT} = Index of earnings per share change for year T

a_i and b_i are regression coefficients.

<u>Unexpected Annual Dividend Change Per Share Estimates</u>

The basic statistical model requires estimates of unexpected dividends per share for each firm for each year of the prediction period. δ_{iT} is referred to as the dividend information variable as it is this element of a firm's reported dividend that is a "surprise" (unexpected) and thus not fully anticipated by the market. Thus if dividend announcements contain information in that they are used by market agents, then the unexpected dividend change should be associated with the unexpected price movements during the realization period for the two random variables.

Because the model actually used by the market to formulate dividend expectations is not known, proxies for the "true" expectations model are used. For dividends, three different models are used, namely:

a. $\hat{\delta}_{iT}$ is obtained by comparing the change in reported annual dividends per share to a forecast of annual dividends per share change made by Value Line Data Service. The difference, designated $\hat{d}_{iT}$ is used in Version 1 of the basic statistical model. Thus:

$$\hat{d}1_{iT} = D_{iT} - DF_{iT} \qquad \text{(Equation 6(b))}$$

Where: DF_{iT} = First annual dividend forecast of year T dividends of firm i made by VL conditional on knowledge of actual dividends of year T-1. This forecast is typically published in March, April or May of year T.

The analyst forecasts are prepared four times a year for each security surveyed by Value Line (VL). An individual market analyst is responsible for about forty securities on which he has to report quarterly. Thus each analyst prepares about 160 reports per year.

While the VL company has a statistical department that can be and is used quite extensively by the analysts, the ultimate responsibility for the accuracy of the forecasts rests with the individual analyst. Because each analyst is continuously evaluated, there is a very strong incentive to produce accurate forecasts. Accuracy as used by the VL company is defined to mean the difference between the forecasted number and the actual number. In the case of earnings forecasts, the incentive is particularly strong as the main evaluative measure used by VL is the accuracy of earnings-per-share forecasts.[3]

This incentive aspect is mentioned here because it supports the proposition that the analyst forecasts probably incorporate information over and above that contained in the forecasts produced by mathematical models; (models that the analysts also have access to).

Given the validity of this argument, the results from the use of the analyst forecast model, whether they support the information hypothesis or not, should be the most appropriate and convincing since this model is more likely to match market expectations than the mathematical models do.

Another argument in favour of the analyst or VL version can be based on the fact that the information published by Value Line Services

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3 This was learned through discussion with VL personnel.

is sold directly to users. This information is certainly not costless to produce and yet the firm has been producing and selling it since 1955.

The inference can be drawn (given this survivorship) that the service earns a positive return for the producers. That implies that there exist users who value this information in that they incur costs to acquire it. Thus, if these users are rational then the benefits they derive, on average, exceed the costs they incur. This further implies that the purchased material has information content. In fact, if we assume that it is the forecast data that is valued (most of the other data is publicly available at the time of the VL publication), and that these forecasts are more expensive than forecasts obtainable from other sources, then we can argue that these forecasts must be superior to the other, less expensive, forecasts.[4]

In a world of rational users and perfect markets, these forecasts are expected to be superior to the less costly ones.

Brown and Rozeff (11) have demonstrated that Value line earnings forecasts outperformed forecasts of selected mathematical models over a number of years. As dividend forecasts are part of the information package purchased by Value Line subscribers, an argument for their superiority can be made; invoking the same market rule.

If these forecasts are better proxies for the market's expectation of the items forecasted, then the information variables $\hat{e}^1_{iT}$ and $\hat{d}^1_{iT}$ should be better proxies for the unexpected portion of the released

4 These could be forecasts derived from mathematical models, say.

information. Thus, if dividends do contain information other than that contained in earnings, then its detection should be more likely using this version (version 1) than the other two. Furthermore, if dividends do not contain information then this verison will be the most likely to find no content since it will contain the least amount of error in the measurement of key independent variables.

b. $\hat{\delta}_{iT}$ is obtained by regressing the change in reported annual dividends declared for firm i on the change in the dividend per share index. The residuals from these regressions, designated $\hat{d}^2_{iT}$ are used in Version 2 of the basic statistical model (see below). The regression equation is as follows:

$$D_{iT} = a_i + b_i D_{mT} + \hat{d}^2{}_{iT} \quad \text{(Equation 5(b))}$$

Where:

D_{iT} and D_{mT} are as defined earlier, and

a_i, and b_i are regression coefficients

c. $\hat{\delta}_{iT}$ is obtained by regressing the change in dividends in year T on current and prior year's earnings and on prior year's dividends. This model is shown below as equation 7.

Equation 7 will also be referred to as the Fama-Babiak dividend model. It is a form of a dividend determination model introduced by Lintner (32). Fama and Babiak (17) tested several forms of the Lintner model, including equation (7), for the years 1946-64. Equation 7 was ". . the best predictive form of the model . . "[5]

The model was estimated as follows:

$$\Delta D_{iT} = \beta_{1i} D_{i,T-1} + \beta_{2i} E_{iT} + \beta_{3i} E_{i,T-1} + \hat{d}^3_{iT} \qquad \text{(Equation 7)}$$

Where:

$\Delta D_{iT} = D_{iT} - D_{i,T-1}$

β_{1i}, β_{2i}, β_{3i} are regression coefficients

$\hat{d}^3_{iT}$ is estimated by an OLS regression of Equation 7. This estimated error term is interpreted as the unexpected change in dividends in year T given earnings of year T. Alternatively, $\hat{d}^3_{iT}$ is considered the dividend information variable in that it should reflect the information contained in dividends over and above that contained in earnings.

That is, $\hat{d}^3_{iT}$ should represent that portion of the information contained in the change in dividends that is not contained in current or last period earnings, or in last period dividends. Thus $\hat{d}^3_{iT}$ and E_{iT}

5 Watts (49), p. 199.

should be uncorrelated.

$\hat{d}^3_{iT}$ and $\hat{e}^2_{iT}$ are used in Version 3 of this basic statistical model (Equation 1). Because $\hat{d}^3_{iT}$ excludes, by construction, the linear information contained in current earnings, multi-collinearity should be a minor problem in running this version of the basic statistical model.

Multicollinearity will be more of a problem in Versions 1 and 2 which use information variables that, by construction, do not consider the concurrent effects of each other. This problem is discussed further below.

A key criticism of Watts (49) discussed in the previous chapter, concerns his use of the API statistic. The dividend information variable, $\hat{d}^3_{iT}$ is used in this study to determine whether or not the current methodology yields different results.

d. Statistical Evaluation of $\hat{d}^2_{iT}$ versus $\hat{d}^3_{iT}$:

The information variables described above all resulted from the comparison of the ex post value of dividends or earnings with the expected values of dividends or earnings. Both Versions two and three use expectations models based upon knowledge of reported financial statement data.

Lintner (32) states that, "Earnings were always present as a major factor and most generally dominated the decision whether or not to change the rate, . . ."[6] This tends to support his specification of

6 Lintner (32), p. 108.

the dividend determination model (equation 7).

On the other hand, this specification does not consider market wide factors explicitly, as does the market index version. Lintner (32) also suggests that there was some evidence of "follow-the leader behaviour or pseudo fashions in payment of extras . . " 7 This suggests that a specification of a dividend determination model where dividends include both regular and extra dividends should include a market, or at least an industry factor. The market index version (Equation 5(b)) does this.

While all three versions use dividend information variables that are proxies for the market's expectations at time T-1 of the realized value of these variables at time T, only $\hat{d}^2_{iT}$ and $\hat{d}^3_{iT}$ are directly comparable. Both of these variables are estimated using information available through time T while Version 1 (Value Line) uses information available only through time T-1.

The dividend information variable from versions two and three are compared, using the methodology outlined below, for the purpose of deciding which model is the most accurate expectations model. That is, the mechanical model which is most accurate at time T may be the most appropriate of the two mechanical models as a proxy of market expectations at time T-1.

The forecast errors generated by equations 5(b) and 7 can be arranged into matched pairs, such that $|\hat{d}^2_{iT}| < |\hat{d}^3_{iT}|$ implies that $\hat{d}^2_{iT}$ is preferred to $\hat{d}^3_{iT}$ in terms of the magnitude of absolute error.

A two-tailed Wilcoxon matched-pairs signed-ranked test is used to

7 Lintner (32), p. 102.

compare these error distributions. This test considers not only the direction of the differences within pairs, but also the size of the differences, in that it gives more weight to a pair that shows a large difference than it does to a pair showing a smaller difference. As there if no theory to suggest that one variable definition is superior to another, a two-tailed test is used.

The procedure used is as follows:

Define $$W^2_{iT} = \frac{\left|\hat{d}^2_{iT}\right|}{\left|D_{iT}\right|}$$

$$W^3_{iT} = \frac{\left|\hat{d}^3_{iT}\right|}{\left|D_{iT}\right|}$$

as the relative absolute dividend error using the market index model (W^2_{iT}) and the Fama-Babiak model (W^3_{iT}) for firm i in year T. Then, the hypothesis tested is:

H_0: $W^2_{iT} = W^3_{iT}$ $\quad$ i = 1, 2, . . . 202

H_1: $W^2_{iT} \neq W^3_{iT}$

This test is conducted over all firms in a given year, and also over all firms over all years. Because the test is a cross-sectional test, each error term is standardized so that the levels of dividends do not affect the results. Thus relative error is used. For this reason, all firm/years in which $D_{iT} = 0$ are deleted. Because the rest of the procedures in this study do not make cross-sectional comparisons, this standardization procedure is not necessary in subsequent analytical steps in this study.

Basic Statistical Model

The basic statistical model (Equation 1) is reproduced here for convenience along with various versions referred to above. A summary of all notation and of equations used can be referenced in Appendix 2.

Basic Model

$$CR_{iT} = \alpha_{0i} + \alpha_{1i}\varepsilon_{iT} + \alpha_{2i}\delta_{iT} + \omega_{iT} \qquad \text{(Equation 1)}$$

Where:

α_{oi}, α_{1i}, α_{2i} are model parameters

ε_{iT} = Earnings information variables for firm i, year T

δ_{iT} = Dividend information variable for firm i, year T

ω_{iT} = Disturbance term for firm i for year T.

Version 1 (Value Line or Analyst Forecast Version)

$$CR_{it} = \alpha_{0i} + \alpha_{1i}\hat{e}^{1}_{iT} + \alpha_{2i}\hat{d}^{1}_{iT} + \omega_{iT} \qquad \text{(Equation 1.1)}$$

Where:

$\hat{e}^{1}_{iT}$ = Estimates of earnings information variable for version 1, for firm i for year T

$\hat{d}^{1}_{iT}$ = Estimates of dividend information variable for version 1, for firm i for year T

Version 2 (Market Index Version)

$$CR_{it} = \alpha_{0i} + \alpha_{1i}\hat{e}^{2}_{iT} + \alpha_{2i}\hat{d}^{2}_{iT} + \omega_{iT} \qquad \text{(Equation 1.2)}$$

Where:

$\hat{e}^{2}_{iT}$ = Estimate of earnings information variable for version 2, for firm i for year T

$\hat{d}^{2}_{iT}$ = Estimate of dividend information variable for version 2, for firm i, for year T

Version 3 (Fama-Babiak Version)

$$CR_{iT} = \alpha_{0i} + \alpha_{1i}\hat{e}^2_{iT} + \alpha_{2i}\hat{d}^3_{iT} + \omega_{iT} \quad \text{(Equation 1.3)}$$

Where:

$\hat{d}^3_{iT}$ = Estimate of dividend information variable for version 3, for firm i, for year T

The parameter values and error terms will differ between versions for firm i, but as confusion is unlikely at this point, a version identifier is not included.

The basic statisical model postulates a linear relationship between the abnormal return for year T and the unexpected amount of both earnings per share and dividends per share during year T.

Most information content studies to date, including the three major ones examining the dividend question, have drawn inferences on the population as a whole by computing an average CR_{iT}. That is, a statistic similar to $1/n\Sigma_i CR_{iT}$ is determined. The statistic is often referred to as the cumulative average residual or error (CAE), or in a slightly different form as the Abnormal Perforance Index (API).

The API is argued to be a metric that measures the association between abnormal security returns and an information variable.

Marshall (35) argues, and in fact demonstrates through an example that the API's value as a measure of association between abnormal security returns and an information variable depends upon the joint distribution of abnormal returns and the information variable in question. This joint distribution may be different for each firm.

The API, however, is a summary statistic that averages across firms. Thus, because of the possible differences between firm distributions, a researcher using this approach may find that the effects he is looking for are disguised or lost in the summary statistics (i.e. the API).

The methodology employed in this study allows for the possibility that the relationship between abnormal returns and the information variables (dividends and earnings) may be different for different firms. Each firm is treated as a separate case. That is, the basic stastical model is run for each firm and evaluative statistics on each run are computed. Whereas in computing the API, model output is averaged across firms, in the current methodology aggregation of output does not take place. There is, however, aggregation of the evaluative statistics, as is described below.

This disaggregated approach is not without its costs, however. There are a maximum of nineteen observations per firm, so the resulting firm specific regression parameters may be subject to substantial error. The effects of such error should, however, be lessened by the final aggregation of the evaluative statistics.

Another difference between this methodology and many prior studies which have used the API is in the use of the information variables (forecast errors). Much previous research used only the sign of the forecast errors. For example, Ball and Brown (4) calculated API values for firms having negative earnings forecast errors and for firms having positive earnings forecast errors, and drew conclusions from the relative size of these values.

The approach used in this study and based on the work by Magee (24) allows for the use of the size as well as the sign of the forecast errors. Thus, more of the potential information is used than is used in studies utlilizing only the sign of the forecast errors.

OLS regressions are run for each firm in the sample, for the three versions of dividend and earnings variables described earlier. The explanatory power of the independent variables as a whole is tested for each firm. The individual regression coefficients, however, cannot be used to test the hypothesis that the dividend variable is a significant explanatory variable because there are potential problems in both the estimation and interpretation of the coefficients.

Both of these problems arise from the expected correlation between ε_{iT} and δ_{iT}. The interpretation problem arises because when multicollinearity is present each regression coefficient could be statistically not significant even though a statistical relationship exists between CR and the set of independent variables. Thus failure to reject the hypothesis that $\alpha_{1i} = 0$ and $\alpha_{2i} = 0$ (i.e. testing the coefficients individually) could be accompanied by rejection of the overall relationship hypothesis that $\alpha_{1i} = \alpha_{2i} = 0$ against the alternative that not all $\alpha_{ji} = 0$ (j = 1, 2). Thus failure to reject:

H_0: $\alpha_{2i} = 0$

would not necessarily mean rejection of the dividend information hypothesis.

The problem of estimation is potentially much greater than the interpretation problem. If multicollinearity is severe the coefficients will tend towards indeterminacy and thus interpretation will not even arise. The precision of the estimates of the regression coefficients is further aggravated by the small sample size (n = 19 years).

Therefore, each set of regression results is examined to decide whether they are sufficiently precise to be useful. The severity of the problem is evaluated based on a rule suggested by Dutta (14). This rule states that multi-collinearity is severe if:

$$r_{\varepsilon\delta} > R_{CR}$$

where $r_{\varepsilon\delta}$ is the zero-order correlation between the independent variables ε_i and δ_i, and R_{CR} is the multiple correlation coefficient between the dependent variable, CR, and the set of independent variables.[8]

The rationale behind such a rule is that "inter-correlation or multicollinearity is not necessarily a problem unless it is high relative to the over-all degree of multiple correlation among all

8 Dutta (14), p. 150.

variables simultaneously.[9]

Interpretation of Regression Coefficients

The results of the above procedures will indicate whether interpretation problems will be present. It is expected, however, that multicollinearity will be present, to some degree, in most forms. If this is so, then one information variable can be expressed as a linear combination of the other.

Using the general information variable notation from the basic statistical model (Equation 1), the following relationship can be expressed.

$$\delta_{iT} = b_{oi} + b_{1i}\varepsilon_{iT} + Z_{iT} \qquad \text{(Equation 8)}$$

Where:

b_{oi}, b_{1i} are model parameters

Z_{iT} = error term

A new set of variables is then defined where:

$\varepsilon_{iT} = \varepsilon_{iT}$

$Z_{iT} = \delta_{iT} - E(\delta_{iT})$

9 Klein (30), p. 101.

Where Z_{iT} is the residual from the prediction equation (8). If ε_{iT} and δ_{iT} are perfectly correlated then there will be, of course, no residual (Z_{iT}) and no marginal explanatory power to either independent variable over the other.

If ε_{iT} and δ_{iT} are less than perfectly correlated, however, then Z_{iT} represents that part of δ_{iT} from which ε_{iT} has been partialled out. Z_{iT} is referred to as the marginal dividend information variable. It can be shown that the coefficient of correlation between ε_{iT} and the transformed variable, Z_{iT} is zero.[10]

That is, $r_{\varepsilon z} = 0$ since the linear information on ε_{iT} has been removed from δ_{iT} and is therefore not included in Z_{iT}.

Version specific forms of equation 8 are as follows:

VERSION 1 (Value Line or Analyst Forecast Version)

$$d^1_{iT} = b_{oi} + b_{1i}e^1_{iT} + z^1_{iT}$$

(Equation 8.1)

Where:

z^1_{iT} = Transformed dividend information variable for Version 1, for firm i, for year T.

VERSION 2 (Market Index Version)

$$d^2_{iT} = b_{oi} + b_{1i}e^2_{iT} + z^2_{iT}$$

(Equation 8.2)

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10 Winer (51), p. 127.

Where:

z^2_{iT} = Transformed dividend information variable for Version 2, for firm i, for year T.

VERSION 3 (Fama-Babiak Version)

$$d^3_{iT} = b_{0i} + b_{1i}e^2_{iT} + z^3_{iT} \quad \text{(Equation 8.3)}$$

Where:

z^3_{iT} = Transformed dividend information variable for Version 3, for firm i, for year T.

Transformed Basic Statistical Model

A revised basic statistical model is then formulated using the transformed dividend information variable, Z_{iT}. This new model is expressed as:

$$CR_{iT} = \alpha_{oi} + \alpha_{1i}\varepsilon_{iT} + \alpha_{2i}Z_{iT} + v_{iT}$$

(Equation 9)

Where:

v_{iT} = error term

As the transformation is performed on the dividend information variable in all three versions, there will correspondingly be three versions of equation 9. These three versions are:

Version 1 (Value Line or Analyst Forecast Version)

$$CR_{iT} = \alpha_{0i} + \alpha_{1i}\hat{e}^{1}_{iT} + \alpha_{z^1i}\hat{Z}^{1}_{iT} + V_{iT} \qquad \text{(Equation 9.1)}$$

Where:

α_{z^1i} = The regression coefficient of the transformed dividend information variable for version 1 for firm i.

Version 2 (Market Index Version)

$$CR_{iT} = \alpha_{0i} + \alpha_{1i}\hat{e}^{2}_{iT} + \alpha_{z^2i}\hat{Z}^{2}_{iT} + V_{iT} \qquad \text{(Equation 9.2)}$$

Where:

α_{z^2i} = The regression coefficient of the transformed dividend information variable for version 2 for firm i.

Version 3 (Fama-Babiak Version)

$$CR_{iT} = \alpha_{0i} + \alpha_{1i}\hat{e}^{2}_{iT} + \alpha_{z^3i}\hat{Z}^{3}_{iT} + V_{iT} \qquad \text{(Equation 9.3)}$$

Where:

α_{z^3i} = The regression coefficient of the transformed dividend information variable for version 3 for firm i.

The other parameter and error term values will differ between versions for firm i, but as confusion is unlikely at this point, a version subscript is not included.

$\hat{z}^1{}_{iT}$, $\hat{z}^2{}_{iT}$ and $\hat{z}^3{}_{iT}$ are estimates of the marginal dividend information variables. They are the residuals from OLS regressions on equations 8.1, 8.2, and 8.3 respectively.

The regression coefficients from the three versions of equation 9 can now be interpreted. Specifically, α_{zi} can be interpreted as a measure of the contribution of that part of δ_{iT} from which the linear information of ε_{iT} has been removed. This can be interpeted as an indication of the marginal effect of adding dividends to the model.

The hypothesis tested is:

H_0: $\alpha_{zi} = 0$

H_1: $\alpha_{zi} \neq 0$

Rejection of the null supports the hypothesis that dividends contain information other than that contained in earnings. This test is performed for each firm, for each version. Thus, to be more precise, version specific notation is now adopted for the dividend coefficient from equation 9. Thus, there are three hypotheses to be tested, namely:

Version 1 $H_0: \alpha_{z}1_i = 0$

$H_1: \alpha_{z}1_i \neq 0 \quad i = 1, \ldots, 202$

Version 2 $H_0: \alpha_{z}2_i = 0$

$H_1: \alpha_{z}2_i \neq 0 \quad i = 1, \ldots, 202$

Version 3 $H_0: \alpha_{z}3_i = 0$

$H_1: \alpha_{z}3_i \neq 0 \quad i = 1, \ldots, 202$

Cross Sectional Analysis

The output of the above is up to 202 $t(\alpha_{zi})$ statistics for each version. It is possible that $t(\alpha_{zi})$ for a given firm, for a given version could not reflect the true relationship due to sampling error, since the number of observations per firm is only nineten. The purpose of this study is to draw conclusions on whether dividends contain information over and above that contained in earnings in general.

Therefore, at this point in the study some across firm analysis must be performed. If n = the number of firms in the sample then for each version k (k = 1, 2, 3), there will be n X $t(\alpha_{zk_i})$ statistics generated. If there is no relationship between unexpected security price changes and we would expect the n values of t( ) to be distributed according to a student's t distribution with (19 - 3 = 16) degree of freedom. That is we would expect n 4 t values in each of the following ranges:[11]

(df = 16)		t	≤	−.69
	−.69	≤ t	≤	0
	0	≤ t	≤	.69
	.69	≤ t		

The observed frequencies of t statistics falling into each category can be compared to the theoretical frequency (i.e. n 4). A Chi Square goodness of fit test is used to test whether the observed and expected frequencies are equal.[12] Rejection of this in favor of the alternative hypothesis that the number of positive t statistics exceeds the expected number of positive t statistics will be interpreted as support for the dividend information hypothesis.

11 Winer (51), p. 863.
12 Siegel (47), p. 42.

IV. INPUTS TO THE BASIC STATISTICAL MODEL

In this chapter the set of firms making up the sample is disclosed and reconciled to available firms. The results of the procedures used to estimate and isolate the information variables are presented and analysed. The estimates of the parameters of the two factor asset pricing model are presented and discussed.

During the study period of 1956 through 1975, 202 firms satisfied the criteria for selection stated in Chapter III. The effect of the selection criteria on the sample size is given in Table 1.

Table 2 shows the distribution of firms in the sample by major industry group. The sample is clearly dominated by firms in the manufacturing industry. There are, however, thirty-five firms in other industries.

Within major industry groups, no individual industry dominates the sample. Table 3 shows the distribution of firms by industry group for those groups containing three or more sample firms. Seventy-three industry groups are represented in the sample.

Information Variables for the Index Version

1. Earnings Information Variable

An accounting earnings index was constructed from the reported annual per share earnings of the firms in the sample. That is, the market index of earnings per share in year T is the sum of the reported year T earnings per share over the 202 firms in the sample divided by 202.

An initial regression of earnings per share (E_{iT}) against the constructed index (E_{mT}) showed, as expected, that the residuals are severely auto-correlated. Thus, first differences were used. This resulted in a loss of an observation, but the autocorrelation problem was less severe.

Because the market index of earnings per share is a weighted average of earnings per share of a group of firms that includes the sample firm, the assumption that the error term is independent of independent variable is violated somewhat. However, as a single firm should have little impact on the index, this violation should not be serious. The effect will be, however, to bias the residuals toward zero slightly. Thus a small portion of the linear information on firm specific earnings per share contained in market earnings per share will not be contained in the residual from the regression that was used to define information content. The regression equation used was:

$$\Delta E_{iT} = a_i + b_i \Delta E_{mT} + \hat{e}^2_{iT} \qquad \text{(Equation 5a)}$$

Where:

$\Delta E_{iT} = E_{iT} - E_{i,T-1}$

E_{iT} = Annual earnings per share for firm i for year T

a_i, b_i = regression coefficients

$\hat{e}^2_{iT}$ = residual (i.e. earnings information variable for firm i for

TABLE 1

Effects of Selection Criteria on Sample Size

CRSP firms with continuous data from month 249 (January 1947), covered by Value Line Data Services since 1955	437
Less: Firms having other than December 31 Year ends	150
	287
Less: Firms not on COMPUSTAT tape	85
Sample Size (Number of Firms)	202

TABLE 2

Distribution of Firms in the Sample by Major Industry Group

Major Industry Group	SEC Codes	Number of Firms
Mining	100 - 149	10
Manufacturing	150 - 399	171
Transportation	440 - 471	9
Utilities	481 - 507	4
Retail	533 - 566	5
Other	614 - 999	3
Total		202

TABLE 3

Distribution of Firms by Industry Group

Industry Group	Number of Firms
100	3
208	5
211	4
230	3
260	5
280	13
283	6
289	3
291	15
295	4
300	3
322	4
331	12
333	4
335	3
353	4
356	5
357	4
360	3
371	12
372	5
386	3
451	7
541	3
Firms in groups with two or less	69
Total	202

year T)

$$\Delta E_{mT} = E_{mT} - E_{m,T-1}$$

$$E_{mT} = \frac{1}{N} \sum_{i=1}^{N} E_{iT} \qquad T = 1956, \ldots, 1975$$

Regressions of equation 5(a) were run over the test period (T = 1956 through 1975) for all firms in the sample. The estimated residuals ($\hat{e}^2_{iT}$) were computed and stored for use in steps 5, 6 and 7.

Each regression (i.e. for each firm in the sample) produced nineteen estimated residuals. The cross-sectional distributions of the estimates from the 202 regressions were computed and are displayed in Table 4. The reason that cross-sectional statistics are shown in various tables throughout this chapter is that any serious departures from the regression assumptions that affect a significant number of firms should be disclosed in the cross-sectional statistics. Of course, this leaves open the possibility that there could be serious departures by some firms in the sample that would not be detected if the cross-sectional statistics alone are examined. Thus, individual firm regression results were also examined for all procedures in this study. Also, the extreme values of cross-sectional distributions are displayed in Table 4 for this very reason.

An examination of Table 4 would seem to indicate that this particular model is not a particularly strong model in terms of explanatory power. The average R^2 of 0.253 is significant at 0.1 but is not particularly high. Mean α and mean β are, by construction, equal to 0 and 1 respectively. However, the standard errors of these parameters are large, especially that of α. This could be due to the relatively small sample size of 19 observations per regression run.

2. Dividend Information Variable

The dividend information variable for the index version was obtained from a regression of annual cash dividend per share change against a constructed market index of dividends per share change. The regression equation used was:

$$\Delta D_{iT} = a_i + b_i \Delta D_{mT} + \hat{d}^2_{iT} \qquad \text{(Equation 5b)}$$

Where:

$\Delta D_{iT} = D_{iT} - D_{i,T-1}$

D_{iT} = Annual dividend per share (including extras) for firm i for year T

$a_i b_i$ = regression coefficients

$\hat{d}^2_{iT}$ = residual (i.e. dividend information variable for firm i for year T)

$\Delta D_{mT} = D_{mT} - D_{m,T-1}$

$$D_{mT} = \frac{1}{N} \sum_{i=1}^{N} D_{iT} \qquad T = 1956, \ldots, 1975$$

The cross-sectional distribution of relevant statistics for this step are displayed on Table 5. The results shown in Table 5 indicate that, as with the earnings index model, the dividend index model is not particularly strong in terms of explanatory power.

TABLE 4

Cross-Sectional Distribution of Ordinary Least-Squares
Estimates of the Market Earnings Index Model
(T = 1956, . . ., 1975; n=202)

				Fractile Values of the Cross-Sectional Distribution of P					
P	$\bar{P}$	Median	$\sigma(\bar{P})$	Low	.20	.40	.60	.80	High
R^2	0.253	0.234	0.194	0.000	0.053	0.148	0.330	0.438	0.729
t(a)	23.866	0.926	79.901	-21.255	-2.443	0.457	2.949	18.575	627.684
b	1.000	0.742	1.052	-0.792	0.139	0.462	0.975	1.821	5.189
t(b)	2.237	2.277	1.657	-1.720	0.692	1.719	2.893	3.636	6.771
F	7.727	5.183	8.038	0.000	0.942	2.959	8.367	13.223	103.897
ρ_1	-0.114	0.133	0.284	-0.788	-0.348	-0.197	-0.074	0.118	0.780

Regression Equation: $\Delta E_{iT} = a_i + b_i \Delta E_{mT} + \hat{e}^2{}_{iT}$ (Equation 5(a))

TABLE 5

Cross-Sectional Distribution of Ordinary Least-Squares
Estimates of the Market Dividend Index Model
(T = 1956, . . ., 1975; n=202)

P	$\bar{P}$	Median	$\sigma(\bar{P})$	Fractile Values of the Cross-Sectional Distribution of P: Low	.20	.40	.60	.80	High
R^2	0.193	0.171	0.146	0.000	0.043	0.117	0.233	0.334	0.584
t(a)	140.916	28.729	265.299	-122.235	-15.346	2.697	70.783	256.669	1632.314
b	1.000	0.590	1.236	-2.087	0.174	0.450	0.778	1.680	6.475
t(b)	1.801	1.873	1.274	-1.524	0.777	1.484	2.270	2.920	4.882
F	4.861	3.507	4.584	0.001	0.760	2.249	5.155	8.524	23.831
ρ_1	0.127	0.125	0.286	-0.630	-0.093	0.064	0.177	0.347	0.893

Regression Equation: $\Delta D_{iT} = a_i + b_i \Delta D_{mT} + \hat{d}^2_{iT}$ (Equation 5(b))

Information Variables for the Fama Babiak Version

1. Earnings Information Variable

The earnings information variable used in this version is the same variable used in version 1, the residuals from a time series OLS regression of annual earnings per share change on annual earnings per share index change.

2. Dividend Information Variable

Annual dividends per share change was regressed against current annual earnings per share, and against the prior year's earnings per share and dividends per share. The residuals from this regression (Equation 7) were computed and stored for use in subsequent steps. These residuals ($\hat{d}^3_{iT}$) can themselves be considered marginal information variables. That is, because current earnings are included in the equation, the residual should contain information on the unexpected dividend change given current earnings. These residuals were the dividend information variables used by Watts (49).

For each firm in the sample, nineteen residuals were computed (T = 1957 through 1975). The individual statistics on each of the 202 regression runs were examined to check for serious violations of the assumptions of the model. There did not appear to be any serious problems. Again, there is a problem in summarizing this data in a useable or meaningful form. This study examines individual firms over time and the tests for information content do not use cross-sectional data.

However, cross-sectional statistics may provide some rough measure of the aptness of the model. The cross-sectional distribution of the estimates and relevant statistics are shown in Table 6. Examination of Table 6 supports this specification of a dividend model. The independent variables having the most explanatory power are, as expected, current earnings and past dividends. The significance of past dividends in this model supports the proposition that firms follow a policy of dividend stabilization.

The overall relationship between dividend change and the independent variables is strong. The Durbin-Watson test for autocorrelation was used to test whether or not the residuals from this model are independent. The test statistic exceeded the upper bound for $\alpha = .01$. The proposition that the residuals are positively correlated must be rejected.

Comparison of Index and FB Dividend Variables

The dividend forecast errors for versions two and three were directly compared using a Wilcoxon matched-pairs signed-ranks test. Because this test uses both the sign of the difference between two matched observations and the size of that difference, and, because the differences are then ranked across all firms, the forecast errors had to be standardized to take level differences into account.

TABLE 6

Cross-Sectional Distribution of Ordinary Least-Squares Estimates of the Fama-Babiak Model (T=1956, . . . 1975)

				Fractile Values of the Cross-Sectional Distribution of P					
P	$\bar{P}$	Median	$\sigma(\bar{P})$	Low	.20	.40	.60	.80	High
R^2	0.615	0.615	0.212	0.113	0.401	0.568	0.691	0.821	0.990
β_1	-0.291	-0.273	0.220	-1.086	-0.453	-0.327	-0.236	-0.115	13.980
$t(\beta_1)$	-1.930	-1.93	1.836	-6.550	-3.02	-2.28	-1.60	-0.84	13.980
β_2	0.239	0.223	0.157	0.002	0.086	0.174	0.277	0.375	0.732
$t(\beta_2)$	5.431	4.02	5.129	-0.180	2.29	3.20	4.85	7.06	38.25
β_3	-0.104	-0.084	0.172	-0.593	-0.253	-0.129	-0.044	0.034	0.239
$t(\beta_3)$	-1.210	-1.11	2.268	-9.120	-3.11	-1.59	-0.56	0.69	3.99
ρ_1	0.009	0.012	0.204	-0.633	-0.146	-0.040	0.056	0.151	0.574

Regression Equation: $\Delta D_{iT} = \beta_{1i} D_{i,T-1} + \beta_{2i} E_{iT} + \beta_{3i} E_{i,T-1} + \hat{d}^{3}_{iT}$ (Equation 7)

The dividend forecast errors from the two versions were standardized by dividing the error for year T by the actual dividend for year T. Thus for each firm in the sample and for each year T = 1957, . . . , 1975, the following statistic was computed:

$$W_{iT} = W^3_{iT} - W^2_{iT}$$

Where:

$$W^3_{iT} = \left|\frac{\hat{d}^3_{iT}}{D_{iT}}\right|$$

$$W^2_{iT} = \left|\frac{\hat{d}^2_{iT}}{D_{iT}}\right|$$

$\hat{d}^3_{iT}$ = residual from equation 7

$\hat{d}^2_{iT}$ = residual from equation 5(b)

The hypothesis tested was:

H_0: $W^3_{iT} = W^2_{iT}$

H_1: $W^3_{iT} = W^2_{iT}$

or alternatively:

H_0: $W_{iT} = 0$

H_1: $W_{iT} \neq 0$

An alternative method of standardizing the dividend forecast errors was considered and subsequently rejected. This alternative was to divide the forecast error for year T by the actual dividend change for year T. Because of the observed policy of dividend stabilization, however, it was expected that a large number of firm/years would have dividend changes equal to zero.

Table 7 shows the distribution of zero dividend changes across years. Of the 202 firms at 19 years, or 3,838 possible firm/year dividend changes, 1,533 had dividend changes equal to zero. The use of ΔD_{iT} as the deflator, then, would have had resulted in the loss of 1,533 observations.

Table 7 demonstrates a rather dramatic non-uniformity in the distribution of zero dividend changes over the study period. A simple chi-square test of homogeneity was conducted and, as can be seen on Table 7, the proposition that the distribution was uniform was rejected.

This result would seem to indicate that there is a market wide factor influencing dividend changes, a factor not controlled for in the Version 3 (Fama-Babiak) model. The index model of version 2 may, by its construction, control for this factor to some extent.

Table 8 summarizes the frequency of zero dividend changes across sample firms. The proposition of dividend stability is supported by this table. There were no firms that changed dividends every year or even every year but one. On average, firms changed dividends somewhat less than twelve times during the nineteen year study period.

Because dividends per share (and earnings per share) are adjusted for stock dividends to 1975, the number of changes may be "overstated"

TABLE 7

Distribution of Zero Dividend Changes over T (T - 1956, . . . , 1975) N = 202

YEAR	No. of Firms With Zero Changes	% of Sample With Zero Changes
1957	65	32.2
1958	83	41.1
1959	100	49.5
1960	84	41.6
1961	81	40.1
1962	114	56.4
1963	102	50.1
1964	86	42.6
1965	62	30.7
1966	50	24.8
1967	35	17.3
1968	73	36.1
1969	87	43.1
1970	77	38.1
1971	97	48.0
1972	124	61.4
1973	92	45.5
1974	60	29.7
1975	40	19.8
Means	79.6	40.0

Note: The null hypothesis that the observed number of firms equals the expected number (i.e. the mean of 79.6) was tested using a χ^2 one sample test. The null was rejected at $\alpha < .001$ ($\chi^2 = 126.24$).

TABLE 8

Frequency of Zero Dividend Changes Across Sample

Number of years with no change	Number of Firms	Percent of Firms	Cumulative Percent
0	5	2.48	2.48
1	9	4.46	6.93
2	5	2.48	9.41
3	8	3.96	13.37
4	14	6.93	20.37
5	21	10.40	30.77
6	16	7.92	38.69
7	27	13.37	52.21
8	23	11.39	63.60
9	14	6.93	70.53
10	22	10.89	81.14
11	12	5.94	87.08
12	6	2.97	90.05
13	5	2.48	92.53
14	8	3.96	96.49
15	3	1.49	97.98
16	1	0.50	98.48
17	3	1.49	100.00
18	0	0.00	100.00
19	0	0.00	100.00
	202	100.00%	

Mean number of years = 7.49 years of zero change.

in this table. That is, management may feel that a cash dividend in a period following a stock dividend is not an increase if the pre and post stock dividend amounts per share remain unchanged. This table, and this study, would, of course, treat this as an increase in dividends.

Table 9 summarizes the results of the Wilcoxon matched-pairs signed-ranks test described above. The test is conducted for each year of the study period.

Note that the negative ranks exceed the positive ranks in all but one year (1973) indicating superiority of the residuals from the Fama Babiak model. The null hypothesis, stated above, is rejectd at $\alpha = .01$ in twelve of the nineteen years, and at $\alpha = 0.10$ in 14 of the 19 years. The null cannot be rejected in the years 1961, 1962, 1964, 1969 and 1973.

While those years in which the null cannot be rejected do seem to average fewer zero changes than the others (68 versus 79.6 - see Table 7) there does not seem to be any obvious reason why these years would differ. Nevertheless, as far as the size of the relative error, the dividend information variables from the Fama Babiak version appear to be better, in general, than those from the Index model. These findings suggest that the subsequent analysis using Version 3 (i.e. Fama Babiak) should provide more discriminating results than analysis using Version 2 (Index).

TABLE 9

Wilcoxon Matched-Pairs Signed-Ranks Test of Dividend Forecast Errors from the Market Index Version 2 ($\hat{d}^2_{iT}$) with Dividend Forecast Errors from the Fama Babiak Version 3 ($\hat{d}^3_{iT}$).

YEAR	NUMBER OF NEGATIVE RANKS*	NUMBER OF POSITIVE RANKS*	z	$P(\hat{d}^2_{iT} = \hat{d}^3_{iT} \mid z)$
1957	128	69	-6.150	0.000**
1958	127	70	-3.963	0.000
1959	128	68	-5.136	0.000
1960	108	86	-2.423	0.015
1961	102	94	-9.553	0.580
1962	101	93	-1.188	0.235
1963	117	76	-2.872	0.004
1964	104	90	-1.425	0.151
1965	110	87	-2.834	0.005
1966	118	81	-3.233	0.001
1967	115	86	-2.401	0.016
1968	119	80	-2.498	0.012
1969	105	94	-0.593	0.553
1970	113	85	-2.654	0.008
1971	121	71	-4.676	0.000
1972	109	79	-3.317	0.001
1973	89	98	-0.799	0.424
1974	109	79	-2.648	0.008
1975	126	66	-4.289	0.000

*A positive rank occurs when $|\hat{d}^3_{iT}| - |\hat{d}^2_{iT}| > 0$

A negative rank occurs when $|\hat{d}^3_{iT}| - |\hat{d}^2_{iT}| < 0$

Thus, a negative value for z implies superiority of $\hat{d}^3_{iT}$

**Probability is less than 0.0005.

Information Variables for the Value Line Version

1. Earnings Information Variable:

Published reports by Value Line Data Services (VL) of New York were the source of both the annual earnings and annual dividend forecasts. For each firm for each of the years 1956 through 1975, the VL report that displayed the first forecast of the current year's annual earnings subsequent to disclosure of actual earnings for the preceding year was used. In most cases, therefore, the earnings forecast for year T was found in a VL publication released in the first three months of year T.

It is important that a particular forecast, of the four published by VL per company, be chosen. It is this forecast that is expected to serve as a proxy for the market's earliest expectations of year T earnings conditional upon knowledge of reported earnings of year T-1.

As these per share numbers come from reports actually published at various dates during the study period, they required adjustment. That is, the earnings variable specified in equation 6(a) requires forecasted and actual earnings per share to be additive. Thus, these forecast numbers were divided by an adjustment factor to reflect stock dividends and splits. This factor was taken from the COMPUSTAT tapes. The resulting adjusted earnings per share forecast numbers were used in equation 6(a) to generate the Version 1 earnings variable.

2. Dividend Information Variable:

The dividend information variable was obtained and adjusted in the same way as the earnings information variable. The dividend forecast used, however, was the one disclosed in the same VL issue as the earnings forecast selected above.

This last point is mentioned because actual dividends for year T-1 may be known before actual earnings for year T-1 are known (or disclosed). Thus the dividend forecast used may be the second one published on year T dividends subsequent to the disclosure of year T-1 dividends. However, it will be the first forecast available that is conditioned on both earnings and dividends for year T-1.

These adjusted forecasts of dividends per share are used in equation 6(b) to generate the Version 1 dividend variables.

Estimation of β

For each firm in the sample, ordinary least squares regressions of equation 3(a) were run over each estimation period to obtain .
$\beta_{i,T-1}$ was subsequently used during the prediction period T. Equation 3(a) is reproduced below.

$$R_{iT} - \hat{a}_{0t} = \hat{a}_{it}\beta_i + u_{it} \qquad \text{(Equation 3(a))}$$

$\hat{a}_{ot}$, the estimate of R_{zt}, the rate of return on the efficient portfolio whose return is uncorrelated with the return on the market portfolio, is a cross-sectional statistic (across all NYSE firms) and thus once estimated for month t it need not be reestimated in subsequent studies where the sample firms are drawn from those of the NYSE. The same holds for $\hat{a}_{1t}$, the estimates of R_{mt} the rate of return on the market portfolio during period t. $\hat{a}_{ot}$ and $\hat{a}_{1t}$ for t = January 1941 through December, 1975 were obtained from Michael Rozeff, The University of Iowa.

The estimation period is defined as 72 months immediately preceding the prediction period. Thus for prediction period T=1, the estimation period is April, 1949 through March, 1956. The corresponding prediction period for T=1 (1956) is April, 1956 through March, 1957. That is, the prediction period for year T includes the first three months of year T+1.

Table 10 shows the means of the $\hat{\beta}_{i,T-1}$'s, the annual change in these estimates plus the percentage annual change.

The first column represents the prediction period year T and the mean $\hat{\beta}_{i,T-1}$ corresponding to that year. Thus, for example, for T = 1964 the prediction period is April, 1964 through March, 1965 and the estimation period is the 72 months ended march, 1964. The entries in the rows are the $\bar{\hat{\beta}}_{i,T-1}$ corresponding to the year T in the first column.

An inspection of Table 10 and of Figure 1 reveals that $\bar{\beta}_{T-1}$ decreased somewhat over the study period. The overall decrease was 0.030370 over the twenty years for a percent decrease of 3.21613%. This, however, understates the movement of these mean estimates during the period. The highest value for β occurred during the estimation period ending March, 1957, where the mean estimate was 0.992682 while the lowest value was for the estimation period ending March, 1975, where

TABLE 10

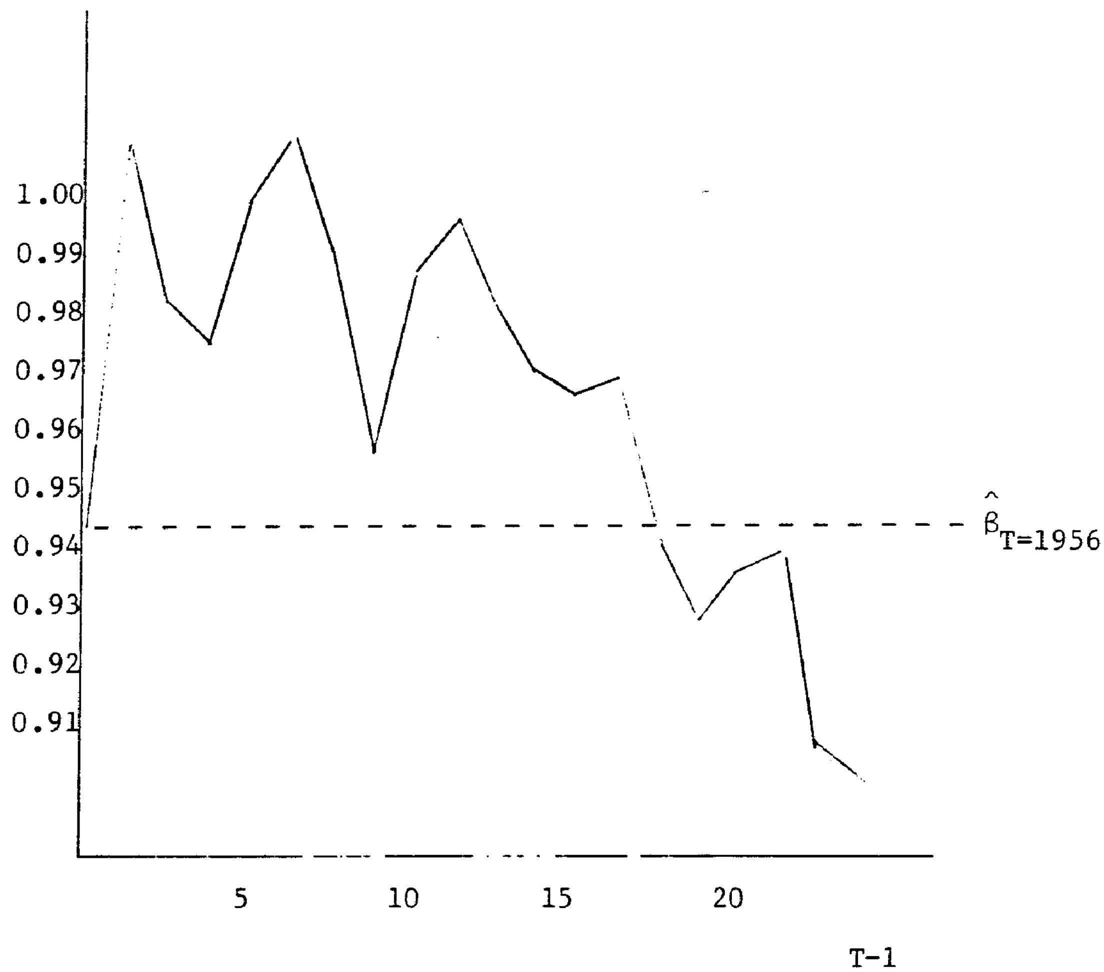
Mean Values of $\hat{\beta}_{i,T-1}$ From Regression of Two-Factor Asset Pricing Model (T = 1956, . . , 1975)

T	$\bar{\hat{\beta}}_{i,T-1} = \hat{\beta}_{T-1}$	$\Delta\beta_{T-1}$	$\%\Delta\hat{\beta}_{T-1}$
1956	0.944301		
1957	0.992682	0.048381	5.12347
1958	0.971238	-0.021440	-2.16020
1959	0.967601	-0.003637	-0.37447
1960	0.984414	0.016813	1.73759
1961	0.991701	0.007287	0.74023
1962	0.978395	-0.013306	-1.34173
1963	0.952188	-0.026207	-2.67857
1964	0.974714	0.022526	2.36570
1965	0.981338	0.006624	0.67958
1966	0.971689	0.009649	-0.98324
1967	0.962670	0.009019	-0.92817
1968	0.960460	-0.002210	-0.22956
1969	0.962830	0.007840	0.81627
1970	0.942083	-0.020747	-2.15478
1971	0.932606	-0.009477	-1.00596
1972	0.939201	0.006595	0.70715
1973	0.940594	0.001393	0.14831
1974	0.915990	-0.024604	-2.61579
1975	0.913931	-0.002059	-0.22478
	Totals	-0.030370	-3.21613
Extremes:			
1957 (high)	0.992682		
1975 (low)	0.913931	-0.078751	-7.93315

Regression Equation: $R_{it} - \hat{a}_{ot} = \hat{a}_{1t}\beta_{i,T-1} + u_{it}$ (Equation 3)

FIGURE 1

Movement of β Over Prediction Period



T = 1956, . . . , 1975

the mean estimate was 0.913931; a difference of -0.078751 or -7.93315%.

The results shown on Table 10 are consistent with those shown by Griffin (28). Griffin divided his study period into two subperiods, 1968-70 and 1971-73. His estimates of this parameter are averages over all securities in his sample, averaged over the three years in each of his subperiods. The same procedure applied to the mean estimates in this study show an average estimate for the 1968-70 subperiod of 0.9551 while Griffin's is 0.9652. In his second subperiod the average estimates are 0.9341 for the current study and 0.9346 for the Griffin study.[1]

Figure 1 also has $\hat{\beta}_{T=1956}$ plotted. That is, if the assumption of stationarity had been made, then $\beta_{i,T-1}$ would have been understated for all but six years of the study period. The resulting residuals would then have been larger (positive direction) than under the current method. The result of using such estimates in the basic and transformed statistical model, assuming the changing β characterization is superior, would be to bias the results against the research hypothesis.

Estimation of Abnormal Security Returns

Equation 3 was used during the prediction period, period T. Thus for each firm in the sample, for T = 1956, . . . 1975, the following estimation equation was used:

$$R_{iT} = \hat{a}_{ot} + \hat{a}_{1t}\beta_{i,T-1} + \hat{u}_{it} \qquad t = \text{April, } T \ldots \text{ March, } T+1$$

1 Griffin (28), p. 640.

where $\beta_{i,T-1}$ is the parameter estimated in the previous step and now used during prediction period T.

$\hat{u}_{it}$ = estimated residuals during the prediction period, for firm i, month t.

The output from this procedure was a series of twelve estimated residuals for each of the twenty years in the prediction period, except for prediction period T = 1975 where only nine residuals were estimated. As the prediction period extends three months into the next calendar year, and as R_{it}, $\hat{a}_{ot}$ and $\hat{a}_{1t}$ were not available at the time of this writing, for 1976, this final year had only nine $\hat{u}_{it}$'s.

The decision to leave T = 1975 in the study involved a trade off between a small bias in one observation ($CR_{i,1975}$) and the loss of a degree of freedom for each firm. It was decided to save the observation.

The estimated monthly residuals from equation 3 were summed over the months of prediction period T yielding CR_{iT} for all i, for all prediction periods (equation 4).

Table 11 shows the mean values for the CR_{iT}'s. These means were computed for comparative purposes only and have no interpretive value, given the assumptions of this study. Again, however, comparison with similar statistics from other studies might indicate abnormalities.

Griffin computed CR_{iT} for each of his subperiods. The mean value of CR_{iT} from Table 11 for the 1968-1970 subperiod is 0.019541 whereas it is 0.0122 in Griffin. For the 1971-73 subperiod it is 0.0577 in the current study and 0.0524 in Griffin.[2]

2 Griffin (28), p. 641.

TABLE 11

Mean Cumulative Residual Estimates for Each Prediction Period

(T = 1956, . . . , 1975) N = 202

T	$\overline{CR}_{it} = CAR$
1956	0.023881
1957	0.012973
1958	-0.006226
1959	0.011119
1960	0.017116
1961	0.000965
1962	0.021602
1963	0.073862
1964	0.028021
1965	-0.005248
1966	-0.005720
1967	-0.061225
1968	-0.000734
1969	0.028016
1970	-0.00741
1971	0.001529
1972	0.020002
1973	0.036243
1974	0.055527
1975	-0.018707
$\overline{CAR}$	0.011263

Note: (1) $R_{iT} - \hat{a}_{ot} = \hat{a}_{1t}\beta_{i,T-1} + \hat{u}_{it}$ (Equation 3)

(2) $CR_{it} = \sum_{t=-12}^{o} \hat{u}_{it}$ (Equation 4)

(3) $CAR = \frac{1}{N} \sum_{i=1}^{N} CR_{it}$ T= 1956, ... , 1975

The estimates from the two studies appear to be very close. The small differences can be attributed to differences in firms in the two samples and to the previously mentioned small differences in the estimated β_{T-1}.

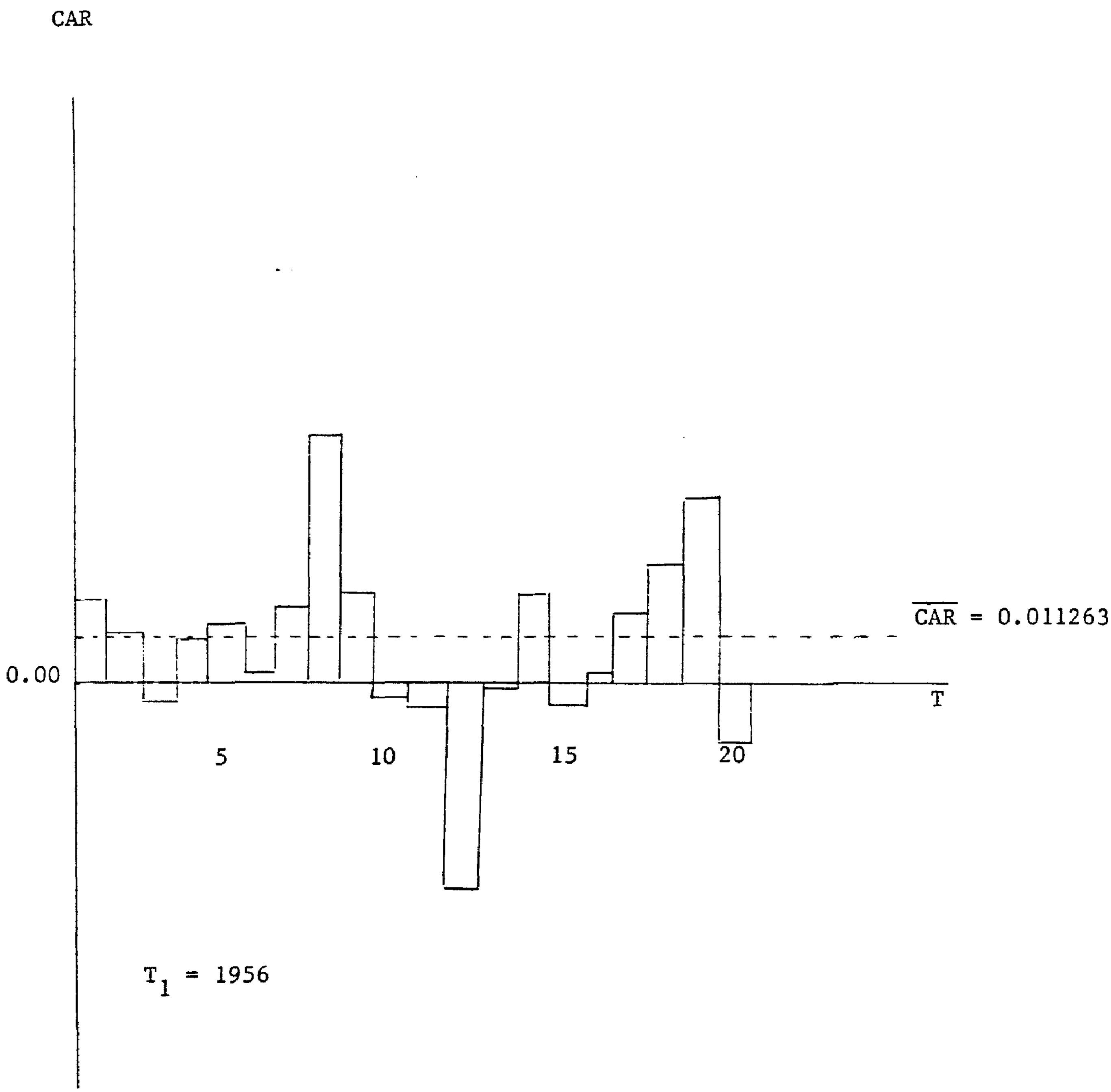
A simple t test on the mean of the mean CR_{iT}'s from Table 11 was conducted. The null hypothesis that CAR= 0 could not be rejected, (t = .3392, t* (.05, 19) = 1.729).

Figure 2 is a visual reproduction of the numbers displayed on Table 11. It is included to emphasize that CR_{iT} over the prediciton period, for the sample used in this study, is systematically greater than zero. This is consistent with results of another study cited immediately above. That is, both the Griffin study and the current study tried to allow for the suspected unstationarity of β_i over the study period. The resulting CAR's computed using equation 3(a), where β_i is allowed to change yearly, tend to be greater than zero.

Note also from Figure 2 that the value of CAR appears to stay greater than zero for more than one period when it becomes positive. However, a one sample runs test was conducted on these results and the null hypothesis that CAR varied randomly about zero could not be rejected at $\alpha = .05$. The same test was run using the mean CAR value (i.e. CAR = 0.011263) as the differentiation level. Again, randomness could not be rejected at $\alpha = .05$.

FIGURE 2

Mean Cumulative Average Residual Over the Prediction Period



V. RESULTS OF ANALYSES

The results of the various regressions run on the basic statistical model, the variable transformations and the transformed basic statistical model are presented and discussed in this chapter.

In addition, the results of some supplementary testing are shown. These tests are called supplementary because they are not based on the methodology outlined in the previous chapter. Detailed description and justification of these further steps, along with results, are contained in the final section of this chapter.

Market Index Version

Tables 12 through 16 summarize the results of the analytical procedures described in Chapter III, for the market index version.

The initial procedure was to run regressions of equation 1, the basic statistical model, using the information variables described above, for the market index version. The results of this procedure are summarized in Tables 12 and 13. The relationship between CR_{iT} and the set of independent variables as evidenced by an average R^2 of 0.113 (Table 12) and an insignificant F value, seems weak. The relationship between the two information variables seems to be stronger than that between the dependent variable and the set of independent variables. $R_{12}/\sqrt{R^2}$ is an indication of this relative strength. A value greater than one, indicates greater relative strength of relationship between the independent variables than the overall model strength of relationship.

There were 101 firms where evidence of severe multicollinearity existed. That is, of the 202 sample firms $|R_{12}/\sqrt{R^2}| > 1$ for 101 of them.

Table 13 is the same as Table 12 except these statistics are only for those firms who satisfied the multicollinearity criterion. A comparison of Table 12 and 13 reveals that if the 101 firms where the independent variables are highly inter-correlated are deleted, the relationship between the independent variables is dramatically weaker in the reduced sample (Table 13). $\overline{R}_{12}$ for the reduced sample is 0.099 while it is 0.294 for the full sample.

The overall strength of the model also seems stronger for the reduced sample. Note that the mean values of R^2 and F are 0.113 and 1.152 for the full sample but they are 0.143 and 1.497 for the reduced sample.

Magee (34) does not disclose statistics on his regression of CR_{iT} on an earnings variable, thus no comparison can be made with his model. Pettit, however, runs somewhat similar models , and shows R^2 of between 0.134 and 0.131.[1] He shows no other comparable descriptive statistics.

Table 14 shows descriptive statistics for the variable transformation procedures. That procedure regresses the dividend information variable for those firms in the full sample on the earnings variable. The residual from this procedure ($\hat{z}^2_{iT}$) will be uncorrelated with the earnings variable and will be used in the next procedure. The relation-

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1 Pettit (44), p. 95.

ship as indicated by an average R^2 of 0.178 and an average F value of 6.384 is predictably strong. That is, the results of the previous step suggested this strength. This lends support to the variable transformation step.

Table 15 summarizes the results of the regression run of the basic statistical model using the earnings information variable described above and the transformed dividend information variable (i.e. the residuals from the output summarized on Table 14).

The use of the transformed dividend information variable in the basic statistical model in place of the original dividend variable adds no new information, in aggregate, to the model. Thus average R^2 is the same for this run as it is for the original run on the sample (see Table 14).

The mean t values for both information variables are not significant. Because the independent variables are statistically independent of each other $R^2_{1y} + R^2_{2y} = R^2$ and thus $R^2_{1y}/R^2 + R^2_{2y}/R^2 = 1$. Thus the last two items on Table 15 can be argued to represent the relative contribution or importance of each information variable in explaining the variation in the dependent variable. That is, of the variability explained by this model, 49.5% is explained by the earnings variable alone, and 50.5% is explained by the dividend variable alone.

Table 16 summarizes the frequency distribution or t statistics for each independent variable. The observed frequency is compared to the expected frequency and the null hypothesis that the observed and expected frequencies are the same was tested using a chi-square one sample test. The null could not be rejected for dividends.

Thus the results of this version do not support the dividend information hypothesis.

Fama Babiak Version

Tables 17 through 21 summarize the results of the analytical procedures described in Chapter III for the Fama Babiak Version. The comments addressed to the Index version, in general, apply to this version as well. There are some notable differences, however.

The use of the residuals from equation 7, an equation that has current earnings as one of its arguments, yields dividend information variables that are much less highly correlated with the earnings variable than they were in the Index model. The mean value of R_{12} of only 0.031 demonstrates this, as does the mean value of the ratio $R_{12} / \sqrt{R^2}$ of 0.121. The relationship between the two information variables relative to the overall relationship of the set of information variables with the cumulative residuals is much weaker in this version than in the index version. There was evidence of severe multicollinearity (i.e. $|R_{12}/\sqrt{R^2}| > 1$) for only 22 of the 202 firms.

Table 18, again, shows the same summary statistics as Table 17, but for the 180 firms when multicollinearity was not severe. The overall strength of the relationship as evidenced by R^2 and F statistics increased from 0.122 and 1.255 respectively for the whole sample to 0.132 and 1.774 respectively for the reduced sample. R_{12} and $R_{12} / \sqrt{R^2}$ predictably decreased.

The variable transformation step was carried out on the 202 sample

TABLE 12

Cross-Sectional Distribution of Ordinary Least-Squares

Estimates of the Basic Statistical Model - Market

Index Version (T = 1956, . . ., 1975; n=202)

				Fractile Values of the Cross-Sectional Distribution of P					
P	$\bar{P}$	Median	$\sigma(\bar{P})$	Low	.20	.40	.60	.80	High
R^2	0.113	0.081	0.009	0.002	0.031	0.062	0.109	0.190	0.442
α_0	0.013	0.009	0.049	-0.102	-0.031	-0.001	0.024	0.052	0.152
α_1	-0.009	-0.026	0.356	-1.578	-0.155	-0.056	-0.014	0.046	2.455
α_2	-0.349	-0.114	1.428	-7.908	-0.116	-0.297	-0.020	0.268	4.563
F	1.152	0.703	1.207	0.019	0.254	0.532	0.982	1.877	6.338
$R_{12}/\sqrt{R^2}$	1.394	0.893	2.020	-2.181	0.088	0.652	1.195	2.451	12.395

Regression Equation: $CR_{iT} = \alpha_{oi} + \alpha_{1i}\hat{e}^2_{iT} + \alpha_{2i}\hat{d}^2_{iT} + \omega_{iT}$ (Equation 1.2)

101 Firms met the multicollinearity criterion that $|R_{12}/\sqrt{R^2}| < 1$

TABLE 13

Cross-Sectional Distribution of OLS Estimates of the Basic Statistical Model for Firms Satisfying the Ratio Criterion* (Market Index Version, N = 101)

P	$\bar{P}$	$\sigma(\bar{P})$	LOW	HIGH
R^2	0.143	0.105	0.003	0.442
α_0	0.012	0.047	-0.087	0.132
α_1	-0.076	0.186	-0.770	0.490
α_2	-0.442	1.513	-7.388	1.470
F	1.497	1.320	0.023	6.338
R_{12}	0.099	0.165	-0.251	0.477
$R_{12}/\sqrt{R^2}$	0.259	0.498	-0.888	0.984

Regression Equation: $CR_{iT} = \alpha_{oi} + \alpha_{1i}\hat{e}^2{}_{iT} + \alpha_{2i}\hat{d}^2{}_{iT} + \omega_{iT}$
(equation 1.2)

* (i.e. $|R_{12}/\sqrt{R^2}| < 1$)

TABLE 14

Cross-Sectional Distribution of Ordinary Least-Squares

Estimates of the Transformed Information

Variables-Index Version (T = 1956, . . ., 1975; n=202)

				Fractile Values of the Cross-Sectional Distribution of P					
P	$\bar{P}$	Median	$\sigma(\bar{P})$	Low	.20	.40	.60	.80	High
R^2	0.178	0.087	0.205	0.000	0.014	0.050	0.147	0.346	0.869
b_0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	+0.000
b_1	1.469	1.382	2.617	-12.978	0.117	0.904	1.606	2.505	17.151
F	6.384	12.844	0.000	0.237	0.899	2.926	2.926	8.982	112.988

Regression Equation: $\hat{d}^2_{iT} = b_{oi} + b_{1i}\hat{e}^2_{iT} + \hat{z}^2_{iT}$ (Equation 8.2)

TABLE 15

Cross-Sectional Distribution of Ordinary Least-Squares

Estimates of the Transformed Basic Statistical

Model-Index Version (T = 1956,. . ., 1975; n=202)

				Fractile Values of the Cross-Sectional Distribution of P					
P	$\bar{P}$	Median	$\sigma(\bar{P})$	Low	.20	.40	.60	.80	High
R^2	0.113	0.081	0.099	0.002	0.031	0.062	0.103	0.190	0.442
α_0	0.113	0.009	0.049	-0.102	-0.031	-0.001	0.024	0.052	0.152
α_1	0.008	-0.061	3.832	-25.849	-0.466	-0.125	-0.008	0.250	39.332
$t(\alpha_1)$	-0.209	-0.256	1.036	-2.626	-1.045	-0.487	-0.041	0.574	2.558
α_z	-0.017	0.027	3.877	-39.387	-0.293	-0.038	0.112	0.479	26.155
$t(\alpha_z)$	0.099	0.079	1.046	-2.928	-0.798	-0.158	0.362	1.009	3.026
R^2_{1y}	0.058	0.028	0.077	0.000	0.004	0.018	0.041	0.100	0.434
R^2_{2y}	0.055	0.029	0.069	0.000	0.005	0.019	0.045	0.088	0.364
R^2_{1y}/R^2	0.495	0.462	0.357	0.000	0.096	0.344	0.622	0.926	1.000
R^2_{2y}/R^2	0.505	0.535	0.357	0.000	0.073	0.376	0.651	0.895	1.000

Regression Equation: $CR_{iT} = \alpha_{oi} + \alpha_{1i}\hat{e}^2_{iT} + \alpha_{z^2i}\hat{z}^2_{iT} + V_{iT}$ (Equation 9.2)

TABLE 16

Chi-Square Test of t Statistics of
Regression Coefficients of the Transformed
Basic Statistical Model (Index Version)
N = 202

Range	Expected Frequency	Observed Frequency $t(\alpha_1)$	Observed Frequency $t(\alpha_Z)$
$t < -0.69$	50.5	62	48
$-0.69 < t < 0$	50.5	60	42
$0 < t < 0.69$	50.5	41	55
$0.69 < t$	50.5	39	57
	202	202	202
χ^2		8.812	2.793

firms. Summary statistics for this step are shown on Table 19. Again, the relationship between the dividend and earnings variables, using the residuals from the Fama Babiak dividend model, is predictably weak. As explained in Chapter III, the residuals from these regressions are used in place of the original dividend information variables (i.e. the residuals from equation 7) in a further run of the basic statistical model. These new dividend variables are called the transformed dividend information variables.

Because of the weakness of the relationship displayed in Table 19, the expectation is that the transformed dividend information variable will be very similar to the original dividend variable. The difference is, however, in the interpretation that can now be made about the relative importance of the regression coefficient.

As mentioned above, the use of the transformed dividend information variables adds no new information, in aggregate, to the model. Thus R^2 is the same for this run as it is for the original run on the same sample (see Table 17). The critical t value for 16 degrees of freedom is 1.746 at $\alpha = .10$. The mean t values for each coefficient fall well below that critical value. Of the 202 t values for each coefficient there are only 25 that are greater than 1.746 for earnings and 22 that are greater than 1.746 for dividends. Thus the importance of either variable in explaining variations in the cumulative residuals is not at all obvious.

Because the independent variables are statistically independent of each other $R^2_{1y} + R^2_{2y} = R^2$ and thus $R^2_{1y}/R^2 + R^2_{2y}/R^2 = 1$. Thus the last two items on Table 20 can be argued to represent the relative contribution or importance of each information variable in explaining the explained variation in the dependent variable. That is, of the explained variation 47.1% is explained by the earnings variable, alone, and 52.9% by the dividend variable, alone.

Table 21 summarizes the frequency distribution of t statistics for each independent variable. The observed frequency is compared to the expected frequency and the null hypothesis that the observed and expected frequencies are the same was tested using a chi-square one sample test.

The results of this version are similar to those obtained using the index version. Namely, these results are not consistent with the hypothesis that dividends have information content.

Value Line Version

Tables 22 through 26 summarize the results of the analytical procedures described in Chapter III for the analyst forecast or Value Line (VL) version.

The dividend and earnings information variables are even more highly inter-correlated for this version than for the Index version. Table 22 shows a mean value for R_{12} of 0.355 for this version while it is 0.294 for the Index version and only 0.031 for the Fama Babiak version. Given an average R^2 that is approximately the same size as those of the other two versions (i.e. 0.117 for VL, 0.113 for Index and 0.122 for FB) and the relatively large value of R_{12}, it was expected

TABLE 17

Cross-Sectional Distribution of Ordinary Least-Squares Estimates of the Basic Statistical Model-Fama Babiak Version

P	$\bar{P}$	Median	$\sigma(\bar{P})$	Fractile Values of the Cross-Sectional Distribution of P: Low	.20	.40	.60	.80	High
R^2	0.122	0.101	0.102	0.001	0.036	0.071	0.118	0.187	0.544
α_0	0.013	0.006	0.050	-0.107	-0.031	-0.001	0.022	0.054	0.151
α_1	-0.030	-0.033	0.225	-0.782	-0.146	-0.054	-0.015	0.032	1.497
α_2	-0.066	-0.078	1.957	-9.321	-0.592	-0.192	0.126	0.636	13.451
F	1.255	0.895	1.321	0.005	0.297	0.616	1.066	1.835	9.536
R_{12}	0.031	0.012	0.139	-0.466	-0.064	-0.004	0.032	0.119	0.560
$R_{12}/\sqrt{R^2}$	0.121	0.032	0.755	-2.594	-0.216	-0.014	0.098	0.402	4.487

Regression Equation: $CR_{iT} = \alpha_{oi} + \alpha_{1i}\hat{e}^2_{iT} + \alpha_{2i}\hat{d}^3_{iT} + \omega_{iT}$ (Equation 1.3)

180 Firms met the multicollinearity criterion that $\left| R_{12}/\sqrt{R^2} \right| < 1$

TABLE 18

Cross Sectional Distribution of OLS Estimates of the Basic Statistical Model for Firms Satisfying the Ratio Criterion* (Fama Babiak Version, N = 180)

P	$\bar{P}$	$\sigma(\bar{P})$	LOW	HIGH
R^2	0.132	0.102	0.002	0.544
α_0	0.013	0.051	-0.107	0.151
α_1	-0.034	0.236	-0.782	1.497
α_2	-0.061	2.069	-9.321	13.451
F	1.774	1.348	0.013	9.536
R_{12}	0.023	0.111	-0.466	0.555
$R_{12}/\sqrt{R^2}$	0.068	0.343	-0.937	0.995

Regression Equation: $CR_{iT} = \alpha_{oi} + \alpha_{1i}\hat{e}^2_{iT} + \alpha_{2i}\hat{d}^3_{iT} + \omega_{iT}$
(equation 1.3)

* (i.e. $|R_{12}/\sqrt{R^2}| < 1$)

TABLE 19

Cross-Sectional Distribution of Ordinary Least-Squares

Estimates of the Transformed Information Variables

Fama Babiak Version

				Fractile Values of the Cross-Sectional Distribution of P					
P	$\bar{P}$	Median	$\sigma(\bar{P})$	Low	.20	.40	.60	.80	High
R^2	0.020	0.005	0.047	0.000	0.000	0.002	0.008	0.022	0.313
b_o	0.001	0.000	0.013	-0.042	-0.003	-0.000	0.000	0.003	0.105
b_1	0.145	0.087	0.906	-3.058	-0.406	-0.018	0.228	0.712	3.178
F	0.399	0.080	1.071	0.000	0.004	0.032	0.129	0.374	7.754

Regression Equation: $\hat{d}^3_{iT} = b_{oi} + b_{1i}\hat{e}^2_{iT} + z^3_{iT}$ (Equation 8.3)

TABLE 20

Cross-Sectional Distribution of Ordinary Least-Squares Estimates of the Transformed Basic Statistical Model Fama Babiak Version (T = 1956,...,1975; n=202)

				Fractile Values of the Cross-Sectional Distribution of P					
P	$\bar{P}$	Median	$\bar{\sigma}(P)$	Low	.20	.40	.60	.80	High
R^2	0.122	0.101	0.101	0.001	0.036	0.071	0.114	0.187	0.544
α_0	0.013	0.009	0.049	-0.102	-0.031	-0.001	0.024	0.052	0.152
α_1	-0.936	-0.162	21.093	-185.652	-2.110	-0.514	0.114	1.555	87.168
$t(\alpha_1)$	-0.128	-0.183	1.143	-3.648	-1.154	-0.443	0.107	0.853	2.886
α_z	0.906	0.100	21.121	-86.809	-1.665	-0.165	0.494	2.031	185.355
$t(\alpha_z)$	0.090	0.150	1.133	-2.874	-0.876	-0.225	0.336	1.107	3.315
R^2_{1y}	0.058	0.028	0.077	0.000	0.004	0.018	0.041	0.100	0.434
R^2_{2y}	0.063	0.034	0.076	-0.000	0.005	0.017	0.052	0.106	0.324
R^2_{1y}/R^2	0.471	0.441	0.355	0.000	0.080	0.265	0.563	0.906	1.000
R^2_{2y}/R^2	0.529	0.541	0.355	0.000	0.093	0.426	0.728	0.919	1.000

Regression Equation: $CR_{iT} = \alpha_{oi} + \alpha_{1i}\hat{e}^2_{iT} + \alpha_{z^3 i}\hat{z}^3_{iT} + V_{iT}$ (Equation 9.3)

TABLE 21

Chi-Square Test of t Statistics of Regression Coefficients of the Transformed Basic Statistical Model (Fama Babiak Version)

N = 202

Range	Expected Frequency	Observed Frequency $t(\alpha_1)$	Observed Frequency $t(\alpha_2)$
$t < -0.69$	50.5	64	49
$-0.69 < t < 0$	50.5	49	42
$0 < t < 0.69$	50.5	42	52
$0.69 < t$	50.5	47	59
	202	202	202
	χ^2	6.515*	2.951

* Significant at $\alpha = .10$

that multicollinearity would be severe for a large number of firms. Of the 191 firms actually used there was evidence of severe multicollinearity (i.e. $|R_{12}/\sqrt{R^2}| > 1$) for 122 firms.

As mentioned in a previous chapter, the security analysts at the Value Line company are evaluated primarily on the accuracy of their forecasts of reported earnings. That is, there is a reward/punishment structure in place that is connected directly to the earnings forecasts each analyst generates. Thus it seems reasonable to expect that a more thorough, intensive job would be done by the analyst on the earnings forecast than on the dividend forecast. For those firm/years in which the analyst has no easily obtainable information specific to dividends, he may use some simple dividend forecast model such as historical payout. That is, his model may use his earnings forecast to predict dividends. If this is so, then the high degree of correlation between the earnings and dividend forecasts is to be expected. Note that the analyst may have some unique information on dividends in some years and not in others, for a particular firm. However, a high degree of multicollinearity could still be in evidence for that firm because of the strong relationship between the two forecasts in the periods in which no specific dividend information is incorporated into the dividend forecast.

The 69 firms that satisfied the multicollinearity criterion are presumably firms on which the analysts had information, other than their own earnings forecasts, on which to formulate dividend forecasts. This condition must have held for a relatively large number of years during the study period. Thus, this set of firms is a particularly interesting one.

The summary statistics for the run of the basic statistical model for this subset of the sample are shown on Table 23.

Note that R^2 and F are again higher for the qualifying sample than for the larger sample. R^2 and F are 0.117 and 1.227 respectively for the whole sample, but they are 0.166 and 1.833 for the reduced sample. It would appear that, in all versions, the basic statistical model is somewhat more valid for those firms in which the information variables used are less inter-correlated. That is not to say the model is more valid for certain firms per se, but just that it seems stronger for certain firms given the various version specific information variables used. In other words, it is not the case that the low multicollinearity firms of this version are a subset of the low multicollinearity of the Index version. Nor is it the case that the 69 firms in this version are a subset of the low multicollinearity firms of the FB version. There are, in fact, only 34 firms that are common to the low multicollinearity sample of each version.

The three versions will be compared in a subsequent section of this chapter. This section will focus, primarily, on the presentation and discussion of the Value Line results.

Table 24 presents summary statistics for the variable transformation step. Again, as in the index version, the relationship between the dividend and earnings variables is predictably strong.

Table 25 shows summary statistics for the regression runs of the basic model using the transformed dividend information variables.

As mentioned above, the use of the transformed dividend information variables adds no new information, in aggregate, to the model. Thus R^2 is the same for this run as it is for the original run on the same sample (see Table 22). The critical t value for 16 degrees of freedom is 1.746 at $\alpha = .10$. The mean t values for each coefficient fall well below that critical value. Of the 191 t values for each coefficient there are 18 that are greater than 1.746 for earnings and 21 that are greater than 1.746 for dividends. Thus the importance of either variable in explaining variations in the cumulative residuals is not at all obvious.

Because the independent variables are statistically independent of each other $R^2_{1y} + R^2_{2y} = R^2$ and thus $R^2_{1y}/R^2 + R^2_{2y}/R^2 = 1$. Thus the last two items on Table 25 can be argued to represent the relative contribution or importance of each information variable in explaining the explained variation in the dependent variable. That is, of the explained variation, 47.3% is explained by the earnings variable, alone, and 52.7% by the dividend variable, alone.

Table 26 summarizes the frequency distribution of t statistics for each independent variable. As explained in Chapter III, a high value for t will indicate a high degree of association between the relevant information variable and abnormal security returns. Since there are only 19 observations, however, a high t value for a given variable for a specific firm may not reflect the true relationship due to sampling error.

If there is no relationship, then these t statistics should be distributed according to Student t-distribution with 16 degrees of freedom. Thus the t statistics should be distributed in the range shown on

Table 26. For 191 firms the expected frequency for each range is 69/4 or 47.75. Table 26 shows the observed frequency of t statistics for both the earnings and dividend variables that fall into each area of the range. If there is no relationship between abnormal security returns and the information variable in question the observed and expected frequencies of t statistics should be the same.

As in the other versions, the null hypothesis that the observed and actual frequencies are the same was tested using a chi-square one sample test.

Again, the results of this analysis do not strongly support the research hypothesis that dividends contain information other than that contained in earnings. The chi-square statistic of 4.874 is significant at an α level of only 0.20 and thus its interpretation can be considered, at best, only as weak support for the hypothesis.

TABLE 22

Cross-Sectional Distribution of Ordinary Least-Squares

Estimates of the Basic Statistical Model - VL

Version

P	$\bar{P}$	Median	$\sigma(\bar{P})$	Fractile Values of the Cross-Sectional Distribution of P: Low	.20	.40	.60	.80	High
R^2	0.117	0.097	0.108	0.000	0.025	0.067	0.118	0.187	0.600
α_0	0.010	0.006	0.050	-0.113	-0.031	-0.005	0.019	0.048	0.165
α_1	-0.010	0.001	0.340	-2.838	-0.135	-0.017	0.017	0.078	1.791
α_2	-0.090	-0.053	0.837	-3.775	-0.471	-0.139	0.015	0.241	3.487
F	1.227	0.862	1.564	0.002	0.200	0.556	1.033	1.823	11.997
R_{12}	0.355	0.355	0.406	-0.787	0.028	0.256	0.506	0.765	0.970
$R_{12}/\sqrt{R^2}$	2.043	1.289	4.285	-5.277	0.081	0.815	1.645	3.066	45.755

Regression Equation: $CR_{iT} = \alpha_{oi} + \alpha_{1i}\hat{e}^2_{iT} + \alpha_{2i}\hat{d}^1_{iT} + \omega_{iT}$ (Equation 1.1)

69 Firms met the multicollinearity criterion that $\left| R_{12}/\sqrt{R^2} \right| < 1$

TABLE 23

Cross Sectional Distribution of OLS
Estimates of the Basic Statistical Model for Firms Satisfying the
Ratio Criterion* (Value Line Version, N = 69)

P	P	σ (P)	LOW	HIGH
R^2	0.166	0.124	0.005	0.600
α_0	0.010	0.047	-0.093	0.125
α_1	-0.059	0.381	-2.838	0.479
α_2	-0.189	1.056	-3.775	3.487
F	1.833	2.016	0.042	11.997
R_{12}	0.108	0.200	-0.429	0.616
$R_{12}/\sqrt{R^2}$	0.268	0.475	-0.775	0.970

Regression Equation: $CR_{iT} = \alpha_{oi} + \alpha_{1i}\hat{e}^1_{iT} + \alpha_{2i}\hat{d}^1_{iT} + \omega_{iT}$
(Equation 1.1)

*(i.e. $\left| R_{12}/\sqrt{R^2} \right| < 1$)

TABLE 24

Cross-Sectional Distribution of Ordinary Least-Squares Estimates of the Transformed Information Variables - Value Line Version (T = 1956,...,1975; n=191)

				Fractile Values of the Cross-Sectional Distribution of P					
P	$\bar{P}$	Median	$\sigma(\bar{P})$	Low	.20	.40	.60	.80	High
R^2	0.258	0.179	0.266	0.000	0.016	0.085	0.234	0.490	0.928
b_o	-0.171	-0.108	0.223	-1.238	-0.267	-0.147	-0.078	-0.031	0.135
b_1	0.843	1.082	1.867	-9.154	-0.227	0.798	1.389	1.996	8.773
F	15.283	3.913	32.543	0.003	0.278	1.669	5.494	16.949	232.832

Regression Equation: $\hat{d}^1_{iT} = b_{oi} + b_{1i}\hat{e}^1_{iT} + z^1_{iT}$ (Equation 8.1)

TABLE 25

Cross-Sectional Distribution of Ordinary Least-Squares Estimates of the Transformed Basic Statistical Model - Value Line Version (T = 1956,...,1975; n=191)

				Fractile Values of the Cross-Sectional Distribution of P					
P	$\bar{P}$	Median	$\bar{\sigma}(P)$	Low	.20	.40	.60	.80	High
R^2	0.117	0.076	0.095	0.001	0.028	0.059	0.105	0.179	0.457
α_0	-0.007	0.005	0.337	-2.441	-0.059	-0.009	0.029	0.096	1.322
α_1	-0.077	0.023	1.737	-9.538	-0.269	-0.041	0.087	0.391	8.385
$t(\alpha_1)$	0.107	0.096	1.035	-3.198	-0.726	-0.136	0.418	0.942	3.359
α_z	0.089	-0.034	1.750	-7.734	-0.531	-0.120	0.077	0.311	9.128
$t(\alpha_z)$	-0.127	-0.150	1.098	-3.345	-1.054	-0.442	0.260	0.711	2.561
R^2_{1y}	0.050	0.028	0.063	0.000	0.003	0.016	0.041	0.079	0.412
R^2_{2y}	0.057	0.027	0.069	0.000	0.006	0.017	0.046	0.104	0.358
R^2_{1y}/R^2	0.473	0.457	0.332	0.000	0.109	0.344	0.580	0.833	1.000
R^2_{2y}/R^2	0.527	0.543	0.332	0.000	0.162	0.408	0.648	0.882	1.000

Regression Equation: $CR_{iT} = \alpha_{oi} + \alpha_{1i}\grave{e}^1_{iT} + \alpha_{z^1 i}\hat{z}^1_{iT} + V_{iT}$ (Equation 9.1)

TABLE 26

Chi-Square Test of t Statistics of Regression Coefficients of the Transformed Basic Statistical Model (Value Line Version) N = 191

Range	Expected Frequency	Observed Frequency $t(\alpha_1)$	Observed Frequency $t\ (\alpha_2)$
$t < -0.69$	47.75	40	58
$-0.69 < t < 0$	47.75	48	42
$0 < t < 0.69$	47.75	43	52
$0.69 < t$	47.75	60	39
	191	191	191
χ^2		4.874	4.874

Comparison of Three Versions

Table 27 shows the mean values for selected statistics for each version. These statistics are taken from tables previously presented and are repeated here so that direct comparison is facilitated. All further references in this section are to Table 27.

Item 1(a) compares statistics from the regressions performed on the basic statistical model, for the various versions. In terms of R^2 and F there is no apparent superiority of one version over the other. The degree of multicolinearity between the independent variables, however, is dramatically different in each version. The mean values of $R_{12}/\sqrt{\bar{R}^2}$ are an indication of this. On this aspect the Fama Babiak version is superior to the Index version which in turn is superior to the Value Line version. This is further reflected in 1(b) where similar statistics are shown for the low multicollinearity firms.

Item 1(b), however, indicates different rankings in terms of R^2 and F. While the differences are not large, the Value Line version seems to be superior both in terms of R^2 and F, for this subsample only.

The higher mean $R_{12}/\sqrt{\bar{R}^2}$ for the VL and Index versions indicates that the relationship specified in equation 8 should be stronger for these two versions than for the FB version. The statistics shown on item 2 support this.

Item 3 gives overall results for the final output of the basic methodology used in this study.

The VL version gives marginally greater support for the acceptance of the research hypothesis than do the other versions. Because of the weakness of the results, however, some further analysis was performed. This further analysis is explained, and the results presented in the next section of this chapter.

The frequency of critical t statistics (i.e. $t \geq 1.746$, $\alpha = .10$) for each version, for each variable are as follows:

	$t^*(\alpha_1)$	$\%t^*(\alpha_1)$	$t^*(\alpha_z)$	$\%t^*(\alpha_z)$
Value Line	18	9.4%	21	11.0%
Index	25	12.4%	21	10.4%
Fama Babiak	25	12.4%	22	10.9%

Thus there is a similar proportion of critical t statistics for dividends for all three versions.

TABLE 27

Means of Selected Statistics for the Three Basic Versions

1. a) Basic Statistical Model (Equation 1) - All Sample Firms

	Version		
P	Value Line	Index	Fama Babiak
R^2	0.117	0.113	0.122
F	1.227	1.152	1.255
$R_{12}/\sqrt{R^2}$	2.043	1.394	0.121
N	191	202	202

b) Basic Statistical Model (Equation 1) - Low Multicollinearity Sample

	Version		
P	Value Line	Index	Fama Babiak
R^2	0.166	0.143	0.132
F	1.833	1.497	1.774
$R_{12}/\sqrt{R^2}$	0.268	0.259	0.068
N	69	101	180

Table 27 (cont'd.).

2. Variable Transformation (Equation 8)

	Version		
P	Value Line	Index	Fama Babiak
R^2	0.258	0.178	0.020
F	15.283	6.384	0.399
N	191	202	202

3. Transformed Basic Statistical Model (Equation 9)

	Version		
P	Value Line	Index	Fama Babiak
R^2	0.117	0.113	0.122
$t(\alpha_1)$	0.107	-0.209	-0.128
$\sigma(\alpha_1)$	1.737	3.832	21.093
$t(\alpha_z)$	-0.127	0.099	0.090
$\sigma(\alpha_z)$	1.750	3.877	21.121
R^2_{1y}/R^2	0.473	0.495	0.471
R^2_{2y}/R^2	0.527	0.505	0.529
$\chi^2(\alpha_1)$	4.874	8.812	6.515
$\chi^2(\alpha_z)$	4.874	2.02	2.951
N	191	202	202

Supplementary Analysis

Because of the inconclusive results just presented, it was decided to conduct some supplementary analysis. In particular, the question posed was this:

Would the results of the Watts (49) study have been different if that study had used (1) security analyst's forecasts as proxies for market expectations and/or (2) had it used dividend information variables that were uncorrelated with the earnings information variable used?

A Reexamination of Watts:

Chapter II of this study contains a short description and a detailed critique of the study and subsequent follow-up comment by Watts. These details will not be repeated here. However, it will be remembered that Watts found that on the basis of the size of the CAR at the announcement month, that the information content of dividends was trivial.

The methodology employed in this study attempted to correct for a fundamental weakness in the Watts study (and in the other studies) namely, the confounding of information effects by averaging cumulative residuals across firms. This section will use this same methodology, however. Despite its inherent weaknesses, it may still provide more meaningful results, if the dividend effect is strong enough, than does the current methodology. That is, the increased noise may be more than for by a superior specification of earnings and dividend information variables.

The analysis in this section will be divided into three parts. The first part will be a replication of the Watts (49) study, using the current sample. This will provide evidence as to whether Watts' results were sample specific. That is, would he have obtained the same results had he used the sample used in this study. This will also provide sample specific comparison figures for the second and third parts in this section of the supplementary analysis.

The residuals from the regressions of the Fama Babiak model (equation 7) were divided into two sets, based on their sign. Cumulative average residuals (CAR's) were then computed using the cumulative residuals from equation 4. It should be noted that this is not a strict replication for the following reasons:

1) This study uses the two factor asset pricing model for both the estimation of β_{iT} and the computation of CR_{iT}, whereas Watts used the market model.
2) This study uses a moving β while Watts assumed β stationarity.
3) The API computed in Watts is the average over all firms and all years of the product of one plus the monthly abnormal returns. The CAR computed in this study is the average over all firms and all years of the sum of the abnormal monthly returns. Thus the two, the API and CAR are not strictly comparable. That is $API \neq 1 + CAR$. They differ by the sum of the cross-product terms in the API (i.e. the compounding element). Nevertheless,

we should still expect similar relative values and thus both will be shown and compared.

Cumulative Average Residuals (CAR's) were computed in this section over the sample of firm/years. The sample was then partitioned, on the sign of the dividend information variable and CAR for each of the two subsamples was computed. The computation is as follows:

$$CAR(d) = \frac{1}{NT} \sum_{i=1}^{N} \sum_{T=1}^{T} CR_{iT}$$

where:

CAR(d) represents the CAR computed over the whole sample

CAR(d+) represents the CAR computed over those firm/years in the sample in which the dividend information variable for that firm/year is greater than zero.

CAR(d-) represents the CAR computed over those firm years in the sample in which the dividend information variable for that firm/year is less than zero.

$E(CAR(d)) = 0$

$CAR(d+) > 0$ and/or $CAR(d-) < 0$ imply information content in d.

1. Residuals from the Fama Babiak Dividend Model:

Table 28, item 3 shows the value of CAR for the 202 sample firms, conditional on $\hat{d}^3_{iT}$, the residual from the Fama Babiak model. These are the dividend information variables used by Watts, and thus the results shown in item 3 should be similar to those in Watts.

Again, while the API and CAR are not strictly comparable, some rough comparisons can be made. Watts found a difference of 0.005 between the API(d-) and API(d+) at the dividend announcement month and concluded that the information content of dividends, if any, was at most trivial.[2] The same conclusion must be made here. There is a difference of only 0.004 between CAR(d-) and CAR(d+). The rankings of the CAR's in this study and the API's in Watts are the same, namely CAR(d-) < CAR(d) < CAR(d+).

The results shown on item 3, Table 28, conform closely to those shown by Watts. Thus the lack of information content shown in his study cannot be explained by the sample he used.

2. Transformed Dividend Variable from the Value line Version:

It has been argued earlier in this study that analyst forecasts of dividends should more closely approximate the market's expectations of dividends than do mathematical dividend models. Given the work of Brown and Rozeff (11) on earnings, this seems to be a reasonable argument. If this is so, then partitioning securities on the basis of dividend attributes determined with the use of these forecasts should be more discriminatory than those determined using mathematical models such as the Fama Babiak dividend model.

Therefore, in order to see whether the results obtained by Watts could be explained by the dividend model used, the procedure outlined above was repeated using the residuals from equation 8.1. That is, the transformed dividend information variables from the Value Line version were used as the basis for partitioning the cumulative residuals into

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2 Watts (49), p. 206.

TABLE 28

Summary Statistics for Cumulative Returns (CR_{iT}) for Various Versions, Conditional on the Sign of the Dividend Information Variable

Version	Sign of Dividend Variable	N	10^2 x Est. Mean $\hat{\mu}(CR_{iT})$ (i.e. CAR)	10^2 x Est. Std. Dev. $\hat{\sigma}(CR_{iT})$
1. Value Line	$\hat{z}^1_{iT} < 0$	1,798	0.65	23.5
	$\hat{z}^1_{iT} > 0$	1,979	1.36	22.7
	$\hat{z}^1_{iT}$	3,777	1.02	23.1
2. Fama Babiak	$\hat{z}^3_{iT} < 0$	1,875	-4.92	22.4
(Eq. 5b)	$\hat{z}^3_{iT} > 0$	1,963	7.70	23.7
(i.e. transformed)	$\hat{z}^3_{iT}$	3,838	1.53	23.9
3. Fama Babiak	$\hat{d}^3_{iT} < 0$	1,767	0.77	23.4
(Eq. 7)	$\hat{d}^3_{iT} > 0$	2,066	1.13	23.2
(i.e. not trans-formed)	$\hat{d}^3_{iT}$	3,833	0.96	23.3

two sets. Again it was assumed that the relevant attribute was the sign of the dividend variable.

Item 1 on Table 28 shows summary statistics for this procedure. The results are similar to those for the Fama Babiak version cited above. The differences between the CAR (d+) and CAR (d-) at the dividend announcement month is only 0.007; a difference similar in size to the ones cited above for both the Watts study and this study (using the residuals from the FB model).

While the rankings of the CAR's are also as expected (i.e. CAR (d-) $<$ CAR (d) $<$ CAR (d+), these results do not provide any strong support for the research hypothesis.

The results shown on Tables 29 and 30 represent attempts to explore this version further. CAR's by year, partitioned on the sign of the VL transformed dividend variable were computed and are displayed in Table 29. The reason for this procedure was to see whether some systematic relationship between CAR (d-) and CAR (d+) might emerge. That is, while the overall difference between CAR (d-) and CAR (d+) is only 0.007, the ranking was consistent with theory. Therefore, does this ranking suggest a positive association between security returns and the dividend variable? If so, then perhaps the dividend variable is poorly specified and a better specification of this variable would better isolate the information effect.

If the specified attribute is relevant (i.e. positive or negative dividend variable) then the differences (column (3) on Table 29) should all have the same sign. The size of the differences would be indications of the strength of association while the sign of the differences would be an indication of the presence of this association.

The differences are not only small, but there seems to be no systematic pattern to the signs of the differences. A Wilcoxon matched-pairs signed-ranks test was conducted on these differences to test the null hypothesis that CAR (d+) = CAR (d-). The null hypothesis could not be rejected.

Table 30 presents results of a direct test of association between the VL dividend variables and the cumulative residuals. Positive association between the dividend variable and the cumulative residual would support the research hypothesis.

Spearman rank correlation coefficients were computed for each year of the study period. As support for the hypothesis requires positive association no matter what dividend category (i.e. d+ or d-) it is the third column that is most relevant. However, if the dividend category is a relevant attribute, then there is a possibility that there might be information in dividend announcements in one category and not in the other.

Inspection of Table 30 shows little indication of a systematic relationship between the dividend variable and the cumulative residual. The Spearman rank correlation coefficients are generally quite small and often in the opposite direction suggested by the information hypothesis. The Rho statistics range from -0.151 in 1963 to 0.188 in 1960. At α = .05 Rho is statistically significant in only two of twenty years (see column (3), Table 30).

The supplementary analysis using the dividend variables from the Value Line Version does not support the research hypothesis.

TABLE 29

Summary Statistics for Cumulative Returns (CR_{iT})

Value Line Version - By Year

Year	(1) 10^2 X Estimated Mean, $\hat{\mu}(CR_{iT})$ $\hat{z}^1_{iT} > 0$	(2) 10^2 X Estimated Mean, $\hat{\mu}(CR_{iT})$ $\hat{z}^1_{iT} < 0$	(3) Difference (1) - (2)
1956	1.39	1.60	-0.21
1957	4.18	-2.67	6.85
1958	-0.73	-6.02	5.29
1959	0.98	1.47	-0.49
1960	5.17	-2.15	7.32
1961	1.07	-2.86	3.93
1962	2.23	2.80	-0.57
1963	9.08	12.93	-3.85
1964	1.68	-1.02	2.70
1965	-2.03	-0.97	-1.06
1966	-0.09	-0.20	0.11
1967	-5.74	-14.72	7.98
1968	-0.89	-3.48	2.59
1969	1.91	5.78	-3.87
1970	-2.63	0.21	-2.84
1971	4.23	0.69	3.54
1972	-9.11	3.30	-3.41
1973	7.52	3.59	3.93
1974	4.62	7.04	-2.32
ALL	1.36	0.65	0.71

Note: A Wilcoxon Matched-Pairs Signed-Ranks test was conducted to test the null hypothesis that (1) = (2). The null could not be rejected.

TABLE 30

Spearman Rank Correlation Coefficients - Value Line Version - By Year

Year	(1) $\hat{z}^1_{iT} < 0$ Rho	P > Rho	(2) $\hat{z}^1_{iT} > 0$ Rho	P > Rho	(3) $\hat{z}^1_{iT}$ Rho	P > Rho
1956	0.086	0.526	-0.001	0.989	0.030	0.697
1957	0.040	0.770	-0.166	0.060	0.028	0.713
1958	0.059	0.747	-0.234	0.004	-0.121	0.095
1959	0.187	0.032	-0.302	0.020	0.062	0.594
1960	0.099	0.646	-0.118	0.247	0.188	0.010
1961	0.221	0.054	-0.061	0.524	0.056	0.552
1962	-0.125	0.194	0.065	0.565	-0.054	0.536
1963	-0.109	0.518	-0.141	0.087	-0.151	0.035
1964	-0.082	0.511	0.001	0.987	0.036	0.629
1965	-0.253	0.027	-0.141	0.127	-0.092	0.202
1966	0.216	0.024	-0.195	0.070	0.024	0.741
1967	0.010	0.927	-0.126	0.180	0.065	0.628
1968	0.303	0.002	-0.122	0.263	0.088	0.226
1969	0.002	0.982	-0.389	0.001	-0.131	0.066
1970	0.015	0.886	-0.067	0.509	-0.049	0.506
1971	0.029	0.744	-0.169	0.178	0.056	0.553
1972	0.101	0.209	-0.113	0.519	0.025	0.732
1973	-0.072	0.618	0.144	0.613	0.007	0.923
1974	0.016	0.886	0.072	0.540	-0.012	0.862
1975	-0.361	0.010	0.054	0.530	-0.025	0.730

3. Transformed Dividend Variables From the Fama Babiak Dividend Model:

A third possibility that is explored next is that the dividend variable used by Watts (i.e. the residual from equation 7) might be improved upon by performing the variable transformation step used in this study (i.e. equation 8.3). The residuals from equation 7 (i.e. $\hat{d}^3_{iT}$) differ from those from equation 8.3 (i.e. $\hat{z}^3_{iT}$) in that $\hat{d}^3_{iT}$ may contain some abnormal earnings effect. That is, while multicollinearity is severe in only 22 of 202 cases in the basic statistical model (see TABLES 17 and 18), it is present to some degree in most cases. It is possible that $\hat{z}^3_{iT}$ may be more discriminating in terms of isolating the dividend effect.

The procedures outlined above were repeated using the transformed dividend information variable from the Fama Babiak dividend model. That is, the residuals from equation 8.3 were used as dividend information variables.

Table 28, item 2, shows the CAR values at the dividend announcement month partitioned on the sign of $\hat{z}^3_{iT}$. These initial indications appear to be very much in favor of the information hypothesis.

The rankings of the CAR's are in the expected direction of CAR (d-) < CAR (d) < CAR (d+). The size of the CAR's, however, is large. There is a difference between CAR (d-) and CAR (d+) of 0.126. This difference is materially larger than the 0.005 difference in the Watts Study. It is also materially larger than the differences of 0.007 and 0.004 for numbers 1 and 3 of Table 28 above.

The results shown on Tables 31 and 32 represent attempts to explore this version further. Table 31 shows that not only do the overall CAR's, partitioned on the sign of the dividend variable differ materially, and in the expected direction, but that this result also holds for CAR's computed on a yearly basis.

The expected direction of the differences holds in all years except for 1973. Also, the size of the differences is larger in each year than it is in each year using the Value Line dividend variable (cf. Tables 29 and 31).

A Wilcoxon matched-pairs signed ranks test was conducted on the differences shown in Table 31 to test the null hypothesis that CAR (d+) = CAR (d−). The null hypothesis was rejected at = 0.01.

Table 32 presents results of a direct test of association between the transformed Fama Babiak dividend variables and the cumulative residuals. Positive association between the dividend variable and the cumulative residual would support the research hypothesis.

Spearman rank correlation coefficients were computed for each year of the study period. Inspection of Table 32, especially column (3), shows a strong positive association between the dividend variable and the cumulative returns as evidenced by the size of the Spearman rank correlation coefficients. Rho is positive for all years of the study. The null hypothesis that Rho equals zero (i.e. no association) is rejected at $\alpha = 0.01$ in 16 of the 19 years and at $\alpha = 0.10$ in 18 of the 19 years. There is only one year, 1973, where this null hypothesis cannot be rejected.

The results of this analysis are consistent with the hypothesis that dividends contain information other than that contained in earnings.

TABLE 31

Summary Statistics for Cumulative Returns (CR_{iT}) Fama Babiak Version - Transformed Dividend Variable - By Year

Year	(1) 10^2 X Estimated Mean, $\hat{\mu}(CR_{iT})$ $\hat{z}^3_{iT} > 0$	(2) 10^2 X Estimated Mean, $\hat{\mu}(CR_{iT})$ $\hat{z}^3_{iT} < 0$	(3) Difference (1) - (2)
1957	7.07	-1.92	8.99
1958	8.24	-1.70	8.94
1959	5.92	-6.64	12.56
1960	8.39	-3.36	11.75
1961	9.31	-4.83	14.14
1962	9.96	-5.77	15.73
1963	11.09	-5.35	16.44
1964	16.94	2.46	14.48
1965	3.40	-1.66	5.06
1966	4.65	-10.08	14.73
1967	3.85	-4.50	8.35
1968	-2.60	-13.94	11.34
1969	7.63	-11.38	19.01
1970	13.56	-10.31	23.87
1971	3.00	-3.49	6.49
1972	13.11	-9.30	22.41
1973	1.86	3.42	-1.56
1974	5.87	0.29	4.58
1975	18.88	-7.00	25.88
ALL	7.70	-4.92	12.62

Note: A Wilcoxon Matched-Pairs Signed-Ranks test was conducted to test the null hypothesis that (1) = (2). The null was rejected at $\alpha < 0.01$.

TABLE 32

Spearman Rank Correlation Coefficients - Fama Babiak Version - Transformed Dividend Variable - By Year

	(1) $\hat{z}^3_{iT} < 0$		(2) $\hat{z}^3_{iT} > 0$		(3) $\hat{z}^3_{iT}$	
	Rho	P > Rho	Rho	P > Rho	Rho	P > Rho
1957	-0.062	0.576	0.137	0.139	0.200	0.005
1958	0.317	0.001	-0.087	0.587	0.323	0.000
1959	0.288	0.003	-0.085	0.590	0.262	0.000
1960	0.469	0.000	-0.041	0.696	0.351	0.001
1961	0.271	0.006	-0.125	0.213	0.353	0.000
1962	0.208	0.017	0.107	0.625	0.408	0.000
1963	0.226	0.014	0.356	0.001	0.476	0.000
1964	0.376	0.000	0.215	0.034	0.419	0.000
1965	0.044	0.673	0.269	0.006	0.218	0.002
1966	0.117	0.267	0.215	0.022	0.307	0.000
1967	0.290	0.005	0.015	0.874	0.234	0.001
1968	0.072	0.508	-0.108	0.267	0.238	0.001
1969	0.249	0.020	0.019	0.831	0.514	0.000
1970	0.222	0.047	0.128	0.153	0.497	0.000
1971	0.168	0.119	0.057	0.551	0.158	0.023
1972	0.343	0.001	0.064	0.522	0.462	0.000
1973	0.032	0.761	0.160	0.093	0.018	0.795
1974	-0.049	0.659	0.226	0.015	0.125	0.072
1975	0.282	0.003	0.072	0.500	0.500	0.000

VI SUMMARY AND CONCLUSIONS

This chapter summarizes and interprets the results of the empirical evaluation of the information content of the sample firms' annual dividend announcements. Limitations and implications of both the findings and the research methodologies are discussed. Finally, some suggestions are offered for further research.

Summary and Interpretation of Empirical Results

The basic objective of this study was to reexamine the question of whether or not dividends contain information other than that contained in earnings. This reexamination was motivated by the existence of the studies, discussed in Chapter II of this paper, that failed to resolve the issue with finality.

The Pettit (43) and Griffin (28) studies supported the proposition while the Watts (49) and Gonedes (22) studies found little or no marginal information content in dividends. This study attempted to reconcile these conflicting findings by employing a different methodology, and by using some different inputs.

The main methodology in this study used a regression model suggested by Magee (34). This model regressed cumulative abnormal security returns on earnings and dividends for each firm in the sample.

Three different definitions of the dividend and earnings variable were used, yielding three different versions of the basic regression model.

A variable transformation was performed yielding uncorrelated dividend and earnings variables. Thus the dividend coefficients in the regressions were unambiguous. That is, statistically significant dividend coefficients were interpreted as support for the research hypothesis. The observed frequency of t statistics on these coefficients was then compared to the theoretical frequency that would have maintained were there no information content.

For all three versions, the null hypothesis that the observed frequency equaled the theoretical frequency could not be rejected. Thus the research hypothesis was not supported by each version. These results are consistent with the findings of both Watts (49) and Gonedes (22).

The results of this basic methodology, as summarized on Table 27 in Chapter V, do not indicate the superiority of any one version over the other. It was expected, given the findings of Brown and Rozeff (11) that the Value Line Version would have indicated a strong earnings effect. The chi-square statistic of only 4.874 as shown on item three of Table 27 does not support a conclusion of a strong earnings effect.

A tentative conclusions that emerges, given the absence of a strong earnings information effect, is that the regression approach used in this study is too weak. That is, the basic statistical model, as evidenced by the relatively low mean R for all versions, was not strong enough to isolate the information effects of either information variable. The use of only nineteen observations for each run of the basic statistical model may, in part, account for this weakness.

The supplementary analysis, as summarized on Table 28 of the previous chapter, yields results that are in two cases consistent with the findings of Watts and Gonedes and in one case inconsistent. This latter case supports the dividend information hypothesis.

Item 1 on Table 28 summarizes the results of this supplementary analysis (henceforth called CAR analysis) for the Value Line Version. These results do not support the dividend information hypothesis. An explanation for this lack of support, assuming there is information content, lies in the analyst reward structure discussed in a previous chapter.

Because of the high emphasis put on the accuracy of earnings forecasts at the Value Line company, it is to be expected that the individual analysts' efforts will be highly concentrated on accurately forecasting the earnings number. That they are successful is supported theoretically by the market rule and empirically by Brown and Rozeff (11).

The dividend forecasts presented by the analysts may simply be estimated using knowledge of the earnings forecast. Using these dividend forecasts to approximate the markets' expectations of dividends, therefore, would yield dividend information variables that contain much the same information as earnings. Items 1 and 2 on Table 27 support this explanation. There is severe multicollinearity in all but 69 of the 191 cases. The mean R^2 of 0.258 from the regression of the dividend variable on the earnings variable is statistically significant, and higher for the VL version than for the other two versions.

Item 3 on Table 28 summarizes the Fama Babiak results for the CAR analysis. The dividend variable used here is the same variable used by Watts (49) and by Gonedes (22). The results are also the same, namely, the dividend information hypothesis is not supported.

Item 2 on Table 28 summarizes the results for the only analysis in this study that supports the dividend information hypothesis. The dividend variables used in this analysis are the residuals from the regression of the dividend variable used in Item 3 on the earnings variable from the Index version. The results of this regression are summarized on Table 19.

As explained in Chapter III these residuals are uncorrelated with the earnings variable, by construction (Equation 8.3). The dramatic difference in the results as summarized in Table 28, Item 2, and detailed in Tables 30 and 31 is the result of the use of dividend information variables that are statistically independent of the earnings information variables. The only source of difference between items 2 and 3 on Table 28 is the use of the variable transformation step in item 2.

A possible explanation for this difference is that while multicollinearity does not appear to be a serious problem for the Fama Babiak version of the basic statistical model, it is present. In twenty-two of the 202 sample firms it is severe. For the rest of the sample firms it is not "severe" according to the definition of severity used by Klein (30). Its' presence, however small, may have been sufficient to obscure the dividend information in the residuals from the FB version (i.e. the equation 7 residuals).

Empirically, the use of the transformed dividend variables does show a strong, systematic association between dividends and security returns. The conclusions, based on this analysis and subject to its limitations, is that dividends do contain information other than that contained in earnings.

Limitations of the Study

As with most of the research into information content issues, the use of estimation models is central to the methodology. Therefore the reliability of the results and conclusions of this study are dependent upon the propriety of all models used.

Attempts were made, in this study, to use the models that seemed to be the most useful and descriptive, given the current state of the art. Nevertheless, the results and conclusions of this study should be evaluated with these limitations or qualifications in mind.

This study assumes that the two factor asset pricing model (Equation 2) is the "correct" model in that it more closely represents the underlying process than do alternative available models. While there is support for this assumption , it is not the assumption of this study that this model perfectly represents the underlying process.[1]

Also, relative risk, beta, for each firm was allowed to vary from one announcement year to the other. However, the method used to allow this variation produced variation that probably lagged the "real"

1 Gonedes and Dopuch (27).

changes in this parameter. To the extent that this slowness of adaptation is a problem, results would be biased against the research hypothesis.

The use of CAR analysis in the "Supplementary Analysis" section of this study is subject to the limitations suggested by Marshall (35). He argues that there may be differences in the joint distributions of security returns and earnings, between firms. That is, this distribution may be different for each firm. Thus a cross-sectional approach to the information content issue may find that the effects that the research is looking for are disguised or lost in the cross-sectional statistics (i.e. the CAR).

Suggestions for Further Research

There are two areas of further research that emerge from this study. One area is a modification that should, given the results of this study, provide even stronger evidence of dividend information content. The other is an extension of this study that assumes dividend information content and hypothesizes firm specific characteristics to high dividend information content firms.

The modification is suggested by the results of Brown and Rozeff (11) on the superiority of analysts' earnings forecasts. A dividend information variable could be estimated by regressing the residuals from the Fama Babiak dividend model (Equation 7) on the Value Line earnings variable (Equation 6(a)), instead of on the earnings variable from the market index version (Equation 5a). To the extent that the VL variables are superior to the market index variables, the newly defined, statistically independent, dividend variables should more accurately capture the firm specific dividend information.

The extension mentioned above is suggested by the work of Lintner (32). He established that managers of firms act as if reducing dividends is an undesirable policy. Thus there is a reluctance to increase a dividend if management feels there is a possibility that they may have to be reduced in the future. Friend and Puckett (21) contend that:

> "In view of what we know about managerial desire to avoid dividend cuts, it certainly seems logical to expect that companies facing greater uncertainty about future profit performance would adopt lower current dividend payout as a means of hedging the risk of being forced to cut their dividend.[2]

If this characterization holds, then the following arguments can be made:

1. High payout firms are less risky in that they face less uncertainty about future returns than do low payout firms. Thus dividend changes may contain little or no information on these expectations over and above that contained in earnings.

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2. Friend and Puckett (21), p. 661.

2. Low payout firms are more risky in that they face more uncertainty about future returns than do high payout firms. Because annual reported profits of "risky" firms may be expected to fluctuate more than reported profits of the less risky firms, then current earnings may be a poor proxy for management's expectation of future earnings. In this case market agents may derive additional information about management's expectations of future earnings from the dividend announcement.

The above arguments suggest that there may be systematic differences in the amount of dividend information content for low and high dividend payout firms. This question can be addressed by partitioning firms on the basis of their target payout as estimated by the coefficients of the Fama Babiak dividend model.

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APPENDIX A

NAMES OF COMPANIES IN THE SAMPLE

A. C. F. Inds. Inc.
A. M. F. Inc.
Abbott Labs.
* Adams Millis Corp.
Allegheny Ludlum Inds. Inc.
Allied Chem. Corp.
Allis Chalmers Corp.
Alpha Portland Inds. Inc.
Amax Inc.
Ambac Inds. Inc.
American Airls. Inc.
American Bakeries Co.
American Brands Inc.
American Broadcasting Cos. Inc.
American Can Co.
American Home Prods. Corp.
American Seating Co.
Ametek Inc.
Anchor Hocking Corp.
Armco Stl. Corp.
Armstrong Cork Co.
Arvin Inds. Inc.
Asarco Inc.
Atlantic Richfield Co.
Bayuk Cigars Inc.
* Belding Heminway Inc.
Bell & Howell Co.
Bethlehem Stl. Corp.
Bliss & Laughlin Inds. Inc.
Boeing Co.
Borden Inc.
Borg Warner Corp.
Bristol Myers Co.
Brunswick Corp.
Bucyrus Erie Co.
Budd Co.
Burroughs Corp.
C. B. S. Inc.
C. P. C. Intl. Inc.
Caterpillar Tractor Co.
Celanese Corp.
* Certain Teed Prods. Corp.
Champion Intl. Corp.

Chemetron Corp.
Chicago Pneumatic Tool Co.
Chrysler Corp.
Cincinnati Milacron Inc.
Clark Equip. Co.
Cluett Peabody & Co. Inc.
Coca Cola Co.
Combustion Engr. Inc.
Congoleum Corp.
Continental Oil Co.
Conwood Corp.
Cooper Inds. Inc.
Copperweld Corp.
Corning Glass Wks.
Crane Co.
Crown Zellerbach Corp.
Cutler Hammer Inc.
Dart Inds. Inc.
Dr. Pepper Co.
Dow Chem. Co.
Du Pont E I De Nemours & Co.
Eastern Air Lines Inc.
Eastman Kodak Co.
Eaton Corp.
* Edison Bros. Stores Inc.
Evans Prods. Co.
Exxon Corp.
F. M. C. Corp.
Federal Mogul Corp.
Ferro Corp.
Fibreboard Corp.
Flintkote Co.
Freeport Minerals Co.
Fruehauf Corp.
* Gable Inds. Inc.
Gardner Denver Co.
General Cable Corp.
General Dynamics Corp.
General Elec. Co.
General Mtrs. Corp.
General Refractories Co.
General Signal Corp.
General Tel. & Electrs. Corp.
Getty Oil Co.
Gillette Co.
Goodrich B. F. Co.
Goodyear Tire & Rubr. Co.
Greyhound Corp.
Grumman Corp.

Gulf Oil Corp.
Hercules Inc.
Hershey Foods Corp.
Homestake Mng. Co.
Honeywell Inc.
Hudson Bay Mng. & Smlt. Ltd.
Inland Stl. Co.
Inmont Corp.
Instlco. Corp.
Inspiration Cons. Copper Co.
Interlake Inc.
International Business Machs.
International Tel. & Teleg. Corp.
Johns Manville Corp.
Kennecott Copper Corp.
Kimberly Clark Corp.
Koppers Inc.
Kraftco Corp.
Kroger Co.
Lehigh Portland Cem. Co.
Libbey Owens Ford Co.
Lockheed Aircraft Corp.
Lone Star Inds. Inc.
Lowenstein M. & Sons, Inc.
Lukens Stl. Co.
* Mac Andrews & Forbes Co.
Marathon Oil Co.
Maytag Co.
McGraw Edison Co.
McGraw Hill Inc.
McIntyre Mines Ltd.
Mead Corp.
Merck & Co. Inc.
Mesta Mach. Co.
Midland Ross Corp.
Minnesota Mng. & Mfg. Co.
Monarch Mach. Tool Co.
Moore McCormack Res. Inc.
Motorola Inc.
* Munsingwear Inc.
Murphy G. C. Co.
N. C. R. Corp.
N. L. Inds. Inc.
Nabisco, Ind.
National Can Corp.
National Distillers & Chem. Corp.
National Gypsum Co.
National Stl. Corp.
National Tea Co.

* Natomas Co.
Northwest Airls. Inc.
Olin Corp.
Owens Ill. Inc.
P. P. G. Inds. Inc.
Pan Amern. World Awys. Inc.
Penn Dixie Inds. Inc.
Pennwalt Corp.
Pepsico. Inc.
Pfizer Inc.
Phelps Dodge Corp.
Philip Morris Inc.
Phillips Pete Co.
Pittston Co.
Pullman Inc.
* Quaker St. Oil Refng. Corp.
R. C. A. Corp.
Republic Stl. Corp.
Revere Copper & Brass Inc.
Reynolds R. J. Inds. Inc.
Reynolds Metals Co.
Royal Crown Cola Co.
Safeway Stores Inc.
St. Joe Minerals Corp.
Scott Paper Co.
Shell Oil Co.
Simmons Co.
Skelly Oil Co.
Square D. Co.
Standard Brands Inc.
Standard Oil Co. Calif.
Standard Oil Co. Ind.
Standard Oil Co. Ohio
Sterling Drug Inc.
Stewart Warner Corp.
Sun Chem Corp.
* Superior Oil Co.
T. R. W. Inc.
Texaco Inc.
Texas Instrs. Inc.
Texasgulf Inc.
Timken Co.
Trans Un Corp.
Trans World Airls. Inc.
* Transway Intl. Corp.
Twentieth Centy Fox Film Corp.
U. A. L. Inc.
U. V. Inds. Inc.
Union Camp Corp.

Union Carbide Corp.
Union Oil Co. Calif.
Uniroyal Inc.
United Sts. Gypsum Co.
United Sts. Stl. Corp.
United Sts. Tob. Co.
United Technologies Corp.
Wallace Murray Corp.
Western Air Lines Inc.
Westinghouse Elec. Corp.
White Mtr. Corp.
Zenith Radio Corp.

* Because of data gathering problems at the Value Line Company in New York, these firms were not included in the Value Line Version.

APPENDIX B

EQUATIONS USED

No.	EQUATION
1	$CR_{iT} = \alpha_{oi} + \alpha_{1i}\varepsilon_{iT} + \alpha_{2i}\delta_{iT} + \omega_{iT}$
1.1	$CR_{iT} = \alpha_{oi} + \alpha_{1i}\hat{e}^{1}_{iT} + \alpha_{2i}\hat{d}^{1}_{iT} + \omega_{iT}$
1.2	$CR_{iT} = \alpha_{oi} + \alpha_{1i}\hat{e}^{2}_{iT} + \alpha_{2i}\hat{d}^{2}_{iT} + \omega_{iT}$
1.3	$CR_{iT} = \alpha_{oi} + \alpha_{1i}\hat{e}^{2}_{iT} + \alpha_{2i}\hat{d}^{3}_{iT} + \omega_{iT}$
2	$R_{it} = R_{zt} + \beta_i(R_{mt} - R_{zt}) + u_{it}$
3	$R_{it} = \hat{a}_{ot} + \hat{a}_{1t}\beta_i + \hat{u}_{it}$
4	$CR_{iT} + \sum_{t=-11}^{0} \hat{u}_{it}$
5(a)	$\Delta E_{iT} = a_i + b_i \Delta E_{mT} + \hat{e}^{2}_{iT}$
5(b)	$\Delta D_{iT} = a_i + b_i \Delta D_{mT} + \hat{d}^{2}_{iT}$
6(a)	$\hat{e}^{1}_{iT} = E_{iT} - EF_{iT}$
6(b)	$\hat{d}^{1}_{iT} = D_{iT} - DF_{iT}$
7	$\Delta D_{iT} = b_{1i}D_{i,T-1} + b_{2i}E_{iT} + b_{3i}E_{i,T-1} + \hat{d}^{3}_{iT}$

EQUATIONS USED (Cont.)

No.	EQUATION
8	$\delta_{iT} = b_{oi} + b_{1i}\varepsilon_{iT} + z_{iT}$
8.1	$\hat{d}^{1}_{iT} = b_{oi} + b_{1i}\hat{e}^{1}_{iT} + z^{1}_{iT}$
8.2	$\hat{d}^{2}_{iT} = b_{oi} + b_{1i}\hat{e}^{2}_{iT} + z^{2}_{iT}$
8.3	$\hat{d}^{3}_{iT} = b_{oi} + b_{1i}\hat{e}^{2}_{iT} + z^{3}_{iT}$
9	$CR_{iT} = \alpha_{oi} + \alpha_{1i}\varepsilon_{iT} + \alpha_{2i}Z_{iT} + v_{iT}$
9.1	$CR_{iT} = \alpha_{oi} + \alpha_{1i}\hat{e}^{1}_{iT} + \alpha_{z1i}\hat{z}^{1}_{iT} + v_{iT}$
9.2	$CR_{iT} = \alpha_{oi} + \alpha_{1i}\hat{e}^{2}_{iT} + \alpha_{z2i}\hat{z}^{2}_{iT} + v_{iT}$
9.3	$CR_{iT} = \alpha_{oi} + \alpha_{1i}\hat{e}^{2}_{iT} + \alpha_{z3i}\hat{z}^{3}_{iT} + v_{iT}$