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THE DIFFERENTIAL EFFECTS OF UNEXPECTED PERMANENT AND TRANSITORY EARNINGS CHANGES ON EQUITY RETURNS

University of Illinois at Urbana-Champaign PH.D. 1987

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THE DIFFERENTIAL EFFECTS OF UNEXPECTED PERMANENT AND TRANSITORY EARNINGS CHANGES ON EQUITY RETURNS

BY

PHILIP ROGER REGIER

B.A., St. John's College, 1978

THESIS

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in Accountancy
in the Graduate College of the
University of Illinois at Urbana-Champaign, 1987

Urbana, Illinois

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

THE GRADUATE COLLEGE

DECEMBER 1986

WE HEREBY RECOMMEND THAT THE THESIS BY

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ENTITLED THE DIFFERENTIAL EFFECTS OF UNEXPECTED PERMANENT AND TRANSITORY EARNINGS CHANGES ON EQUITY RETURNS

BE ACCEPTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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ABSTRACT

THE DIFFERENTIAL EFFECTS OF UNEXPECTED PERMANENT AND TRANSITORY EARNINGS CHANGES ON EQUITY RETURNS

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This study characterizes the new information contained in an earnings announcement based on the degree to which the new information perturbs expectations of earnings. New information is categorized as either permanent or transitory, depending on the degree to which the new information is associated with changes in earnings expectations. The differential impact of the categories of new information on a firm's value is modeled, and the effect of nonrecurring items on earnings expectations is studied. Hypotheses are formulated from the analysis. A market-based research design is constructed to test the hypotheses. The design uses standardized abnormal returns from a market model to surrogate changes in firm value, and forecasts from the Value Line Investment Survey to proxy market earnings expectations. Parametric and nonparametric tests are utilized in testing the hypotheses. The results of the empirical tests provide evidence that unexpected changes in permanent components of earnings have a greater impact on firm value than unexpected changes in transitory components. The results also support the hypothesis that revisions in market expectations of earnings are greater for firms which disclose earnings figures which contain nonrecurring items than for other firms.

DEDICATION

This work is dedicated to my parents, Louis and DeMar Regier, whose example has been my best teacher.

ACKNOWLEDGEMENTS

This work benefitted greatly from discussions with the members of my dissertation committee: Professor Thomas J. Frecka, Professor Cheng-Few Lee, Professor Louis O. Scott, and Professor David A. Ziebart. The chairman, Professor James C. McKeown, provided invaluable assistance at critical points in the preparation of this study. The thoughtful comments of workshop participants at Arizona State University, the University of Michigan, and Ohio State University are gratefully acknowledged. Financial assistance during the latter stages of the dissertation was provided by the Ernst & Whinney Foundation. Hwan Kim and John VanHorn contributed programming assistance which facilitated completion of the empirical work. Finally, I would like to thank Fred Mittelstaedt and James Yardley for their comments on this dissertation and their friendship during the Ph.D. program.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The notion that the new information in an accounting earnings announcement signals changes in firm value has been used to motivate and support a number of accounting research studies and has, itself, been a direct object of accounting research. Ball and Brown [1968] established that the sign of an earnings forecast error is associated with the direction of security return movement. Later, Beaver, Clarke, and Wright [1979] observed an ordinal association between the magnitude of a security's earnings forecast error and the unexpected security return.

These studies, among others, helped establish the perspective that accounting information is an input to the security valuation process. Related research, examining how the information is used in the valuation process (e.g., Gonedes [1976],[1978]; Beaver, Lambert, and Morse [1980]; and Easton [1985]), has posited a link between the new information in an earnings announcement and market agents' assessments of future income distributions.

This study uses this link in developing a classification of new information in an earnings announcement. Whereas prior studies view all new information as qualitatively similar, the analytical portion of this research categorizes new information as permanent or transitory based on the more general notion of earnings persistence. Earnings persistence reflects the degree to which new information in a current earnings

announcement affects earnings expectations for future periods. Using this classification, the research models the different effects of the classes of new information on firm value.

The crux of the argument motivating the proposal is that knowledge of the new information contained in an earnings announcement is a relatively crude aid in understanding the impact of the announcement on firm value. Earnings forecast errors, which proxy for new information, signal changes in the cash flow prospects of the firm. However, the impact of earnings forecast errors becomes much clearer after determining the extent to which the new information is expected to be present in the future earnings series.

There is an abundance of research supporting the position that both earnings announcements and revisions in analysts' earnings forecasts provide information useful in establishing equilibrium security prices. However, the effect of each of these events on firm value has always been studied independently of the other. The importance of the current research is in using the effect which an earnings announcement has on earnings expectations to explain the magnitude of return response to an earnings announcement.[1]

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[1] Kormendi and Lipe [1986] analyze the cross-sectional relationship between the impact of new information in an earnings announcement on security price and a persistence parameter developed from a two-equation autoregressive system. Basic differences between the current study and Kormendi and Lipe include: (1) In this study, the relevant theoretical hypotheses are derived from an earnings capitalization model rather than the two-equation autoregressive system of Kormendi and Lipe; (2) The current study directly assesses the impact on analysts' expectations of new information in an earnings announcement rather than relying on time-series model to determine the effect; and (3) This study uses quarterly earnings series rather than the annual series.

This study has three specific research objectives. The first objective is to provide a theory explaining why new information in an earnings announcement has differing effects on firm value based on its expected relation to the future earnings series. This objective addresses the problem of whether viewing new accounting information conditional on its effect on earnings expectations increases our understanding of the effect of the new information on firm value. The second objective is to formulate empirically testable hypotheses based on the theoretical development and to test the hypotheses using a research design described in the study. This market-based research design uses standardized cumulative residuals from a market model to determine the consistency between the market response to an earnings announcement and changes in earnings expectations. The final objective is to determine whether the effect of the new information contained in the disclosure of nonrecurring items is consistent with the definition of a transitory earnings change proposed in the study. The implications for the current accounting model of this objective relate to the recurring/nonrecurring item classification present under generally accepted accounting principles (hereafter GAAP). There is a widespread presumption that the impact of employee strikes, plant closings, and other nonrecurring items has a transitory effect on earnings. This research directly tests the presumption.

1.2 Literature Review and Contributions

An important feature differentiating this study from prior works is the classification of the new information in an earnings announcement by its expected persistence in future earnings figures. By viewing new

information from different firms' earnings announcements as qualitatively dissimilar, the study is able to address the following topics stemming from the earnings announcement and forecasting literature.

1. To what degree does new information provided by GAAP serve as an input in the firm valuation process envisioned in the informational perspective?

2. What are some of the causes of cross-sectional variation in forecast revisions relative to an earnings announcement?

3. What are the differential effects of permanent and transitory changes in earnings on firm value, and how are the effects conditioned by firm growth characteristics?

The remainder of this section details the contributions provided by this study relative to these three topics areas.

1.2.1 The Informational Perspective and Accounting Earnings

In the last decade, a fundamental shift has occurred in the perspective taken by the FASB, accounting researchers, and others with regard to accounting earnings. The shift has been characterized as moving away from viewing earnings as the output of an accounting valuation model operating in certain and complete markets (the economic income perspective) to viewing earnings as an information input in the firm valuation process occurring in uncertain and incomplete markets (the informational perspective).[2]

The adoption of the informational perspective has expanded the theoretical role of earnings in a valuation context, and focused attention on the effect which information in an earnings announcement can have

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[2] Representative works in the economic income perspective include Edwards and Bell [1961], Chambers [1966], and Revsine [1973].

on a stock's price. In a certainty context, the expression of the relation between price and earnings is typically defined as a constant called the earnings multiplier. However, once uncertainty is introduced in the form of expectations regarding future earnings, the connection between current prices and current earnings becomes more obscure.

The informational perspective explains the connection by reference to two fundamental links. First, the time-series of accounting earnings has a predictive relationship with future accounting earnings which are, in turn, related to future benefits (cash-flows) accruing to shareholders. Second, expected future benefits are linked to the security prices which are derived as the present value of expected future benefits accruing to shareholders. The relationship between a company's earnings and stock price at a point in time is a reduced-form characterization of these two fundamental links.

Easton [1985] provides evidence concerning these two fundamental links. Using ex post dividend realizations as a measure of expected future benefits, Easton finds a strong association between current accounting earnings and future cash flows to shareholders. He also finds that these future cash flows have a strong association with the security price.

In the current study, the informational perspective is used to describe the process which results in equilibrium security prices subsequent to an earnings announcement. The important implication provided by the informational perspective and tested in this study is

that the return response to an earnings announcement is consistent with the effect of the announcement on earnings expectations.[3,4]

1.2.2 Implications for Financial Reporting

The two sections which follow classify the information contained in an earnings announcement based on the degree to which it affects expectations of earnings. The discussion distinguishes between information which affects expectations for all periods (termed "permanent"), and information that does not change future expectations (termed "transitory"). The theory will indicate that the valuation effects induced by the different types of items are different.

Different valuation effects presumably underlie the present disclosure rules for nonrecurring items under GAAP. Under the current

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[3] In testing this proposition, the study uses earnings generated under GAAP to proxy for "economic earnings under uncertainty" envisioned in the informational perspective. Whereas the role of economic earnings may be characterized as being, "purely dependent on predictive content" (Ohlson, [1983], p. 143), earnings generated in accordance with generally accepted accounting principles (GAAP) may provide new information which is not expected to affect future earnings figures or firm value. Extraordinary items, for example, may be unexpected components of the earnings figure which have a negligible effect on price because they are not expected to impact future earnings figures. The extent to which the economic earnings assumption limits the use of the informational perspective in accounting research is addressed in this study. The study examines whether accounting numbers derived by GAAP function as a surrogate for expected future benefits in the manner predicted by the informational perspective.

[4] An additional qualification is in order. In the past decade there has been a substantial amount of research which indicates that the market can "see through" cosmetic accounting changes. A change in accounting method may perturb the entire stream of future earnings, but have a negligible effect on price. This is addressed more fully in the "Nonstationarities" section of the section on research design. This study focuses on "real" events which are reported by the accounting system, instead of cosmetic events induced by the accounting system.

rules, reported income numbers must be disaggregated into recurring (ordinary) and nonrecurring (unusual and/or infrequent) components.

Gonedes ([1976],[1978]) discusses potential differential return effects of certain types of accounting information. His analysis is aimed at the assumption implicit in the GAAP decomposition that the separate sources of net income (recurring and nonrecurring) have different information, and hence, valuation, effects. His research indicates that the return effects attributable to items classified as extraordinary are no different than those from recurring sources:

> Our major inference is that the evidence presented here is uniformly inconsistent with the view that the . . . annual extraordinary-item signals reflect information beyond that reflected in contemporaneous annual income signals or existing sample evidence. (p. 28)

Such results appear anomalous in light of valid theory supporting the differential valuation effects of permanent and transitory items. The question this study addresses is: Do analysts behave as if their assessments of future income are formed conditional on the recurring/-nonrecurring item classification? Without referring to any empirical results, it might seem obvious that expectations are formed conditional on such a dichotomy. However, Gonedes' results indicate that, if the expectations of income are implicit in price, then the expectations are not based on the current income dichotomy. The need for such research has recently been recognized in the literature:

> An important area for future research is operationalizing the permanent and transitory components [of reported earnings]. One might suspect, for example, that the impact on earnings of employee strikes and plant closures and writedowns should be classified largely as transitory. At this stage, however, we know little about how the earnings concept implicit in security price determination differs from either pre- or

> post-extraordinary item GAAP reported earnings. (Brown, Foster, and Noreen [1985], p. 6).

Implications for the current accounting model of such research are intriguing. For example, if revisions in expectations do not appear to be affected by the earnings classification, a possible explanation is that so-called nonrecurring items have important recurring future effects which are discerned by market agents and impounded in the security return. For example, a plant expropriation may be an event which qualifies for classification as a nonrecurring item, but the income effects which result from the diminished operating capacity of the firm continue for an indefinite period into the future. Classification of the item as nonrecurring does not indicate the potentially more significant effect on future earnings.

If the above explanation is correct, then current disclosure rules are potentially deceptive. The rules disregard the continuing impact of nonrecurring items on operations, and thus disregard the single most useful item of information for purposes of valuation. The economic impact may be that firms are currently bearing unnecessary costs to comply with the current rules, while individual market agents are forced to utilize scarce economic resources to obtain the valuation-relevant information (expected persistence in future earnings) pertaining to the permanent or transitory nature of nonrecurring items.

Alternative explanations exist. One contribution of this study is to test whether unexpected changes in current earnings due to non-recurring items have effects on earnings expectations which are distinguishable from unexpected changes due to recurring items.

1.2.3 Adaptive Forecasting

In consumer economics, the permanent income hypothesis asserts that current consumption is a function of a consumer's expected long-run ability to consume (Friedman [1957]; Hall [1978]; Sargent [1978]; Flavin [1981]). Expectations of long-run ability to consume are based on expected permanent income. As the expected permanent income stream is revised in response to new information, the consumer's consumption pattern is changed.

The major elements of the hypothesis are transferable to enterprise economics. In this environment, the current stock price is a function of the perceived level of permanent income contained in the current earnings figure. As this amount is revised in response to new information, the stock price may fluctuate. This study focuses on the aspects of the theory most relevant to market-based accounting research, which is the relationship between new information contained in an earnings announcement and changes in expectations of earnings.

Currently, there are two competing theories used in macroeconomics to explain the formation of expectations: adaptive forecasting and rational expectations. The adaptive forecasting model characterizes the role of new information in earnings on the formation of expectations as follows:

$$E_t(X_{t+1}) - E_{t-1}(X_{t+1}) = a + b(X_t - E_{t-1}(X_t)) + e_t, \qquad (1)$$

where $E_t(X_{t+1})$ is the expectation at time t of earnings for period t + 1;

X_t is actual earnings at time t; and

a and b are intercept and slope terms, respectively.

The slope term (referred to as "the adaptive coefficient") is very similar to the notion of earnings persistence introduced in the next section (see Section 3.0). It describes the degree to which new information in an earnings announcement ($X_t - E_{t-1}(X_t)$) causes revisions in expectations of next period's earnings.

The adaptive model presented above possesses the primary relevant qualities of any adaptive model: (1) the expectations are extrapolations of past trends; (2) the expectation revision results primarily from information contained in past expectations and current values; and (3) the role of accounting and economic theory in determining changes in expectations is minimal. In any specific period a portion of the adjustment is due to the impact of factors other than earnings on expectations. The emphasis in this study is on examination of earnings trends in explaining revisions in expectations, and many other factors which may affect expectations are not examined. This is a limiting feature of the study (see Section 5.2).

In contrast to the adaptive model, the main principles underlying the rational expectations approach (originally proposed by Muth [1961]) are that agents utilize all available relevant information in revising their expectations, and that agents are aware of and utilize the theoretically correct underlying model in formulating their expectations.

Holden, Peel, and Thompson [1985] describe the difference between the rational expectations approach and adaptive forecasting as follows:

> First, the emphasis [in rational expectations] is on expectations being forward-looking, rather than simply being extrapolations of past trends; second, agents are acting in an optimising manner by processing all the relevant information; . . . third, the rational expectations approach provides a central role for economic theory in determining expectations. (p. 19)

Prior research which has analyzed the change in an expectation based on the past earnings series and current earnings realization falls in the category of adaptive forecasting literature. This category includes not only those studies using naive and/or mechanical forecasting models, but also studies which have analyzed changes in financial analysts' forecasts based on the past time series of revisions and the current forecast error.[5]

Tests analyzing the conformity of financial analysts' forecasts with a rational expectations model are relatively rare in accounting research. Muth's original criterion for rationality was that economic agents must form their expectations using the underlying "true" economic model to predict the value of the variable.[6] However, in accounting research the model generating accounting earnings is not known, and researchers have studied instead weak forms of rational expectations. Givoly [1985], for example, emplo "the weaker condition that expectations fully reflect

[5] See, for ex Abdel-Khalik and Espejo [1978]; Brown and Rozeff [1978]; as and Hopwood [1980]; Elton, Gruber, and Gultekin [1984]; Fried a ivoly [1982]; Givoly [1985].

[6] Shiller [1978] articulates the primary criticism of rational expectations:

> . . . while it may sometimes be useful as an expositional device to assume that agents have [the correct model of the economy], the assumption cannot be taken seriously. If economists are only now discovering these models, we cannot seriously propose that everyone else knew them all along.

all information contained in the past history of the variable being forecasted" (p. 374). Such a condition blurs the distinction between adaptive forecasting and rational expectations.

Givoly's study is divided into two sections. In the first part, "rationality tests" are performed by examining the randomness of analysts' forecast error terms. The results fail to reject a null hypothesis of no bias. In the second part, the adaptive forecasting model of equation 1 is estimated for 36 companies. Givoly's results suggest that the model, "adequately represents the process by which earnings expectations are formed" (p. 382).

Givoly's study is not designed to determine whether one model is "correct", but instead to determine the consistency of analysts' forecast errors with an adaptive model and with a very narrowly defined rational expectations model.

The definitions and metrics used in this study are derived from adaptive forecasting. Two considerations lead to the use of the adaptive model:

1. The primary focus of the study is on the return response to an earnings announcement conditional on changes in expectations. The adaptive model provides a straightforward expression of changes in expectations consistent with prior literature.

2. Givoly's work indicates that an adaptive model is rational in the weak form sense employed in the study. Until more research on the economic process generating earnings is performed, a stronger form of the rational expectations model is not justified.

Use of the adaptive model allows us to address some unanswered questions in the literature. The remainder of this section discusses the contribution of the study in this area.

Givoly's research, and that of others in the area of forecast revisions (e.g., Elton, Gruber, Gultekin [1984] [1981]; Fried and Givoly

[1982]; Givoly and Lakonishok [1979]; Abdel-Khalik and Espejo [1979]), is very general. The conclusions document variations in the degree of forecast revisions to new information in earnings, but ignore fundamental issues relating to the cause of such variations and the effect of such variations on fundamental firm variables.

In relation to the causes of the cross-sectional variation, accounting researchers should attempt to determine whether current disclosure rules are important. This study examines one possible cause of the variation related to accounting disclosure: the existence of non-recurring items in an earnings announcement.

Virtually no research has been conducted examining the effect on firm value of changes in earnings expectations arising from an earnings announcement. Elton, et al. [1981] showed that for firms in their sample, stock price movements were correlated with revisions in the expectations of the current year's income. However, (1) the revisions did not arise from new accounting information; (2) changes in expectations beyond the current period were not considered; and (3) the study did not account for differing growth expectations which may impact the size of the price movements.

The classification of information in an earnings announcement based on persistence is potentially useful in understanding a result noted in Elton, et al. [1984], which is that some firms' earnings are more difficult to predict than those of other firms. The inability of market agents to properly assess an accounting figure's impact on future earnings has two explanations related to the expected persistence of the information:

1. The information was erroneously not expected to affect future earnings; and

2. The information was erroneously expected to be present in future earnings.

For firms subject to the first type of error, the announcement did not provide a signal interpreted by market participants as requiring a change in expectations. Conversely, new information in earnings releases of firms of the second type was erroneously expected to impact future earnings. Identification of cross-sectionally consistent disclosure policies followed by firms in the two classes (for example, in regard to nonrecurring and extraordinary items) could help accountants reduce error in the signals of future earnings generated by a particular earnings announcement.

1.3 Organization of the Study

This chapter has presented the objectives of the study and discussed the expected contributions of this research in light of prior literature. Chapter 2 develops a theory linking permanent and transitory accounting earnings changes to changes in firm value, and specifies hypotheses arising from this analysis. In Chapter 3, a research design is developed to test these hypotheses. Chapter 4 presents the results of the empirical tests. Chapter 5 provides a summary and discusses conclusions and limitations of the study.

CHAPTER 2

THEORY AND HYPOTHESES

2.1 Definitions

The purpose of this section is to provide definitions which relate the new information contained in an earnings announcement to the firm's future earnings stream based on the persistence concept.

The definitions are developed from the adaptive model presented in equation 1. Brown and Rozeff [1979b], using quarterly data in a pooled cross-sectional regression, find that the intercept is insignificant in most cases. For a single observation, dividing the change in expectation by the earnings forecast error gives an expression of the degree to which new information affects the one-period ahead forecast:

$$b = \begin{cases} \dfrac{E_t(X_{t+1}) - E_{t-1}(X_{t+1})}{X_t - E_{t-1}(X_t)}, & X_t \neq E_{t-1}(X_t). \\ \\ 0, \text{ otherwise.} \end{cases} \qquad (2)$$

In the case where $X_t = E_{t-1}(X_t)$, no new information is provided by the earnings announcement, and so no revision of expectations based on new information is possible.

Equation 2 expresses the degree to which new information is expected to recur or "persist" in the one-period ahead expectation. If the expression is one, for example, the new information is expected to affect the value of the next period's earnings exactly as it affected current earnings.

In this study, the degree of persistence for any particular future period is measured as the change in the expectation relative to the new information:

$$P_{t+k} = \begin{cases} \dfrac{E_t(X_{t+k}) - E_{t-1}(X_{t+k})}{X_t - E_{t-1}(X_t)} \quad , \quad \forall\ k > 0;\ X_t \neq E_{t-1}(X_t). \\ \\ 0, \text{ otherwise.} \end{cases} \tag{3}$$

where: P_{t+k} is the measure of persistence relative to the k-th period-ahead earnings forecast.

The numerator is the change in the forecasted value of an earnings figure associated with the current earnings announcement. The denominator is the "new information" in earnings, which is operationalized by use of analysts' forecast errors in the empirical analysis.

Scaling the change in expectations by the earnings forecast error allows both the direction and magnitude of the change in expectations relative to the new information to be reflected in the definitions.

This definition of persistence is a more general expression of the adaptive coefficient presented in equation 1. Whereas the adaptive coefficient specifically describes the change in the next period's expectation, the measure in equation 3 describes the change in the expectation of any future period relative to the current forecast error. By examining the measure in equation 3 for different forecasts (k = 1, 2, 3, etc.) a picture of how a particular earnings realization affects the expected earnings stream begins to emerge. If, for example, the measure is zero for forecasts $k \geq 1$, the current earnings realization did not affect the future earnings stream and the effect of any new data in

earnings is transitory. Conversely, the aggregate effect of measures not equal to zero for periods after and including k = 1 indicates the persistence of the effect of the new information on future earnings.

2.1.1 Transitory Change in Earnings

The new data contained in an earnings announcement is transitory when expectations of earnings are not affected by the new information. A transitory change is defined as follows:

$$\frac{E_t\ (X_{t+k}) - E_{t-1}(X_{t+k})}{X_t - E_{t-1}(X_t)} = 0\ ;\ \forall\ k > 0. \qquad (4)$$

2.1.2 Permanent Change in Earnings

The new information in an earnings announcement is permanent when all expectations of earnings are affected by the new information:

$$\frac{E_t\ (X_{t+k}) - E_{t-1}(X_{t+k})}{X_t - E_{t-1}(X_t)} = 1\ ;\ \forall\ k > 0. \qquad (5)$$

There are intermediate cases between the transitory and permanent classifications where some, but not all, of the expectations of earnings are affected by the new information and where the change in expectation relative to the new information is between zero and one. The analysis which follows refers only to the extreme cases, and there is little loss in generality arising from ignoring intermediate cases in the theoretical analysis.

2.1.3 Discussion: Earnings Persistence and Earnings Uncertainty

An investor faces a spectrum of uncertainty related to firm performance. The degree of uncertainty ranges from uncertainty concerning a particular earnings result to uncertainty related to the long-run

profitability of the firm.[7] Examples of the first extreme include uncertainty due to litigation or other contingencies, the current income effect of a divestiture, natural disaster, or change in accounting principle, and, in general, uncertainty arising from events or occurrences specific to a particular period. This is not meant to imply that the effect of such events is confined to the current period. As indicated in Section 2.2, the economic impact of nonrecurring items may continue for an indefinite future period. Examples of the second extreme include long-run impairments or increments to earnings arising from changes in supply technology or product demand, changes in a firm's investment opportunities or investment strategies, and, in general, effects of decisions or events related to the multiperiod prospects of a firm.

Uncertainty arising from permanent and transitory changes in earnings may be illustrated through reference to two perpetual bonds with unique characteristics. Holders of the first bond are promised a specified yield over time, with the stipulation that the coupon rate in any given period may diverge from the specified long-term rate by a non-serially correlated, mean-zero disturbance term. Deviations in any specific period from the specified coupon rate are analogous to transitory changes in earnings. The expected value of future payments is not

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[7] The position of an investor along this continuum depends to a great extent on the type of decision the investor is making and the investor's holding period. Thus, a bank trust officer managing a portfolio of securities may be less concerned with the direction of a particular firm's earnings announcement than a speculator attempting to arbitrage the benefits accruing to the same firm by placing trades within the first few minutes of the firm's earnings announcement.

affected by either the presence or absence of a disturbance term in the current payment. Uncertainty is focused on the near term.

We can also imagine a second perpetual bond where the coupon rate is stochastically re-evaluated at the end of each period.[8] Holders of this type of bond, while assured of the current coupon payment, are uncertain of the long-term yield which they will receive. The expectation of future payments is re-evaluated with each change in the coupon rate, and uncertainty is focused on periods other than the current period. The stochastic change in the coupon rate is analogous to a permanent change in earnings of the firm.

In Section 4, an earnings model of firm valuation is presented. The certainty assumption used to derive the model is relaxed, and the effect of types of uncertainty stemming from the current earning realization are examined. In summary, the sources of uncertainty derived in this section and examined in Section 4 are:

1. Uncertainty arising from a transitory departure of the current earnings realization from expectations; and

2. Uncertainty arising from reassessments of future profitability occasioned by a permanent departure of the current earnings realization from expectations.

This classification of sources of uncertainty due to earnings is similar to that of Fewings [1979] and Pettit and Westerfield [1972].

2.2 Theory

The purpose of this section is to utilize the definitions of permanent and transitory changes in accounting earnings provided in the previous section in order to model the relationships between these

[8] Described in Fewings [1979], p. 7.

components of an earnings change and the financial concepts of firm value and firm value conditional on growth.

2.2.1 An Earnings Model of Firm Valuation

Miller and Modigliani [1961] show that the value of an enterprise in an economy characterized by perfect capital markets, rational investment behavior, and perfect certainty in regard to investment programs and cash-flows, can be stated as:

$$V_0 = \sum_{t=1}^{\infty} \frac{CF_t}{(1+p)^t} , \qquad (6)$$

where: V_0 is the value of the firm at the beginning of period 1;

p is the market rate of interest, assumed to be intertemporally constant; and

CF_t is the net cash flow (receipts less outlays) accruing to the firm at the end of period t.

By making adjustments for changes in certain current accounts and non-cash charges and credits, this cash flow model may be rewritten as:

$$V_0 = \sum_{t=1}^{\infty} \frac{X_t}{(1+p)^t} , \qquad (7)$$

where X_t is income from operations for the period t[9].

---

[9] Periodic cash flow may be reconciled with periodic net income by adjusting for (1) changes in the current balance sheet accounts which have a direct income statement effect (e.g., accounts receivable, inventory, etc.); and (2) non-cash income statement charges and credits (e.g., depreciation, amortization, etc.). For an enterprise with a stable investment policy, the operating income will adequately reflect the cost to maintain operating income at its previous level.

2.2.2 Firm Value and Earnings Uncertainty (No Growth)

In this section we utilize a no growth assumption which will be relaxed in the next section. In this section and section 2.2.3 we use a simplifying assumption whereby the dividends paid to shareholders at time 1 includes any permanent or transitory increment occurring during period 1:

$$d_1 = E(d_1) + [X_1' - E(X_1)], \tag{8}$$

where: d_1 is dividends paid at time 1.[10]

By relaxing the perfect certainty assumption and using expectations of earnings realizations we are able to restate the value of an enterprise prior to a specific earnings realization in terms which are consistent with our definitions of transitory and permanent changes:

$$V_0 = \frac{E(X_1)}{(1+p)^1} + \frac{E(X_2)}{(1+p)^2} + \ldots = \frac{E(X)}{p} \tag{9}$$

At time 0, the expectation of the value of the firm at the end of period one (time 1) is:

$$E(V_1) = E(X_1) + \frac{E(X_2)}{(1+p)} + \frac{E(X_3)}{(1+p)^2} + \ldots = E(X_1) + \frac{E(X)}{p} \tag{10}$$

Now suppose that period 1 earnings differ from expectations and the difference is transitory. The value of the firm immediately following the end-of-year earnings realization is:

$$V_1 = X_1' + \frac{E(X_2)}{(1+p)} + \frac{E(X_3)}{(1+p)^2} + \ldots = X_1' + \frac{E(X)}{p} \tag{11}$$

---

[10] If the increment was reinvested, future earnings would be affected due to higher or lower interest rates on debt. However, because the reinvestment would occur at rate p, the future return, and hence, the present value of the firm, would not be affected.

where: X_1' is the actual earnings realization for period 1.

The absolute change in the value of the firm due to a transitory change in earnings in a no-growth environment is:

$$\Delta V_{T,NG} = V_1 - E(V_1) = X_1' - E(X_1). \tag{12}$$

The change relative to the beginning value is:

$$\frac{V_1 - E(V_1)}{V_0} = [X' - E(X)] \; / \; [E(X)/p]. \tag{13}$$

Under our assumptions, if the value of the corporation is ten times earnings, and current earnings differ from expectations by 10% due to a transitory change in earnings, the shareholders are better or worse off by approximately 1% of the pre-announcement market value. The change in the value of the firm is relatively small because we have specified that the unexpected change in earnings does not affect future earnings expectations.

Reassessment of long-term profitability - a permanent change in earnings - may be either contemporaneous with or independent of the current earnings realization. Here, we assume that the reassessment occurs due to information in the current earnings realization, which is consistent with the primary focus of the study. In this case, the value of the firm immediately following the period 1 earnings announcement is:

$$V_1 = X_1' + \frac{E(X_2')}{(1+p)} + \frac{E(X_3')}{(1+p)^2} + \ldots = X_1' + \frac{E(X')}{p} \tag{14}$$

where $X' \neq X$ due to a permanent change in earnings. The change in the value of the firm due to a permanent change in earnings is:

$$\Delta V_{P,NG} = V_1 - E(V_1) = X' - E(X) + \frac{E(X') - E(X)}{p} \tag{15}$$

The effect on value of a permanent change is greater than that of a transitory change by the amount of the second term in the right-hand side of equation 15.

The change in value due to a permanent component relative to the beginning value of the firm is:

$$\frac{V_1 - E(V_1)}{V_0} = \frac{X' - E(X) + \{[E(X') - E(X)]/p\}}{E(X)/p} \qquad (16)$$

The conclusion of this analysis can be illustrated by again referring to the bond example described in the prior section. Assuming a reasonable and stable discount rate, the value of the first bond will vary from period to period by the difference between the expected current payment and the actual current payment. This is because the value of the bond is primarily based on the future expectations which are unaffected by changes in the current yield of the bond. Conversely, holders of the second bond experience much larger variability in value because future expectations are affected by the stochastic change in coupon rate.

2.2.3 Firm Value and Earnings Uncertainty (Growth)

2.2.3.a A Model of Firm Valuation Incorporating Growth

Introducing growth in the analysis requires a re-evaluation of equation 9 for firm value. We utilize Fama and Miller's ([1972], p. 92) definition of a growth firm as one which has the potential to make investments in the future which will generate returns greater than those available to market investors. The definition allows us to empirically identify growth firms as those for which the market places a high value in relation to current earnings. In terms of equation 9, a growth firm is one for which

$$V_0/E(X) > 1/p. \tag{17}$$

Suppose that our original firm has the opportunity to invest, at the end of period 1, in assets which will generate a uniform perpetual stream of earnings in the future. In the models which follow, we assume that investments are entirely funded by borrowing at rate p. At the beginning of period 1, the expectation of period two earnings will be:

$$E(X_2) = E(X_1) + E(I_1)(p^* - p) \tag{18}$$

where: I_1 is the new investment undertaken at the end of period 1; and

p^* is the rate of return on the new investment.

Similarly, the expectation of period 3 earnings at time 0 (the beginning of period 1) is:

$$E(X_3) = E(X_2) + E(I_2)(p^* - p). \tag{19}$$

Through repeated substitution,

$$E(X_t) = E(X_1) + \sum_{\tau=1}^{t-1} E(I_\tau)(p^* - p). \tag{20}$$

Appendix 2.1 shows how this expression, when substituted into equation 9, will yield the following present value expression for the value of the firm at time 0 (the beginning of period one):

$$V_0 = \frac{E(X_1)}{p} + \sum_{t=1}^{\infty} \frac{E(I_t)(p^* - p)}{p(1 + p)^t} \tag{21}$$

Equation 21 expresses firm value as the sum of two values: the value of the earnings stream produced by assets currently held by the firm, and the value of the future earnings arising from advantageous investment opportunities. The relative importance of the two quantities

in regard to total firm value is dependent on the expectation of future investment and the relation of p* to p.

Using equation 21, the expectation at time 0 of the value of the firm at time 1 is:

$$E(V_1) = E(X_1) + \frac{E(X_1)}{p} + \frac{p^* - p}{p} \sum_{t=1}^{\infty} \frac{E(I_t)}{(1+p)^{t-1}} \qquad (22)$$

(See Appendix 2.1 for derivation.)

2.2.3.b Firm Value, Growth, and Transitory Changes

In the following sections we make use of the traditional capital market assumption of unlimited borrowing ability to finance investments. Thus, the choice of which investments should be undertaken is not dependent on permanent or transitory changes in earnings.

In this environment, the value of a firm at time 1 which experiences a transitory change in earnings in the first period is:

$$V_1 = X_1' + \frac{E(X_1)}{p} + \frac{(p^* - p)}{p} \sum_{t=1}^{\infty} \frac{E(I_t)}{(1+p)^{t-1}} \qquad (23)$$

The change in value of a firm due to a transitory component of earnings in this growth case is:

$$\Delta V_{T,G} = V_1 - E(V_1) = X_1' - E(X_1) \qquad (24)$$

Note that equation 24 is the same as equation 12, indicating that the absolute change in firm value due to a transitory component is equal in the growth and the no-growth cases. However, the relative change in the growth case is given by:

$$\frac{V_1 - E(V_1)}{V_0} = \frac{X_1' - E(X_1)}{\frac{E(X_1)}{p} + \frac{(p^* - p)}{p} \sum_{t=1}^{\infty} \frac{E(I_t)}{(1+p)^t}} \qquad (25)$$

Comparing equation 25 with equation 13 indicates that the denominator in 25 islarger by the value of the summation factor present in 25. This results in the percentage change in value of a firm due to a transitory component being smaller for a growth firm than for a non-growth firm. This result occurs because some portion of the value of a growth firm is dependent on future investments which are unaffected by unanticipated changes in current earnings.

2.2.3.c Firm Value, Growth, and Permanent Changes

In a growth environment, a permanent change is assumed to affect p*, which is interpreted as the average rate of return on all investment opportunities of which the firm chooses to take advantage. In the case of a permanent change, the average return shifts either right or left to a new value, p*'. The value of a growth firm at time 1 which experiences an unexpected permanent change in earnings during the first period is given as (see Appendix 2.1):

$$V_1 = X_1' + \frac{X_1'}{p} + \frac{(p^{*\prime} - p)}{p} \sum_{t=1}^{\infty} \frac{E(I_t)}{(1+p)^{t-1}} \qquad (26)$$

The unexpected change in value is (equation 26 minus equation 22):

$$\Delta V_{P,G} = V_1 - E(V_1)$$

$$= X_1' - E(X_1) + \frac{X_1' - E(X_1)}{p} + \underline{\frac{(p^{*\prime} - p')}{p} \sum_{t=1}^{\infty} \frac{E(I_t)}{(1+p)^{t-1}}} \qquad (27)$$

The underlined portion of equation 27 is the additional increment by which a permanent change alters the value of a growth firm relative to a non-growth firm (compare with equation 15 above).

The change in firm value relative to the beginning value of the firm is (equation 27 divided by equation 21):

$$\frac{V_1 - E(V_1)}{V_0} =$$

$$\frac{X_1' - E(X_1) + \frac{X' - E(X_1)}{p} + \frac{(p^{*\prime} - p')}{p} \sum_{t=1}^{\infty} \frac{E(I_t)}{(1+p)^{t-1}}}{\frac{E(X_1)}{p} + \underline{\frac{(p^* - p)}{p} \sum_{t=1}^{\infty} \frac{E(I_t)}{(1+p)^t}}} \quad . \qquad (28)$$

Again, the underlined portion of the ratio indicates the portion of the ratio not found in the no-growth model (equation 16).

Examining the equation, it becomes clear that there is no unambiguous relationship between the relative change in the value of a firm in a growth and a no-growth setting arising from a permanent change in income. The denominator of equation 28 is larger than the denominator in the corresponding no-growth equation (equation 16) by the amount of the underlined portion. The numerator is also larger in absolute value by the amount of the underlined portion. The size of this incremental portion in the numerator of the growth equation is primarily determined by the difference between p*' to p*. Obviously, and somewhat surprisingly, when the difference is very small, the change in relative value of a growth firm due to a permanent change in earnings can be smaller than the change in relative value of a no-growth firm. This result is at odds with the conventional wisdom which asserts that the impact of a permanent

change on the relative value of a growth firm must be greater than the impact of such a change on a no-growth firm.[11]

Further analysis is necessary to determine the conditions under which the impact on relative value in the growth case may be expected to be smaller than, equal to, or larger than the impact in the no-growth case. However, we do not believe at this stage that such analysis would yield testable hypotheses, and it is virtually certain that any empirical tests which might result would be subject to very severe proxy limitations.

2.2.4 Nonrecurring Items and Earnings Expectations

Appendix 2 derives precisely the amount by which the effect of a recurring change in income exceeds the effect of a nonrecurring change on the expectations of any given income figure. Here, it is sufficient to note that the effect on expectations of a change in recurring income is substantially greater than that of a nonrecurring charge.

The accounting question underlying the analysis is whether unanticipated nonrecurring items have negligible effects on income expectations or non-negligible effects on expectations. The first effect is consistent with interpreting these items as transitory, while the second is consistent with viewing such items as containing permanent components.

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[11] See, for example, Fewings [1979], p. 7.

2.3 Theoretical Hypotheses

The following hypotheses are derived from the analysis contained in Section 2.2. The alternative form is the form in which each hypothesis is expected to hold.

The first hypothesis relates to the analysis of firm value and earnings uncertainty.

> H_{O1}: An unexpected permanent change in earnings does not have a greater effect on firm value than an unexpected transitory change in earnings.
>
> H_{A1}: An unexpected permanent change in earnings has a greater effect on firm value than an unexpected transitory change in earnings.

The second hypothesis relates to the analysis of growth and earnings uncertainty.

> H_{O2}: An unexpected transitory change in earnings does not have a smaller effect on firm value in the case of high growth firms than in the case of low growth firms.
>
> H_{A2}: An unexpected transitory change in earnings has a smaller effect on firm value in the case of high growth firms than in the case of low growth firms.

The final hypothesis relates to nonrecurring items. For a firm disclosing nonrecurring items, new information in an earnings announcement can be due either to new information related to continuing operations or new information related to the nonrecurring item. New information from each of these sources may cancel if the sign of the unexpected information from each source differs. For this reason, the hypothesis refers only to those instances where the nonrecurring item is not opposite in sign from the new information in earnings.

H_{O3}: For firms disclosing nonrecurring items which are not opposite in sign from the new information contained in net income, the persistence of the new information contained in earnings is not less than it is for those firms not disclosing nonrecurring items.

H_{A3}: For firms disclosing nonrecurring items which are not opposite in sign from the new information contained in net income, the persistence of the new information contained in earnings is less than it is for those firms not disclosing nonrecurring items.

CHAPTER 3

RESEARCH DESIGN

3.1 General Description

3.1.1 Hypotheses One and Two

In testing the first two hypotheses, the study utilizes a cross-sectional interrupted time-series design to study the different effects which new earnings information can have on firm value based upon the information's persistence in future earnings. The events studied are the third quarter earnings announcements in 1983, 1984, and 1985.

Use of quarterly data is consistent with a near-term market focus and reduces the possibility of nonstationarities in the earnings process (see also Section 6.3)[12].

[12] Implicit in this proposal is the assumption that more information is available through examination of a long horizon of expectations than through examination of a short horizon. Empirical evidence on this assumption is not clear-cut. Hopwood and McKeown [1986], using ARIMA models to assess the incremental information benefit of private information in regard to future quarterly earnings, conclude:

> . . . that the addition of perfect knowledge of quarterly earnings for periods more than three quarters in the future (given knowledge of earnings one through three quarters in the future) would not enable an individual to earn an abnormal return within the current one quarter holding period. (p.44)

In contrast, Brown, et al. [1985] use analysts' multi-year annual forecasts to derive results which:

> . . . are consistent with the capital market employing a multi-year earnings forecast horizon rather than a single year ahead forecast horizon. (p. 4)

There are important methodological differences in these studies which may

Third quarter announcements are used for the following reasons. First, after the first quarter, Value Line forecasts are typically available only for the remainder of a company's current fiscal year. Because it is desirable to have access to as long a time-series of quarterly forecasts as possible both before and after an earnings announcement, this data limitation restricts the study to use of third or fourth quarter announcements. In testing these two hypotheses, there are no requirements which significantly restrict data availability (unlike the test of the third hypothesis, described below). In this relatively unrestrictive data environment, the third quarter earnings announcements are used to test the hypothesis because of the third quarter's low forecast errors relative to the fourth quarter.[13]

The purpose of examining three different points in the business cycle is to increase the generalizability of the results. Givoly's [1985] results indicate intertemporal as well as cross-sectional changes

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account for the opposing conclusions.

Lacking an unambiguous guide to the relevant forecast horizon from prior empirical research, the decision concerning which expectations horizon to use in this study is based on both practical and theoretical considerations. As a practical matter, n cannot exceed six, because we know of no data base which forecasts earnings after the second quarter farther than six quarters ahead. The Hopwood and McKeown study indicates there is some marginal benefit to using at least three-quarters-ahead forecasts. The range of possible forecasts is thus bounded by three and six quarters ahead. In using three, five or six quarters ahead, we run the risk of having seasonal considerations in certain industries (e.g., higher earnings expectations for two and six periods ahead for a retail firm) distort the persistence of new information. Accordingly, we examine the average persistence during the four quarters following the third quarter earnings observation.

[13] Thus, use of the third quarter announcements minimizes noise in the empirical tests. See, for example, Collins, Hopwood, and McKeown [1984].

in the adaptive coefficient of equation 1, suggesting that examination of multiple periods in earnings forecasting studies is desirable.

3.1.2 Hypothesis Three

The final hypothesis uses earnings data from the fourth quarter of 1985. The information on nonrecurring items was gathered from the Wall Street Journal's Digest of Earnings. Fourth quarter earnings figures are used instead of third quarter figures because there are substantially more nonrecurring items reported in fourth quarter earnings.[14] Details on the nonparametric procedures used to test hypothesis three are given in Section 3.5.

3.2 Data Requirements and Sampling Procedures

To test the first two hypotheses, three equal-sized random samples of companies were chosen for each year from 1983-1985 inclusive from the population of firms which met the following criteria in each year:

1. Coverage in the Value Line Investment Survey (hereafter Value Line;
2. Fiscal year end of December 31;
3. ASE or NYSE listing;

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[14] For example, there were 146 nonrecurring asset disposals or writedowns reported for ASE and NYSE firms during the fourth quarter 1985 announcement period. Seventy-seven of the companies reporting such items had usable data in Valueline, and 46 of the items were in the same direction as the earnings forecast error. In contrast, there were only 91 such disposals or writedowns reported in the third quarter 1985 announcement period in the WSJ's Digest of Earnings. Of these, only about 60 firms had usable Valueline data, and fewer than forty of these items were in the same direction as the earnings forecast error.

4. No extraordinary items, changes in accounting principle, or mergers or acquisitions reported during the third quarter; and

5. CRSP daily and Compustat quarterly listing.

The first criterion insures that the information necessary to determine the persistence in later quarters of new information contained in the third quarter announcement is available. Use of the Value Line forecasts for all firms results in a consistent forecast model. Givoly [1985] has shown that the use of a single forecaster in information release studies does not bias the results in any consistent manner.

The second criterion is necessary to insure that the market conditions surrounding the announcement dates for firms in each sample are uniform.

The third and fifth criteria insure that daily return data and EPS announcement dates are available for the firms under examination.

The fourth criterion is discussed in Section 3.3 below.

In order to test the final hypothesis, a sample of firms which disclosed nonrecurring items during the fourth quarter of 1985 was obtained. This sample selection procedure is discussed in more detail in Section 3.5.

3.3 Nonstationarities

Nonstationarities are induced in accounting earnings series primarily by two different types of events:

1. Changes in the way in which the accounting earnings number is measured, due to (a) authoritative pronouncements, and (b) individual firm changes in accounting principles; and

2. Changes in the structure of the company due to (a) business combinations and spinoffs, and (b) reorganizations.

The experimental control problem arising in both cases lies in separating changes in expectations due to a particular earnings announcement from changes due to new accounting methods or anticipated or announced reorganizations.

The method of controlling for changes in individual firms' accounting method changes is to detect such changes through Compustat footnote codes and then exclude firms from the sample which make changes during the sample year.

Similarly, firms announcing reorganizations during the sample year are excluded from the sample. Such changes are detectable from Compustat footnote codes denoting a merger or acquisition.

The third hypothesis concerns the effect of nonrecurring items on expectations. If extraordinary items have a systematically different effect on expectations than other items, inclusion of firms disclosing extraordinary items adds noise to the data and decreases the power of the tests of hypotheses one and two. Accordingly, such firms are excluded from the samples used to test the first two hypotheses.

3.4 Operationalization of Variables

3.4.1 Market Effects and Variable Selection

The tests of the first two hypotheses (see Section 3.5) require estimation of the coefficients in cross-sectional regressions of abnormal returns (the dependent variable) on measures of unexpected permanent and transitory earnings which are not adjusted for market-wide covariation in earnings revisions. Thus, the approach to market effects on the regression variables is not fully consistent, because market effects are abstracted from the dependent variable but not from the independent

variables. The considerations leading to this choice of variables are as follows.

In regard to the independent variables, the coefficients obtained from use of unadjusted variables are no different than those obtained through use of the common mean-adjustment procedure.[15,16] In the case of this expectations model the regression itself abstracts the market component from expectations, and in this sense the procedures described in Section 3.5 result in market adjustment of the independent variables. An underlying assumption of the procedure is that the accounting beta, summarizing the covariation between changes in a particular firm's earnings expectations and the market earnings expectation, is equal to one for all firms. Potentially insurmountable difficulties are avoided by making this assumption, including lack of knowledge concerning the appropriate time-series model to relate unexpected third-quarter earnings (both permanent and transitory) to market-wide earnings (or unexpected earnings) and lack of a sufficient number of prior observations to estimate such models should they become known.

One might argue that use of raw returns is an appropriate choice for the dependent variable because the earnings expectations are not directly adjusted for market effects. However, use of raw returns could cause economy-wide events to distort the values of the dependent variable.

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[15] The only differences which might arise occur from rounding or truncation effects. In mean adjustments of the independent variables presented in Table 4.4, there were no differences between the coefficients on unadjusted and mean-adjusted variables through the ten-thousandths place.

[16] The mean-adjustment procedure and model of the return-generating process on which it is based are discussed in Brown and Warner [1980], pp. 207-209.

Because the dependent variables are measured over different calendar periods for different firms, inclusion of economy-wide events adds noise to the data and could induce bias in certain instances.

For these reasons the research procedures described below utilize abnormal returns and unadjusted earnings forecast errors. However, we recognize the difficulty of addressing the issues a priori, and will present results using unadjusted market returns as supplementary information.

3.4.2 Abnormal Return

This variable is operationalized using the standardized and unstandardized residuals from a single-factor market model.[17] The 200 daily rates of return preceding the fifteen day announcement period which surrounds the earnings announcement were used to estimate regression coefficients for each firm in each sample. In instances where daily return data was missing, the missing day and the following day were excluded from the 200 observations.

The estimation model regresses the individual daily returns of each security on the value-weighted return of a market portfolio of NYSE stocks for day τ (τ = -207, . . .,-8). The estimated regression coefficients are then used to determine the prediction errors from a market model estimated during the fifteen day announcement period as follows:

$$\tilde{R}_{it} = a_1 + b_1(\tilde{R}_{mt}) + \hat{\mu}_{1t} \qquad (t = -7,\ldots,0,\ldots,7) \qquad (29)$$

---

[17] The use of a simple one-factor market model is justified by the research of Brown and Warner [1980], who find that, "beyond a simple, one-factor market model, there is no evidence that more complicated methodologies convey any benefit" (p. 249).

where:

a_i and b_i are the estimated coefficients; and

$\hat{\mu}_{it}$ is the unsystematic return (prediction error) for security i in day t.

Under the strict assumptions of OLS, the abnormal return during the announcement period for security i is:

$$AR_i = \sum_{t=-7}^{7} \hat{\mu}_{it} \quad . \tag{30}$$

The abnormal returns utilized in this procedure are not residuals in the strict OLS sense because they are estimated using observations not used in the estimation of the coefficients a_i and b_i. The variance of the regression prediction error which reflects the increase in variance due to prediction outside the estimation period is computed as follows:[18]

$$S_i^2 = 1 + \frac{1}{200} + [(\tilde{R}_{mt} - \bar{R}_m)^2 / \sum_{\tau=-207}^{-8} (\tilde{R}_{m\tau} - \bar{R}_m)^2] \sum_{t=-207}^{-8} \mu_{it}^2 /(T-2) \tag{31}$$

Where: $\bar{R}_m$ is the average market return during the estimation period;

$\tilde{R}_{mt}$ is the market return on day t during the cumulation period;

and

$\tilde{R}_{m\tau}$ is the market return on day τ during the estimation period.

The standardized residual for each day during the cumulation period is as follows:

$$\hat{V}_{it} = \hat{\mu}_{it} / S \ , \tag{32}$$

and the cumulative standardized abnormal return for firm i is:

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[18] This standardization procedure is described in Patell [1976] and Hong, Kaplan, and Mandelker [1978].

$$StAR_i = \sum_{t=-7}^{t=7} \hat{V}_{it} . \qquad (33)$$

The description of the empirical tests which follows this section refers only to the standardized unexpected return of equation 33. However, for the sake of completeness, empirical results are reported using both the unstandardized unexpected return of equation 30 and the standardized unexpected return of equation 33.

3.4.3 New Information in Earnings Announcements

New information is operationalized as the difference between the actual earnings announced for the third quarter and the earnings expected for the third quarter prior to the announcement:

$$X_{i,3} - E_2(X_{i,3}) = \text{Earnings Forecast Error (EFE)} \qquad (31)$$

where: $X_{i,3}$ is the announced earnings for company i during the third quarter of the sample year; and

$E_2(X_{i,3})$ is the Value Line forecast for company i given in the pre-announcement issue of the Investment Survey.

3.4.4 Growth

The market's evaluation of a firm's potential to grow is evaluated using the inverse of the P/E ratio. Price is measured at the end of the day following the third quarter announcement. Earnings is measured as the sum of quarterly earnings in the four quarters prior to the fourth quarter of the year under study.

3.5 Tests of Hypotheses

3.5.1 Hypothesis One

The following procedure was used to empirically test the first hypothesis:

1. A random sample of firms were selected for each year from 1983-1985. Each sample consisted of approximately 50% of all firms meeting the criteria discussed in Section 6.2.

2. For each firm in each sample, the third quarter earnings announcement date was determined from Compustat. The announcement date was designated as day zero.

3. The standardized unsystematic return during the fifteen day period surrounding and including the announcement date was calculated for each firm in each sample.

4. For each observation, the third quarter earnings forecast error (EFE_i) was determined:

$$EFE_i = X_{i,3} - E_2(X_{i,3}),$$

where $E_2(X_{i,3})$ was the third quarter earnings expectation published in the pre-announcement issue of Value Line.

5. The EFE_i were divided into unexpected permanent and trans components as follows:

Unexpected Permanent:

$$UP = (1/4) \sum_{k=1}^{4} E_3(X_{i,3+k}) - E_2(X_{i,3+k})$$

Unexpected Transitory:

$$UT = EFE_i - UP .$$

6. For each sample, the parameters of the following regression model were estimated:

$$StAR = a + b_1 \frac{UP}{S_B} + b_2 \frac{UT}{S_B} + e,$$

where S_B was the stock price at the beginning of the cumulation period.[19]

7. The primary hypothesis ($b_1 > b_2$) was tested using a one-tailed t-test.

3.5.2 Hypothesis Two

Hypothesis two was tested using the following procedure:

1. The firms in each sample selected to test hypothesis one were rank ordered by E/P ratios.

2. Firms with negative earnings were eliminated from the sample.

3. Firms in the middle quartile of the remaining sample were eliminated (25% of the firms above the median were eliminated, and 25% below were eliminated), leaving equal-sized high growth (low E/P) and low growth (high E/P) subsamples.

4. For each of the firms in each subsample the third quarter earnings forecast error was determined and divided into unexpected permanent and transitory components as described the test of hypothesis one.

5. Parameters of a single multivariate regression equation were estimated. The equation contains four independent variables corresponding to the permanent and transitory components for high-growth (HG) and low-growth (LG) subsamples. For low-growth firms, the first two independent variables in the following equation were set equal to zero, and for high-growth firms the last two variables were set equal to zero:

$$StAR = a + b_1(UP/S_B)_{HG} + b_2(UT/S_B)_{HG} + b_3(UP/S_B)_{LG} + b_4(UT/S_B)_{LG} + e$$

6. For each of the years, the b_2 and b_4 coefficients of the models were compared. The null hypothesis was rejected if b_4 was significantly greater than b_2.

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[19] The independent variables are deflated by the beginning equity price. Christie ([1986], p. 14) states that the unambiguously correct deflator for use in return studies is the beginning equity value, due primarily to the presence of this variable in the denominator of the dependent variable. The deflator is also consistent with the theoretical development of Section 4 (e.g., equation 16).

3.5.3 Hypothesis Three

The final hypothesis was tested using the following nonparametric procedure.

1. Fourth quarter earnings announcements in the Wall Street Journal were examined to determine all NYSE and ASE firms for which the WSJ reported nonrecurring (but not extraordinary) items.[20]

2. Firms in this sample which were not followed by Value Line were eliminated.

3. The fourth quarter earnings forecast error of all firms in the remaining sample was determined. The final sample consisted of firms which had EFEs and nonrecurring items in the same direction in the fourth quarter.

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[20] Extraordinary items, while usually considered an extreme form of nonrecurring item, are not used in this analysis because a large majority of such items are tax benefits from tax loss carryforwards or reversals of such benefits reported in prior quarters. In these instances, an analyst can anticipate the amount of an extraordinary item based upon his estimate of future income and knowledge of tax benefits from past losses which are still available to the firm. This study assumes that announcements of nonrecurring items follow a white noise process with expectation equal to zero.

The following figures, determined from examination of the WSJ's Digest of Earnings, provide some indication of the pervasive nature of tax loss benefits relative to other extraordinary items:

3rd Quarter, 1985:	
Total number of extraordinary item announcements	129
Tax loss benefits or reversals of previously announced benefits	96
4th Quarter, 1985:	
Total number of extraordinary item announcements	100
Tax loss benefits or reversal of previously announced benefits	75

4. An equal-sized random sample of firms was chosen from Value Line. If a chosen firm disclosed extraordinary or nonrecurring items during the fourth quarter, an adjacent firm was used.

5. The absolute percentage change in the expectation of 1986 annual earnings arising from the earnings announcement was determined for each firm, and firms in each sample were ranked by the value of this measure.

6. The Wilcoxon rank sum test was used to test the one-sided hypothesis that the change in expectations is not less for firms disclosing nonrecurring items than for other firms.

CHAPTER 4

RESULTS

4.1 Sample Characteristics: Hypotheses One and Two

The initial samples in each year were constructed by selecting every other firm covered in Value Line which was listed on the New York Stock Exchange or the American Stock Exchange and had a December 31 fiscal ear-end (criteria one through three). Intermediate samples consisted of those firms meeting all five criteria. The final samples for the first hypothesis consisted of those firms in the intermediate sample having sufficient CRSP daily return information to estimate the parameters of the market model using the procedures described in the prior chapter. For testing the second hypothesis, firms were also required to have positive earnings. Sample sizes at each step are detailed in Table 4.1.

The 278 firms in the 1983 sample represented 122 4-digit SIC industries. The earliest third quarter earnings announcement occurred on October 6, and the final announcement was issued on November 17. The final third quarter earnings forecast prior to the actual earnings announcement for this group of firms occurred in various weekly editions of Value Line from July 29 through October 30.

The 303 firms in the 1984 sample represented 116 4-digit SIC industries. The earliest earnings announcement occurred on September 28, and the final announcement was issued on November 29. Final third quarter forecasts prior to actual earnings announcements were published in various Value Line editions from July 27 to November 2.

TABLE 4.1

SAMPLE SIZES BY YEAR

Year	(1) Initial Sample[1]	(2) Intermediate Sample[2]	(3) Final Sample, H1[3]	(4) Final Sample, H2[4]
1983	457	284	278	239
1984	445	309	303	276
1985	450	264	259	218

[1]Column (1) indicates the number of firms meeting criteria 1, 2, and 3.

[2]Column (2) indicates the number of firms meeting criteria 1 through 5.

[3]Column (3) indicates the number of firms meeting criteria 1 through 5 with sufficient daily return data for market model estimation.

[4]Column (4) indicates the number of firms in column (3) which have positive E/P ratios.

The 259 firms in the 1985 sample represented 112 4-digit SIC industries. The earliest third quarter earnings announcement occurred on October 9, and the final announcement was issued on November 18. Final third quarter forecasts prior to actual earnings announcements were published in various Value Line weekly editions from July 26 to November 1.

The mean intercept from the market model is very close to zero in each of the three years, while the mean beta ranges from a low value of .78313 in 1983 to a high value of .90409 in 1984. Further statistics concerning the coefficients and abnormal returns derived using the coefficients are summarized in Table 4.2.

Table 4.3 is useful in emphasizing the difficulty of isolating the effect of an accounting earnings announcement on stock prices. Given perfect information concerning market earnings expectations immediately prior to an earnings announcement and the appropriate model of the market return generating process, the correlation between abnormal returns and earnings forecast errors would be very close to one in an efficient market. As the frequency tables in Table 4.3 suggest, the actual relationship is much more tenuous. The two primary empirical problems relate to the release of additional information during the cumulation period, and the time lag between the publication of market forecast and the actual earnings announcement. Both problems are discussed later in this chapter and in the final chapter. However, it should be noted that even with substantial noise and imperfect information concerning expectations, the earnings forecast errors and standardized abnormal returns were in the same direction over half the time in each year. Overall, the measures were in the same direction 56% of the time, and these results

TABLE 4.2

SUMMARY STATISTICS:

MARKET MODEL COEFFICIENTS AND ABNORMAL RETURNS

	1983	1984	1985
Coefficients, Market Model:			
Mean Intercept	.00037	-.00027	.00009
Mean Beta	.78313	.90409	.88233
Standard Deviation, Beta	.46677	.53343	.45942
Minimum Beta	-.11905	.01510	-.22234
Maximum Beta	2.2916	2.8265	2.5703
Unstandardized Abnormal Returns (All Data):			
Mean	-.00159	.00898	-.00262
Standard Deviation	.08102	.06697	.00901
Standardized Abnormal Returns (All Data):			
Mean	-.01306	.00931	-.00077
Standard Deviation	.08255	.07165	.06967
Unstandardized Abnormal Returns (Excludes Outliers):			
Mean	-.01484	.01008	.00078
Beta	.08074	.06500	.06814
Standardized Abnormal Returns (Excludes Outliers):			
Mean	-.01430	.01081	.00057
Beta	.08189	.06813	.06905

TABLE 4.3

FREQUENCY TABLES:

STANDARDIZED ABNORMAL RETURNS AND EARNINGS FORECAST ERRORS

1983

	Negative EFE	Nonnegative EFE	
Negative StAR	88 (32%)	61 (22%)	149 (54%)
Nonnegative StAR	66 (24%)	63 (22%)	129 (46%)
	154 (66%)	124 (44%)	278 (100%)

1984

	Negative EFE	Nonnegative EFE	
Negative StAR	83 (27%)	43 (14%)	126 (41%)
Nonnegative StAR	90 (30%)	87 (29%)	177 (59%)
	173 (57%)	130 (43%)	303 (100%)

1985

	Negative EFE	Nonnegative EFE	
Negative StAR	89 (34%)	42 (16%)	131 (50%)
Nonnegative StAR	66 (26%)	62 (24%)	128 (50%)
	155 (60%)	84 (40%)	259 (100%)

All Years

	Negative EFE	Nonnegative EFE	
Negative StAR	260 (31%)	146 (17%)	406 (48%)
Nonnegative StAR	222 (27%)	212 (25%)	434 (52%)
	482 (58%)	358 (42%)	840 (100%)

were reasonably stable across the three year period. These results are not sensitive to choice of standardized or unstandardized residuals, being slightly stronger when unstandardized residuals are used in place of the standardized abnormal returns.

4.2 Results of Tests of Hypothesis One

The primary results for hypothesis one are given in Panel A of Tables 4.4 through 4.7. Tables 4.4 and 4.5 present results using the standardized residuals, while Tables 4.6 and 4.7 provide results using unstandardized residuals. Tables 4.4 and 4.6 provide results excluding outliers from the samples.

Two methods were used to detect outliers. In the first method, outliers were visually identified through examination of scattergraphs constructed with the dependent variable (standardized residuals) on the y-axis and either the scaled permanent or scaled transitory component of the earnings forecast error on the x-axis. Using this method, four observations were excluded from each sample in each year. In the second method, observations were excluded if the independent variables were farther than three standard deviations away from the sample mean. This method resulted in a loss of four, eight, and seven observations in 1983, 1984, and 1985, respectively. The results obtained for the final two years were not significantly different under the two methods; accordingly, the reported results reflect the second method only.

Scattergraphs for each year are provided in Figures 4.1 through 4.3. Panels A and C in each figure display all observations. Outliers excluded under the second method are circled in Panel A. In all three years the number of outliers circled in panels A and C is greater than

TABLE 4.4

REGRESSION STATISTICS FOR STANDARDIZED RETURNS:

OUTLIERS EXCLUDED FROM ESTIMATION SAMPLE

PANEL A: Dichotomized Earnings Forecast Error
($StAR = a + b_1(UP/S_B) + b_2(UT/S_B) + e$)

	1983	1984	1985
Permanent Component:			
Coefficient (b_1)	2.4658	.4108	2.8963
Standard Error	1.1818	.6819	.8638
T-Statistic	2.0864	.6025	3.3529
Transitory Component:			
Coefficient (b_2)	-1.0690	.0469	-.5141
Standard Error	.5354	.4549	.5059
T-Statistic	-1.9966	.1030	-1.0162
t-statistic for $b_1 > b_2$ (one-tailed test)	2.613***	.375	3.265***
R-Squared	.0268	.0018	.0449
F	3.738**	.265	5.852***
n	274	295	252

PANEL B: Undichotomized Earnings Forecast Error
($StAR = a + b(EFE/S_B) + e$)

	1983	1984	1985
Total Earnings Forecast Error:			
Coefficient	-.3740	.1791	.4246
Standard Error	.4696	.2865	.4242
T-Statistic (one-tailed)	-.7968	.6253	1.0010
R-Squared	.0023	.0013	.0040

* Significant at α equal to .10.
** Significant at α equal to .05.
*** Significant at α equal to .01.

TABLE 4.5

REGRESSION STATISTICS FOR STANDARDIZED RETURNS:

ALL OBSERVATIONS INCLUDED IN ESTIMATION SAMPLE

PANEL A: Dichotomized Earnings Forecast Error
($StAR = a + b_1(UP/S_B) + b_2(UT/S_B) + e$)

	1983	1984	1985
Permanent Component:			
Coefficient (b_1)	.4029	-.1132	1.3953
Standard Error	.7981	.2422	.4747
T-Statistic	.5048	-.4674	2.9392
Transitory Component:			
Coefficient (b_2)	-.3941	.1246	.2486
Standard Error	.1706	.2437	.3000
T-Statistic	-2.3096	.5114	.8286
t-statistic for $b_1 > b_2$ (one-tailed test)	.908	-.563	3.913***
R-Squared	.0196	.0011	.0366
F	2.7534*	.159	4.864***
n	278	303	259

PANEL B: Undichotomized Earnings Forecast Error
($StAR = a + b(EFE/S_B) + e$)

	1983	1984	1985
Total Earnings Forecast Error:			
Coefficient	-.3099	.0052	.5910
Standard Error	.1431	.1197	.2464
T-Statistic (one-tailed)	-2.1647	.0437	2.3980***
R-Squared	.0167	.0000	.0219

* Significant at α equal to .10.
** Significant at α equal to .05.
*** Significant at α equal to .01.

TABLE 4.6

REGRESSION STATISTICS FOR UNSTANDARDIZED RETURNS:

OUTLIERS EXCLUDED FROM ESTIMATION SAMPLE

PANEL A: Dichotomized Earnings Forecast Error
($CAR = a + b_1(UP/S_B) + b_2(UT/S_B) + e$)

	1983	1984	1985
Permanent Component:			
Coefficient (b_1)	2.2914	.5574	2.7717
Standard Error	1.1631	.6503	.8622
T-Statistic	1.9701	.8571	3.2146
Transitory Component:			
Coefficient (b_2)	-1.2382	-.1430	-.8213
Standard Error	.5269	.4338	.5416
T-Statistic	-2.3498	-.3297	-1.5164
t-statistic for $b_1 > b_2$ (one-tailed test)	2.651***	.756	3.496***
R-Squared	.0302	.0025	.0474
F	4.223**	.369	6.175***
n	274	295	251

PANEL B: Undichotomized Earnings Forecast Error
($CAR = a + b(EFE/S_B) + e$)

	1983	1984	1985
Total Earnings Forecast Error:			
Coefficient	-.5441	.1114	.2160
Standard Error	.4624	.2734	.4623
T-Statistic (one-tailed)	-1.1769	.4077	.4671
R-Squared	.0051	.0006	.0009

* Significant at α equal to .10.
** Significant at α equal to .05.
*** Significant at α equal to .01.

TABLE 4.7

REGRESSION STATISTICS FOR UNSTANDARDIZED RETURNS:

ALL OBSERVATIONS INCLUDED IN ESTIMATION SAMPLE

PANEL A: Dichotomized Earnings Forecast Error
$(CAR = a + b_1(UP/S_B) + b_2(UT/S_B) + e)$

	1983	1984	1985
Permanent Component:			
Coefficient (b_1)	.4456	-.0139	1.3325
Standard Error	.6269	.2264	.4656
T-Statistic	.7109	-.0616	2.8617
Transitory Component:			
Coefficient (b_2)	-.4207	.0845	-.0262
Standard Error	.1618	.2279	.2943
T-Statistic	-2.6002	.3708	-.0889
t-statistic for $b_1 > b_2$ (one-tailed test)	1.141	-.249	2.298**
R-Squared	.0241	.0005	.0313
F	3.385**	.080	4.139**
n	278	303	259

PANEL B: Undichotomized Earnings Forecast Error
$(CAR = a + b(EFE/S_B) + e)$

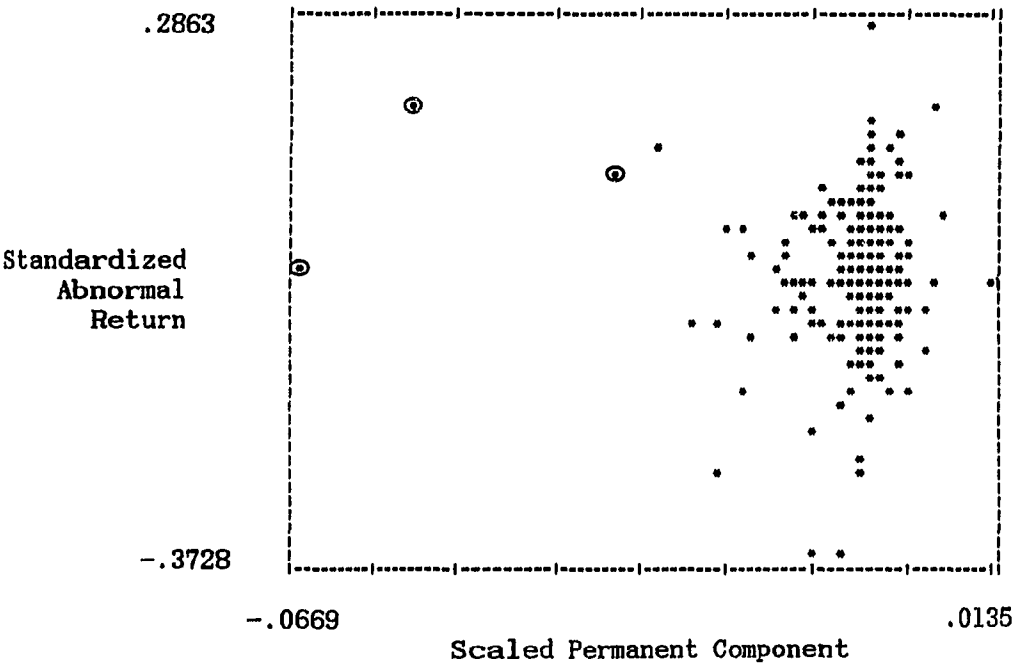
	1983	1984	1985
Total Earnings Forecast Error:			
Coefficient	-.3345	.0351	.4162
Standard Error	.1404	.1119	.2424
T-Statistic (one-tailed)	-2.3822	.3134	1.7174**
R-Squared	.0201	.0003	.0113

* Significant at α equal to .10.
** Significant at α equal to .05.
*** Significant at α equal to .01.

FIGURE 4.1

SCATTERGRAPHS OF 1983 DATA

Panel A: Permanent Component, All Data (Outliers Circled)



Panel B: Permanent Component, Excludes Outliers

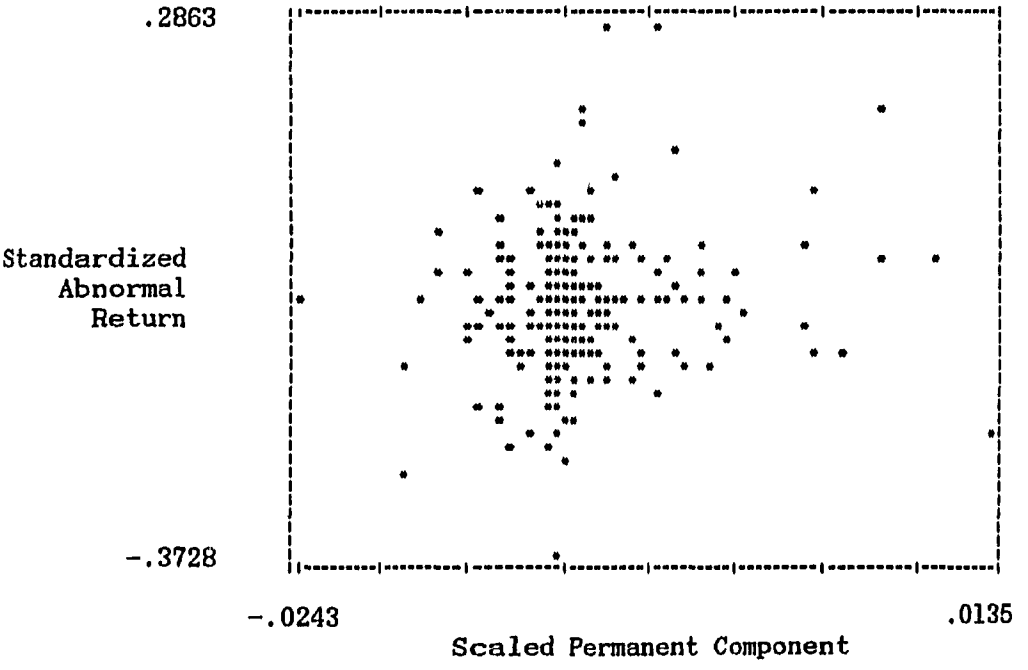
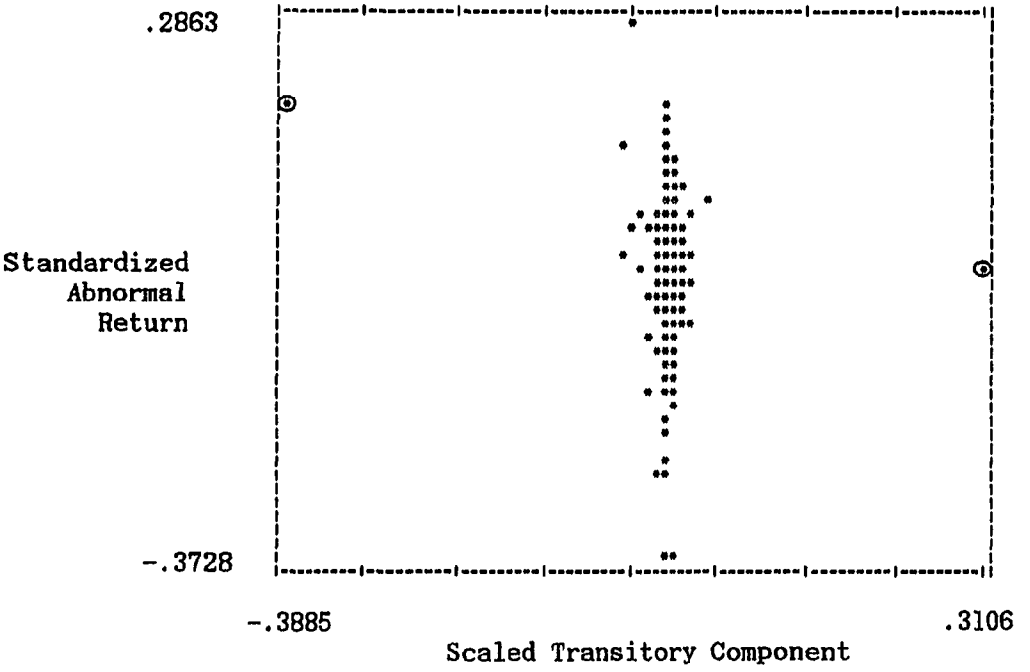


FIGURE 4.1 (Continued)

SCATTERGRAPHS OF 1983 DATA

Panel C: Transitory Component, All Data (Outliers Circled)



Panel D: Transitory Component, Excludes Outliers

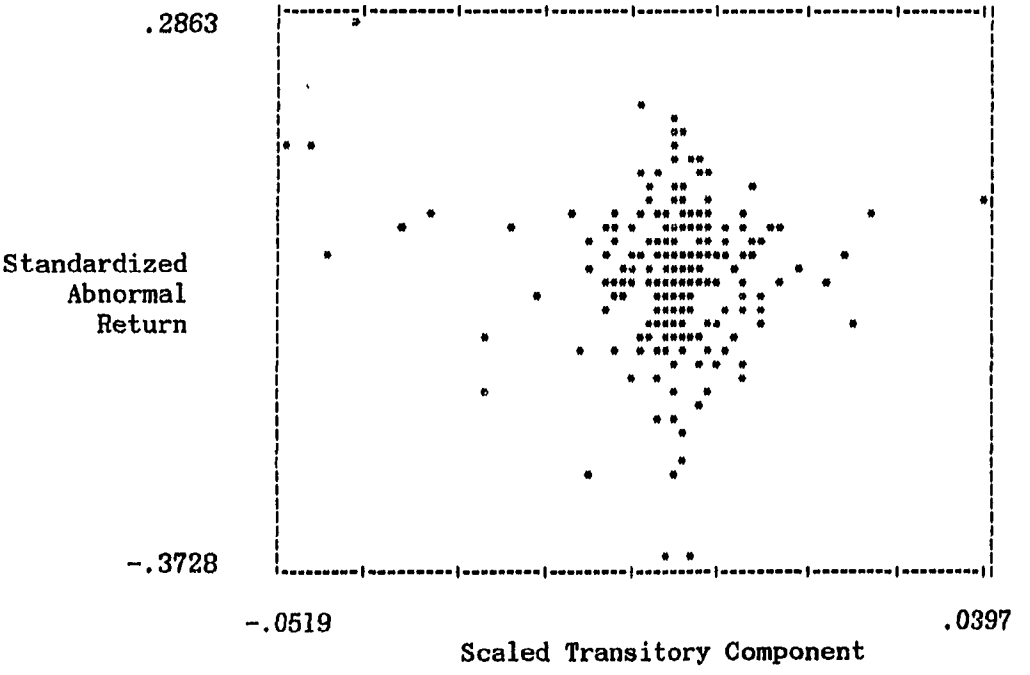
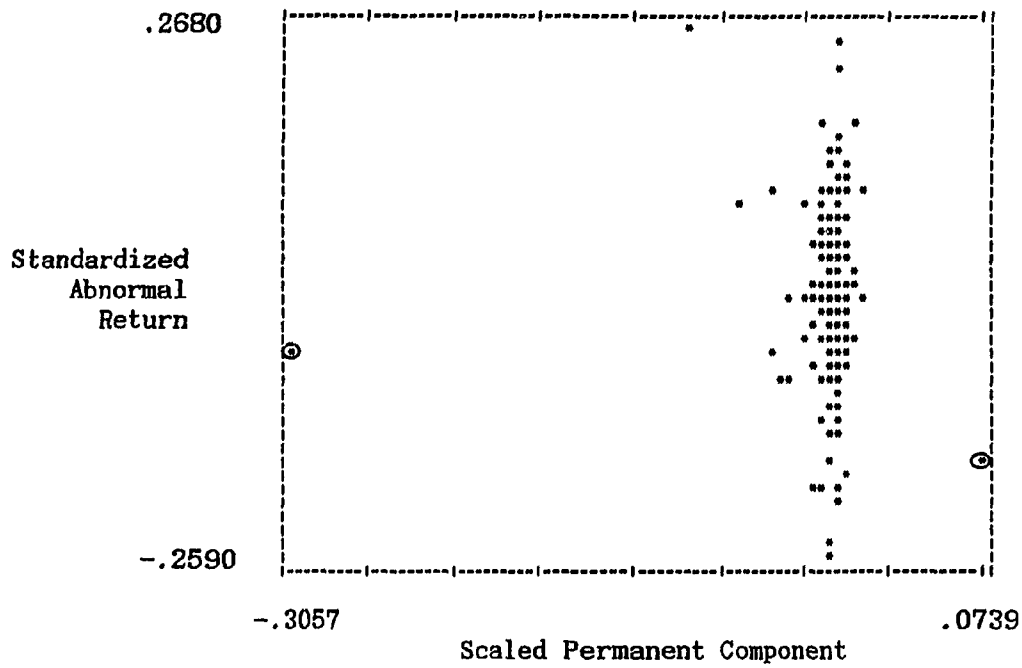


FIGURE 4.2

SCATTERGRAPHS OF 1984 DATA

Panel A: Permanent Component, All Data (Outliers Circled)



Panel B: Permanent Component, Excludes Outliers

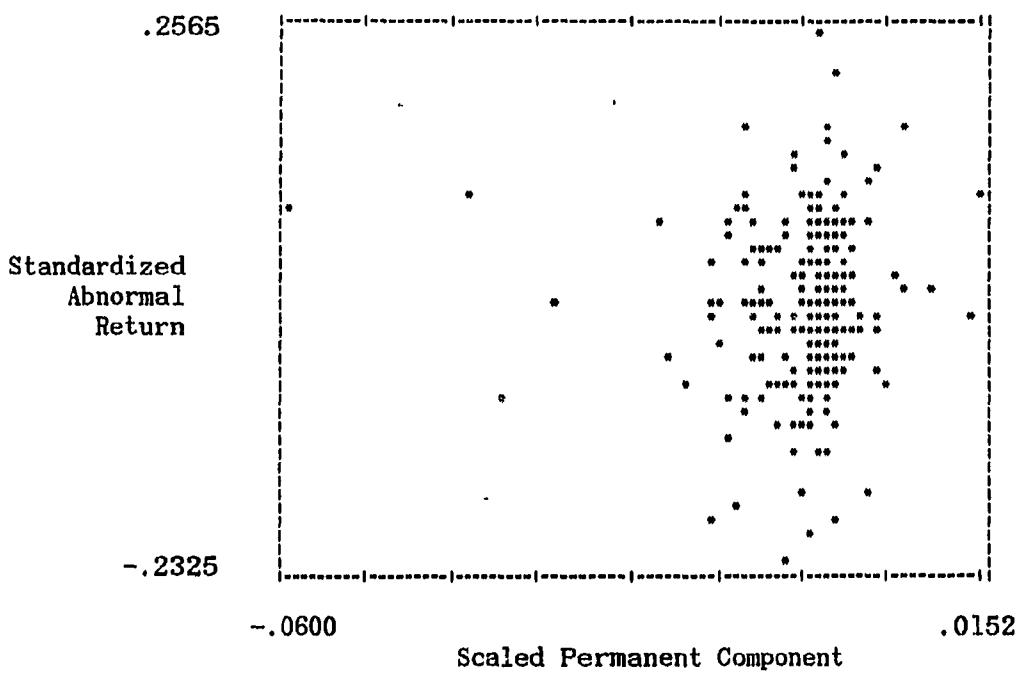
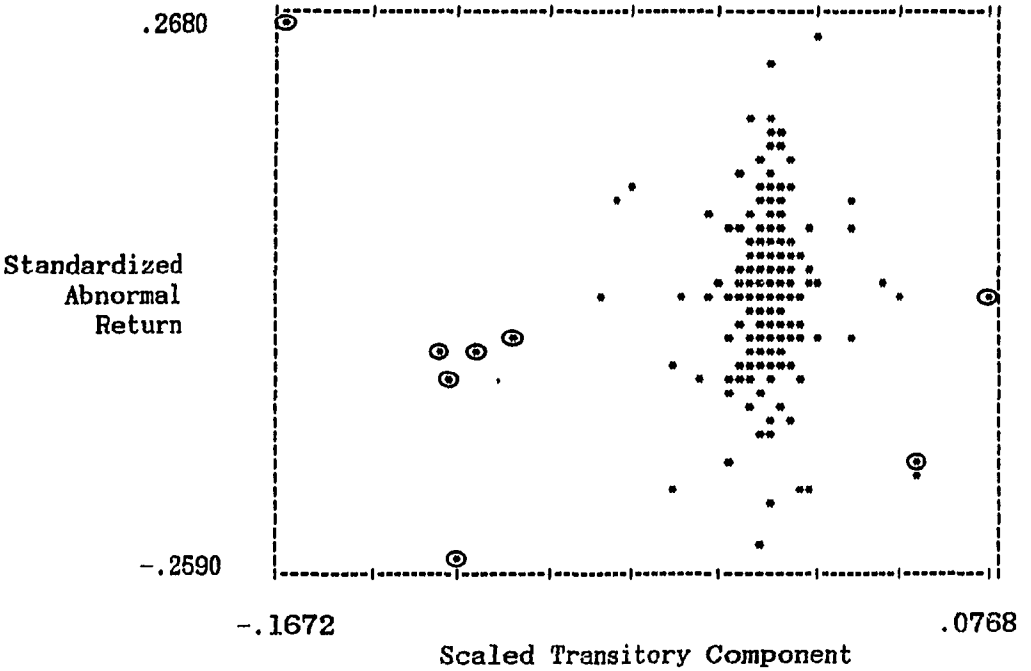


FIGURE 4.2 (Continued)

SCATTERGRAPHS OF 1984 DATA

Panel C: Transitory Component, All Data (Outliers Circled)



Panel D: Transitory Component, Excludes Outliers

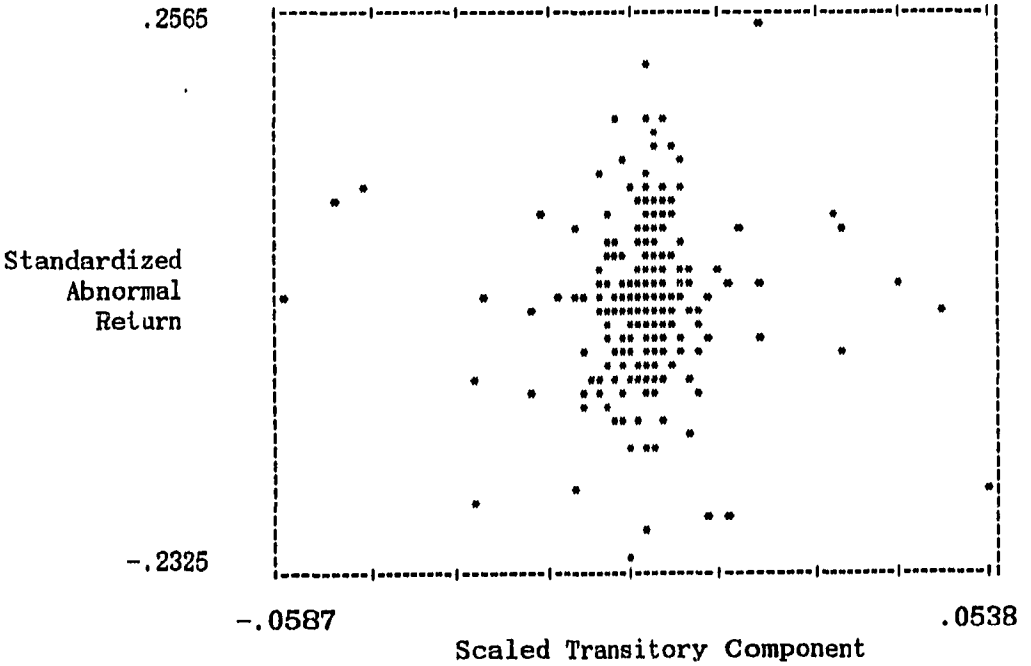
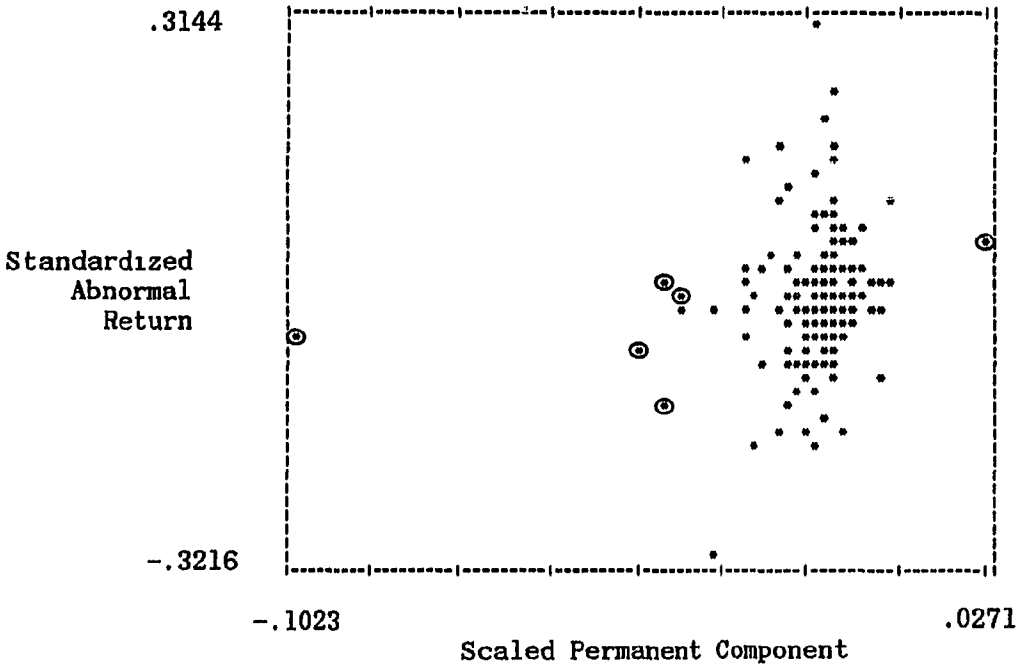


FIGURE 4.3

SCATTERGRAPHS OF 1985 DATA

Panel A: Permanent Component, All Data (Outliers Circled)



Panel B: Permanent Component, Excludes Outliers

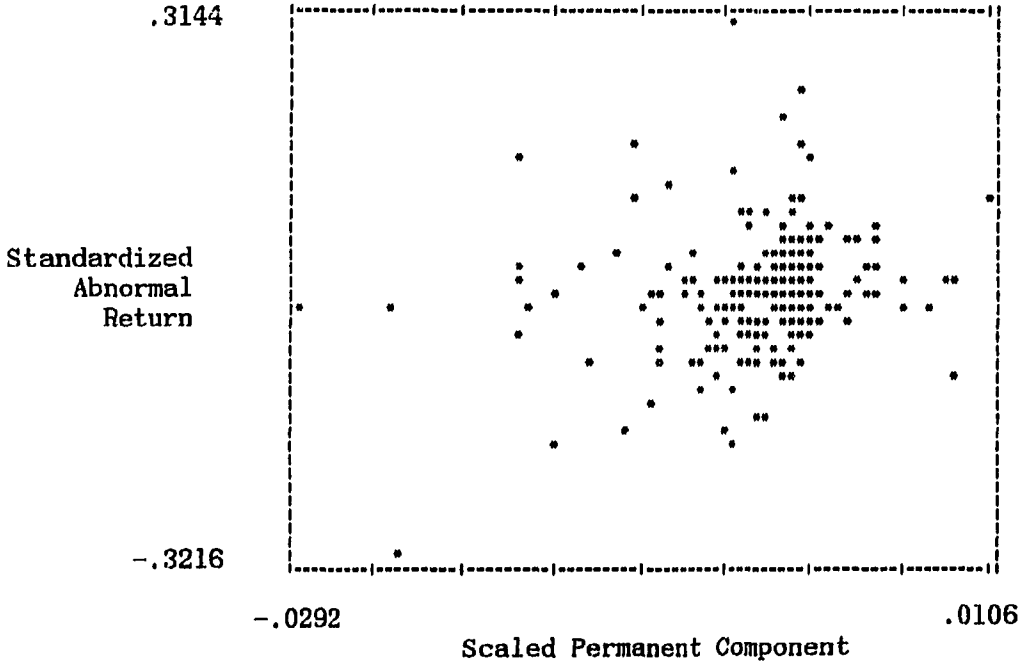
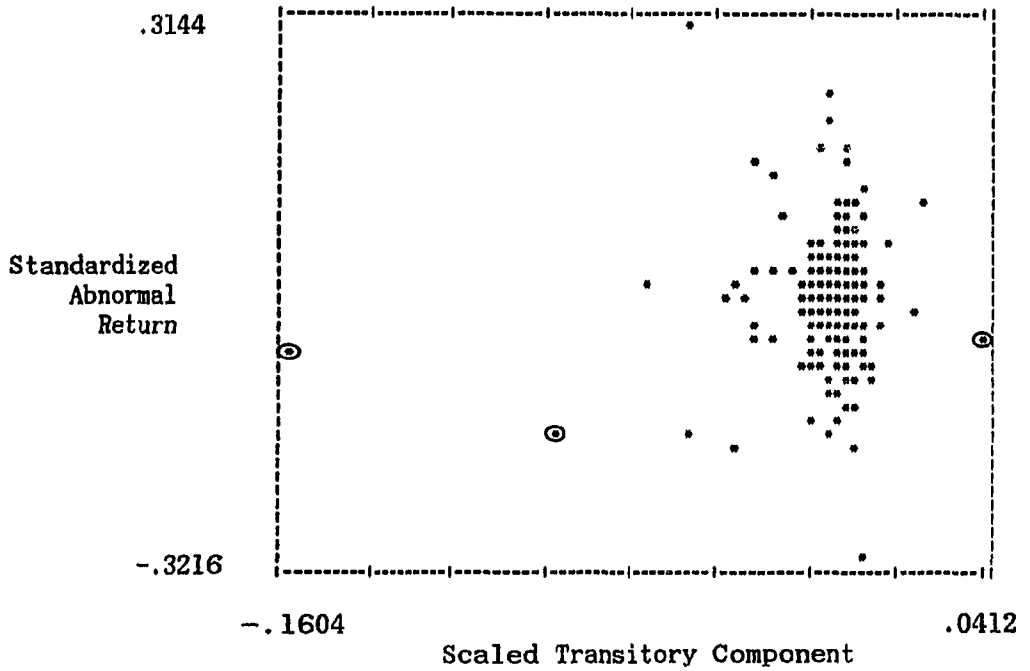


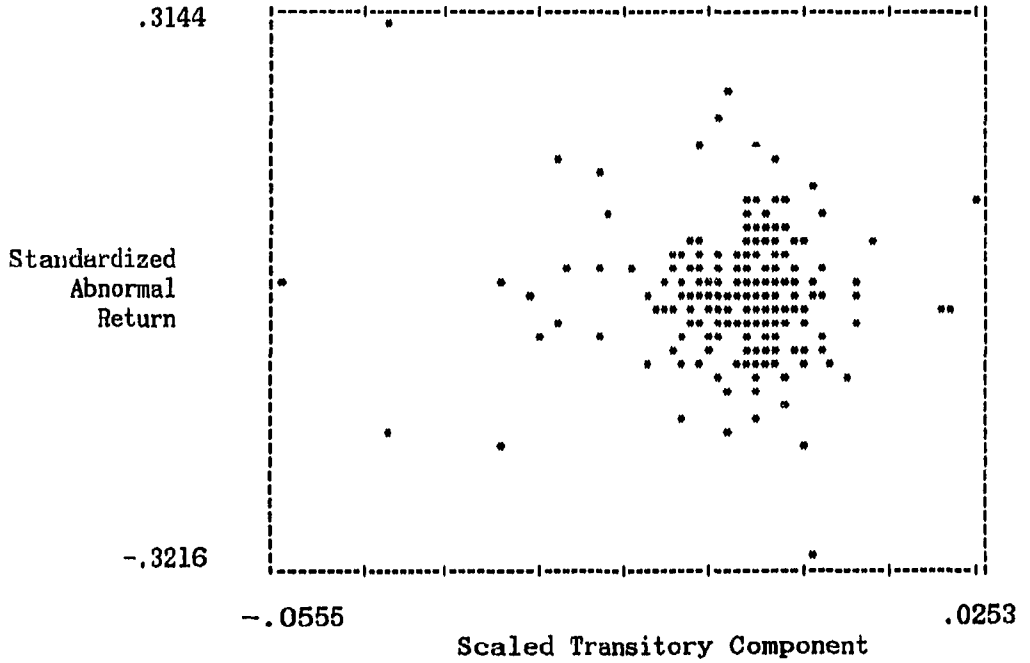
FIGURE 4.3 (Continued)

SCATTERGRAPHS OF 1985 DATA

Panel C: Transitory Component, All Data (Outliers Circled)



Panel D: Transitory Component, Excludes Outliers



the actual number excluded. This occurs because the same observation was occasionally an outlier in relation to both independent variables.

The first hypothesis asserts that permanent components have a greater effect on firm value than do transitory components. Operationally, the hypothesis may be rewritten as:

$$H_{01}: \quad b_1 \leq b_2$$

$$H_{A1}: \quad b_1 > b_2.$$

This one-tailed hypothesis is tested using:

$$t = (b_1 - b_2) \; / \; \text{Std. Error } (b_1 - b_2).$$

This t-statistic is reported in Panel A of Tables 4.4 through 4.7.

The first hypothesis receives only qualified support from examination of the tables. The results for 1985 provide the strongest support for the hypothesis. In each of the four tables the coefficient on the permanent component is significantly greater than that on the transitory component and the overall explanatory power of the model (tested with the F-statistic) is significant.[21] The results using 1983 data also strongly support rejection of the null after removal of five outliers from the sample (Tables 4.4 and 4.6).

In contrast, the results for 1984 provide no support for rejection of the null hypothesis. In this year, b_1 is never significantly greater than b_2 and all coefficients are insignificantly different from zero, resulting in low F-statistics for the overall utility of the model. Two plausible explanations for this lack of results are examined later in this chapter.

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[21]The results of a partial F-test are in all cases consistent with those obtained by examination of the individual t-statistics, because the F-statistic has (1, n - 2) degrees of freedom and is thus equivalent to the square of the t-statistic with n - 2 degrees of freedom. See also Weisberg ([1980], pp. 49-50).

Overall, the results provide qualified support for hypothesis one, but are not consistent enough to warrant outright rejection of the null hypothesis. Two difficulties in experimental control which result in noise in the data, and which may be responsible for the lack of significance in certain instances, result from the inability to capture earnings information affecting returns disseminated in the market prior to seven days before the announcement date and the inability to capture actual market expectations prior to the announcement due to the time lag between Value Line forecast dates and earnings announcement dates.

The first weakness could result either from intra-industry information transfers subsequent to the release of earnings information by an industry comember, or information leakage concerning the to-be-reported earnings figure of the sample company. Results of a test designed to capture all relevant return information in the period preceding the earnings announcement are reported in Table 4.8. The test utilized 60-day cumulation periods in place of the 15-day cumulation periods reported previously. The cumulation period began three days following the Value Line forecast date in order to allow the market to assimilate the expectations information, and ended just prior to the publication of the post-announcement Value Line to avoid having the market react to new earnings forecasts. This test could not be performed with 1985 data due to the absence of CRSP daily return information after December 31, 1985. As Table 4.8 indicates, the use of a 60-day cumulation period does not strengthen the 1984 results, and significantly reduces the power of the 1983 results. The t-statistics for b_1 greater than b_2 are insignificant even at relatively high alpha levels ($\alpha = .10$) in both years, and none of the coefficients are significantly different from zero in either year. Possibly, the

TABLE 4.8

REGRESSION STATISTICS USING SIXTY-DAY CUMULATION PERIOD:

EXCLUDES OUTLIERS

PANEL A: Dichotomized Earnings Forecast Error
($StAR = a + b_1(UP/S_B) + b_2(UT/S_B) + e$)

	1983	1984
Permanent Component:		
Coefficient (b_1)	1.9157	2.0950
Standard Error	2.3623	1.3748
T-Statistic	.8109	1.5238
Transitory Component:		
Coefficient (b_2)	-.9934	.7757
Standard Error	1.0675	.9192
T-Statistic	-.9306	.8439
t-statistic for $b_1 > b_2$ (one-tailed test)	1.076	.673
R-Squared	.0051	.0175
F	.683	2.581*
n	274	292

PANEL B: Undichotomized Earnings Forecast Error
($StAR = a + b(EFE/S_B) + e$)

	1983	1984
Total Earnings Forecast Error:		
Coefficient	-.4225	1.2561
Standard Error	.9266	.5782
T-Statistic (one-tailed)	-.4560	2.1723**
R-Squared	.0008	.0160

* Significant at α equal to .10.
** Significant at α equal to .05.
*** Significant at α equal to .01.

60-day cumulation period captured not only relevant pre-announcement information, but also a large amount of noise in the post-announcement period, thereby reducing the ability of the tests to detect significance.

The second problem - the inability to capture market expectations immediately preceding the earnings announcement - makes it difficult to accurately determine changes in market expectations of a firm's earnings arising from an earnings announcement. The problem is especially troublesome in those instances where there is a significant lag between the Value Line publication date (used to proxy expectations) and the actual earnings announcement. Table 4.9 provides information related to this timing lag for the three years covered in the research. One observation from Table 4.9 is that the Value Line lead time from earnings announcement date to publication date appears to be no more than seven days.

Two tests are performed to determine the effect of this timing lag on the experimental results. The first test uses the number of days from Value Line publication to the actual earnings announcement as a third independent variable in addition to the scaled permanent and transitory components. Table 4.10 summarizes the results of this regression. The main finding of interest is that the timing coefficient is significant in 1984 but not in the other two years (the 1984 coefficient has a corresponding t-statistic of 2.2194, significant at α=.05, versus insignificant t-statistics of .30314 and -.61266 in 1983 and 1985, respectively). This lends credibility to the conjecture that the 1984 data is more sensitive to the time lag than is the data of the other two years.

Results of a straightforward control test to determine the effect of the time lag are presented in Table 4.11. In this test, the samples were

TABLE 4.9

DAYS ELAPSED FROM PRE-ANNOUNCEMENT FORECAST

DATE TO EARNINGS ANNOUNCEMENT DATE

	1983		1984		1985	
Days Elapsed	Number of Firms	Percent of Firms	Number of Firms	Percent of Firms	Number of Firms	Percent of Firms
-13 - -8*	1	.4	0	0	0	0
-7 - -1*	14	5.2	15	5.0	12	4.6
0 - 9	39	14.0	35	11.6	27	10.6
10 - 19	63	22.7	79	26.1	61	23.6
20 - 29	36	12.9	38	12.5	31	12.0
30 - 39	23	8.3	33	10.9	17	6.6
40 - 49	45	16.2	50	16.5	45	17.4
50 - 59	44	15.8	41	13.5	57	22.0
60 - 69	11	4.0	12	3.9	9	3.4
70 - 79	2	.7	0	0	0	0
Total	278	100.0	303	100.0	259	100.0
< 31 Days	151	54.3%	170	56.1%	130	50.2%
Range	-13 to 76		-7 to 66		-5 to 65	

* A negative value occurs in those instances where the date of the Value Line forecast of third-quarter earnings followed the date of the actual announcement. This occurs when an earnings announcement for a particular firm is released shortly after the Value Line edition which reports on the firm has been sent to press.

TABLE 4.10

REGRESSION STATISTICS USING TIMING AS THIRD INDEPENDENT VARIABLE:

STANDARDIZED RESIDUALS, EXCLUDES OUTLIERS

$(StAR = a + b_1(UP/S_B) + b_2(UT/S_B) + b_3(timing) + e)$

	1983	1984	1985
Permanent Component:			
Coefficient (b_1)	2.4122	.5259	2.8965
Standard Error	1.1970	.6794	.8649
T-Statistic	2.0153	.7742	3.3490
Transitory Component:			
Coefficient (b_2)	-1.0581	.0624	-.5533
Standard Error	.5375	.4519	.5105
T-Statistic	-1.9685	.1381	-1.0838
Timing Variable:			
Coefficient (b_3)	.00003	.0005	-.0001
Standard Error	.00001	.0072	.0002
T-Statistic	.3031	2.2194**	-.6127
t-statistic for $b_1 > b_2$ (one-tailed test)	2.530***	.480	3.293***
R-Squared	.0272	.0184	.0463
F	2.515*	1.821	4.017**
n	274	295	252

* Significant at α equal to .10.
** Significant at α equal to .05.
*** Significant at α equal to .01.

TABLE 4.11

REGRESSION STATISTICS USING SUBSAMPLE OF FIRMS WITH TIMING INTERVAL THIRTY DAYS OR LESS: STANDARDIZED RESIDUALS, EXCLUDES OUTLIERS

PANEL A: Dichotomized Earnings Forecast Error
($StAR = a + b_1(UP/S_B) + b_2(UT/S_B) + e$)

	1983	1984	1985
Permanent Component:			
Coefficient (b_1)	1.7932	2.0786	3.0715
Standard Error	1.6525	1.1286	1.0143
T-Statistic	1.0852	1.8417	3.0281
Transitory Component:			
Coefficient (b_2)	-2.4631	.0094	-1.0889
Standard Error	.7871	.5125	.7299
T-Statistic	-3.1294	.0184	-1.4918
t-statistic for $b_1 > b_2$ (one-tailed test)	2.195**	1.584*	3.402***
R-Squared	.0642	.0204	.0852
F	5.078***	1.739	5.911***
n	151	170	130

PANEL B: Undichotomized Earnings Forecast Error
($StAR = a + b(EFE/S_B) + e$)

	1983	1984	1985
Total Earnings Forecast Error:			
Coefficient	-1.5304	4.3805	.3013
Standard Error	.6710	.4400	.6293
T-Statistic (one-tailed)	-2.2807	.9792	.4748
R-Squared	.0337	.0557	.0018

* Significant at α equal to .10.
** Significant at α equal to .05.
*** Significant at α equal to .01.

restricted to those observations having timing intervals under thirty days. The table indicates that the null hypothesis is rejected in each year, including 1984. Therefore, it appears that an important consideration in analyzing the lack of significance of the 1984 results reported in Tables 4.4 through 4.7 arises from difficulty in surrogating market expectations immediately prior to the cumulation period.

Two final issues are addressed before turning to results of tests of the second hypothesis. First, the values in Panels A and B lend support to the assertion that dividing an earnings forecast error into permanent and transitory components provides more information than the earnings forecast error considered by itself. The overall explanatory power of the two panels is compared using an F-statistic computed as follows (see Weisberg [1980], p. 88):

$$F = \frac{(RSS_B - RSS_A) / (df_B - df_A)}{RSS_A / df_A} ,$$

where, RSS_A is the residual sum of squares of the bivariate model;

RSS_B is the residual sum of squares of the univariate model;

df_A is the appropriate degrees of freedom corresponding to the bivariate model; and

df_B is the appropriate degrees of freedom corresponding to the univariate model.

The results, presented in Table 4.12, closely parallel the results related to the first hypothesis. In those periods where the effect of the permanent component is significantly greater than the transitory component, the overall utility of the bivariate model exceeds that of the univariate model.

Second, the previous chapter addressed the seemingly inconsistent use of market-adjusted dependent and unadjusted independent variables,

TABLE 4.12

COMPARISON OF EXPLANATORY POWER OF UNDICHOTOMIZED VERSUS DICHOTOMIZED EARNINGS FORECAST ERRORS

	1983	1984	1985
Table 4.4 (StAR, No Outliers)	6.628***	.129	10.651***
Table 4.5 (StAR, All Observations)	.817	.329	3.904**
Table 4.6 (CAR, No Outliers	7.034***	.589	12.111***
Table 4.7 (CAR, All Observations)	1.299	.066	5.271***

* Significant at α equal to .10.
** Significant at α equal to .05.
*** Significant at α equal to .01.

and indicated that results using unadjusted, or raw, market returns would be presented as supplementary information. Results of a test regressing raw returns on the scaled permanent and transitory components are presented in Table 4.13. The results presented support rejection of the null hypothesis in all three years and thus appear to indicate that abstracting the market component from returns in 1984 has a deleterious effect on the results. This conclusion, however, is tempered by other considerations.

The discussion of Table 4.12 emphasized the underlying intuition that dichotomization of earnings forecast errors provided more information than use of undichotomized forecast errors. This is true only at a relatively high alpha-level in 1984. (The F-statistic comparing Panel A to Panel B is 2.73; the cut-off at $\alpha = .10$ is 2.71).

Comparison of Table 4.4 with Table 4.13 suggests that adding the market component to the dependent variable increases the covariation between the dependent and independent variables. This increase in covariation could occur if information having a market-wide effect arrived in the market at the same time that a subset of firms were announcing earnings for the third quarter. If the market-wide information moved the raw returns in the same direction as the permanent component reported by the firms during the same period, the covariation between the variables would increase even though the announcement and the market-wide information were unrelated.

The following procedures were performed to determine whether market-wide events influenced the raw return results during the cumulation period of a subset of the sample firms. First, October and November issues of the Wall Street Journal were scanned to determine significant

TABLE 4.13

REGRESSION STATISTICS FOR RAW RETURNS:

OUTLIERS EXCLUDED FROM ESTIMATION SAMPLE

PANEL A: Dichotomized Earnings Forecast Error
(Cumulative Return = $a + b_1(UP/S_B) + b_2(UT/S_B) + e$)

	1983	1984	1985
Permanent Component:			
Coefficient (b_1)	4.0982	1.7256	2.8930
Standard Error	1.2236	.6810	.9070
T-Statistic	3.3492	2.5340	3.1898
Transitory Component:			
Coefficient (b_2)	-1.1796	.1172	-.5369
Standard Error	.5543	.4543	.5312
T-Statistic	-2.1279	.2580	-1.0107
t-statistic for $b_1 > b_2$ (one-tailed test)	3.769***	1.658**	3.128***
R-Squared	.0501	.0291	.0410
F	7.145***	4.373**	5.326***
n	274	295	252

PANEL B: Undichotomized Earnings Forecast Error
(Cumulative Return = $a + b(EFE/S_B) + e$)

	1983	1984	1985
Total Earnings Forecast Error:			
Coefficient	-.1418	.7016	.4073
Standard Error	.4927	.2873	.4447
T-Statistic (one-tailed)	-.2879	2.4417**	.9159
R-Squared	.0003	.0199	.0033

* Significant at α equal to .10.
** Significant at α equal to .05.
*** Significant at α equal to .01.

economy-wide events that took place during the third-quarter announcement period of 1984. Both oil prices and the prime rate declined steadily during the period, but the single event which would reasonably be expected to have the greatest influence on the market was the cut in the discount rate announced by the Federal Reserve Board after the close of trading on November 21. (The results of the presidential election appeared to have been substantially anticipated by the market.)

The 1984 data were then re-examined. Listings of each firm's industry number, earnings information, and announcement date, and the incremental return due to the market during the cumulation period (the raw return less the cumulative abnormal return) were generated. This information was then ranked by the firms' incremental return, announcement date, and industry numbers. These rankings were examined to detect patterns of correlation between the incremental returns and the scaled permanent components. In the ranking by incremental returns, seven of the first twenty firms had announcement dates which would result in their cumulation periods including November 23, the date when the discount rate announcement reached the market. Examining the ranking by announcement dates showed that fourteen firms had announcement dates which would result in their cumulation periods containing November 23. If announcement dates were uniformly distributed in the incremental return ranking, the expected number of the fourteen firms which would have been included in the first twenty firms of the incremental return ranking would be slightly less than one (14 * (20/330) = .9241).

The 1984 raw return regression coefficients were then re-estimated excluding the fourteen firms whose cumulation period included November 23. The results are presented in Table 4.14. These results are consistent with those of Table 4.4 in that the t-statistic for

b_1 greater than b_2 is insignificant, and Panel A does not explain a greater portion of variation in the raw return than does Panel B (F = -1.3714). The overall conclusion of this analysis is that the use of raw returns does not improve the overall results in 1984, and that the apparent increase in covariation reported in Table 4.13 is primarily the result of a major market-wide event occurring contemporaneously with certain third-quarter earnings announcements.

4.3 Results of Tests of Hypothesis Two

Because of difficulties surrounding the interpretation of negative E/P ratios, the test of the second hypothesis described in the preceding chapter utilized only those firms with nonnegative E/P ratios. The results of this test are presented in Table 4.15. The results for 1985 support rejection of the null hypothesis. In that year, the t-test for b_4 greater than b_2 is strongly supported, and the transitory component displays a significant, positive correlation with abnormal returns as evidenced by the coefficient's individual t-statistic. In 1983, the individual coefficient on the low-growth transitory component is significant and positive, but not significantly greater than the corresponding t-statistic for high-growth firms. As in the first hypothesis, the 1984 results do not support rejection of the null hypothesis. In neither high-growth nor low-growth firms do the transitory components explain a significant amount of variation in abnormal returns.

4.4 Results of Tests of Hypothesis Three

The final hypothesis asserts that the change in expectations resulting from earnings announcements should be less for firms reporting

TABLE 4.14

1984 REGRESSION STATISTICS FOR RAW RETURNS

EXCLUDING FOURTEEN-FIRM SUBSAMPLE AND PRIOR OUTLIERS

PANEL A: Dichotomized Earnings Forecast Error
(Cumulative Return = $a + b_1(UP/S_8) + b_2(UT/S_8) + e$)

	1984
Permanent Component:	
coefficient (b_1)	1.6065
Standard Error	.8029
T-Statistic	2.0010
Transitory Component:	
Coefficient (b_2)	.3588
Standard Error	.5130
T-Statistic	.6995
t-statistic for $b_1 > b_2$ (one-tailed test)	1.168
R-Squared	.0203
F	2.876*
n	281

PANEL B: Undichotomized Earnings Forecast Error
(Cumulative Return = $a + b(EFE/S_8) + e$)

	1984
Total Earnings Forecast Error:	
Coefficient	.7743
Standard Error	.3698
T-Statistic (one-tailed)	2.0934**
R-Squared	.0155

* Significant at α equal to .10.
** Significant at α equal to .05.
*** Significant at α equal to .01.

nonrecurring items when the nonrecurring items are in the same direction as the total earnings forecast error. Examination of the Wall Street Journal's Digest of Earnings for the fourth quarter of 1985 and Value Line pre- and post-announcement earnings forecasts resulted in a test sample of 53 firms. The Wall Street Journal's Digest of Earnings did not disclose any items requiring intraperiod tax allocation in the fourth quarter for any of these firms. An equal-sized control sample was randomly selected from NYSE and ASE firms followed by Value Line which had December 31 year-ends and which did not have any extraordinary items reported by Value Line for the fourth quarter of 1985.

The Wilcoxon rank sum test is used to compare the two samples. The experimental form of the null hypothesis under this test is that the distribution of absolute percentage changes in earnings expectations for firms disclosing nonrecurring items is identical to that of firms not disclosing such items. The alternative hypothesis is that the two distributions are nonidentical.[22] If, as is hypothesized in the prior chapter, nonrecurring items have smaller effects on expectations than recurring items, then the rank sum for the test sample should be significantly smaller than the rank sum of the control sample.

In the few instances where a 1986 quarterly expectation was zero prior to the fourth quarter announcement, the observation was deleted. The final test sample consisted of 48 firms and the final control sample consisted of 49 firms. Results of the Wilcoxon test are presented in

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[22]Technically, an alternative hypothesis which states that the means of the two sample groups are unequal is preferable to the Wilcoxon alternative hypothesis of nonidentical distributions. However, Bradley ([1968], pp. 112-114) argues that instances of the test supporting nonidentical distributions where sample means are equal are primarily theoretical in nature, and that, as a practical matter, a Wilcoxon result of nonidentical distributions is tantamount to a result of unequal means.

TABLE 4.15

REGRESSION STATISTICS FOR HIGH-GROWTH AND LOW-GROWTH FIRMS

$(StAR = a + b_1(UP/S_B)_{HG} + b_2(UT/S_B)_{HG} + b_3(UP/S_B)_{LG} + b_4(UT/S_B)_{LG} + e)$

	HIGH-GROWTH (LOW E/P) (b_2)	LOW-GROWTH (HIGH E/P) (b_4)
1983		
Transitory Component:		
Coefficient	1.1550	2.2452
Standard Error	1.6147	1.0069
T-Statistic	.7154	2.2298
t-statistic for $b_4 > b_2$	.572	
1984		
Transitory Component:		
Coefficient	.6399	-.6196
Standard Error	.7552	.7398
T-Statistic	.8474	-.8375
t-statistic for $b_4 > b_2$	-1.053	
1985		
Transitory Component:		
Coefficient	-3.3631	2.7128
Standard Error	1.8057	.8035
T-Statistic	-1.8625	3.3763
t-statistic for $b_4 > b_2$	3.073***	

* Significant at α equal to .10.
** Significant at α equal to .05.
*** Significant at α equal to .01.

Table 4.16. The results warrant rejection of the null hypothesis at a very low alpha-level. What is of primary interest concerning the results, however, is the very clear implication that firms reporting nonrecurring items have higher absolute percentage changes in expectations than firms which do not report such items. The Wall Street Journal[23] has suggested two possible reasons for this phenomenon: The writeoffs signal a more aggressive stance on the part of corporate managers; and the writeoffs reflect divestment of less profitable or unproductive assets and therefore clear the way for higher future profitability. The research conducted in this section is consistent with both explanations, and further research is necessary to distinguish between these and other possible hypotheses.

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[23]In the quarterly earnings report story for the fourth quarter, 1985: "Corporate Profits Fell 13% in Fourth Period; Huge Write-Offs Hurt"; February 24, 1986; p.1.

TABLE 4.16

WILCOXON RANK SUM TEST FOR THIRD HYPOTHESIS

	Sample Size	Sum of Scores	Expected Under H_0	Mean Score
Test Sample	48	2713.50	2352.00	56.53
Control Sample	49	2039.50	2401.00	41.62

Z-score = 2.6079 (Probability > |Z| = .0091)

CHAPTER 5

CONCLUSIONS AND LIMITATIONS

5.1 Conclusions

Other researchers have discussed the potential for research which operationalizes permanent and transitory earnings components to yield insights into the relationship between reported earnings and stock prices. This section summarizes and assesses the contributions of the methodology and results obtained in this study.

To evaluate the contributions, we begin by returning to the list of topics found at the beginning of the literature review in Chapter 1 (p.4). The first topic is the ability of GAAP earnings to function as a surrogate for the economic earnings concept envisioned in the informational perspective. The functioning of economic earnings in the informational perspective is similar to the permanent earnings concept discussed in the second chapter: there is a strong direct relationship between firm value and unexpected changes in earnings (permanent or economic). The current study measures unexpected changes in earnings resulting from an earnings announcement because of advantages in regard to the quantifiability of the revisions, the relative ease of determining the date of information dissemination in the marketplace, and conformity of the resulting experimental design with the causal system theorized in the informational perspective.

The ability of GAAP earnings to function in a manner similar to economic earnings in the informational perspective may be detected by a consistency between return response to an earnings announcement and changes in earnings expectations resulting from new information in the announcement. In the operational form of the current study, there should

be a direct relation between abnormal returns surrounding an announcement and permanent earnings (which are detected by changes in expectations). The operationalization of permanent earnings is unique to this study and arises from the notion of earnings persistence advanced in Miller and Rock [1985] and Kormendi and Lipe [1986].

The results of the study provide limited evidence indicating that such a relationship exists. In Tables 4.4 through 4.7, for example, the coefficient on the permanent component is always positive, with the exception of 1984 results in Table 4.4, when the coefficient is insignificantly different from zero. However, the strength of the conclusion must be tempered by recognizing that (1) the strength of the relationship is partially dependent on the elimination of extreme observations; (2) the relationship does not appear to be intertemporally consistent; and (3) our ability to measure such a relationship is weakened by substantial empirical obstacles (see below).

The second topic outlined in Chapter One addresses causes of cross-sectional variation in forecast revisions relative to an earnings announcement. Results of tests of the third hypothesis indicate that analysts behave as if their assessments of future earnings are formed conditional on the recurring/nonrecurring income dichotomy. Therefore, one cause of cross-sectional variation in forecast revisions appears to be the presence or absence of nonrecurring items.

This is not a particularly surprising conclusion. However, it is important to note an anomaly arising from this conclusion and the one previously presented. If there is a consistency between return reactions and forecast revisions relative to an earnings announcement, and if forecast revisions depend on the recurring/nonrecurring dichotomy, then we would expect return reactions to differ depending on whether the

underlying announcement reported nonrecurring income. However, Gonedes' research indicates that return effects from extraordinary items are not substantially different from recurring items. The paradox is clear: Either the informational perspective is not an adequate description of return response to an earnings announcement containing extraordinary items, or Gonedes' research is flawed. This study provides no direct evidence on this issue. The dispute is a possible arena for further research. Gonedes' results might be re-evaluated using the post-1975 definition of extraordinary items. However, as footnote 18 indicates, this might be a fruitless line of inquiry due to the low number of extraordinary items which are not benefits of tax loss carryforwards not recognized in loss years.

Related to this topic, the results reveal one very interesting and unanticipated observation, namely, that a revision in expectations following a nonrecurring item is greater than revisions arising from recurring earnings innovations. Again, it is possible to speculate on causes for this results (which might include management signaling or the effects of current capital writeoffs on future earnings), however, more research is needed before rival hypotheses can be eliminated.

The final topic raised in Chapter One relates to the differential effects of permanent and transitory components on firm value and whether such effects are conditioned by firm growth prospects. The evidence in the preceding chapter indicates certain empirical regularities, the interpretation of which must be tempered by the same sort of considerations listed in the discussion of GAAP earnings and the informational perspective on page 79. As stated earlier, there is limited evidence which supports the direct relation between security returns and permanent components of earnings forecast errors. A priori considerations detailed

in Chapter 2 led to the conclusion that effects of transitory components on firm value would be smaller than effects of permanent components. Statistically, the coefficients on permanent earnings components are significantly larger than those on transitory components in 1983 and 1985, but the coefficients estimated using 1984 data do not warrant rejection of the null hypothesis.

Another interesting result, also subject to the caveats discussed earlier in the chapter, is the larger explanatory power of dichotomized earnings components relative to undichotomized earnings forecast errors. Because additional information is necessary to perform the dichotomization procedure, the explanatory power of the bivariate regressions should be greater than the univariate regression. However, the result does bear out the underlying intuition of the study, "that knowledge of new information in an earnings announcement is a relatively crude aid in understanding the impact of the announcement on firm value" (p. 2). The explanatory power of the bivariate regressions relative to the univariate models (Table 4.12) suggests the usefulness of considering earnings persistence in explaining returns.

In regard to growth considerations (hypothesis two), the results do not support a relationship between growth and the effect of transitory components.

5.2: Limitations

A number of restrictions on the generalizability of the results have been mentioned earlier in this chapter. There are, however, other theoretical and practical considerations which limit the validity of the study.

First, the theoretical development and empirical tests do not incorporate the effects of possible shifts in systematic risk arising from earnings announcements. Because the distribution of expected firm returns is unaffected by a transitory shift in earnings, hypothesis two is not affected by ignoring systematic risk in the analysis and subsequent testing. The direction of any change in systematic risk arising from a permanent shift in earnings is indeterminate barring a systematic relationship between (1) the difference between the return at time t for an individual firm and the return expected for the firm; and (2) the difference between the market return at time t and the expected market return. Further, in the empirical test of hypothesis one, any bias resulting from a shift in systematic risk is a joint function of the signs of the earnings components, the sign of the market return during the cumulation period, and the sign of the shift in systematic risk. A change in systematic risk possibly induces noise in the empirical measures, but does not appear to systematically bias the test of hypothesis one.

The internal validity of the study is weakened by the short expectation horizon used in the empirical tests relative to the horizon assumed in the theoretical model. However, as discussed in footnote 12, it is not certain that the relevant market horizon extends beyond one year, and utilizable multi-year forecasts are not available.

Another important limitation of the study is the exclusive use of earnings trends in explaining changes in earnings expectations. The use of an adaptive model dictated this approach, but there is little doubt that expectations are also revised in response to non-earnings factors which are ignored in this study. A more general model of expectations

revision would incorporate market agents' reactions to non-earnings factors.

The model development itself contains some restrictive assumptions in regard to firm valuation and growth. These assumptions, which are standard in much of the firm valuation literature, serve to make the business environment tractable. It is not clear that less restrictive and more complex models would yield substantially different results, or results more intuitively appealing than those of the current study.

Other limitations arise in operationalizing the research design. Some important variables - including market earnings expectations, the new information in earnings, and the permanent and transitory components of the new information - are unobservable, and decisions related to the choice of proxies used to surrogate these unobservable variables may influence the results. To the extent that measurement error is present in the proxies of market expectations, earnings persistence, and growth, the power of the empirical tests will be reduced. The study assumes that the cause of forecast revisions is the new information in a firm's current earnings figure, but the market uses a wider set of information in determining expectations than just the past time-series of earnings. Finally, problems are inherent in the use of the Value Line data base. The problems affect the determination of the cause of revisions in expectations and the ability of GAAP earnings to function as surrogates for economic income.

APPENDIX 1

DERIVATIONS OF EQUATIONS USED IN SECTION 2.2.3

Equation 21:

At time 0 (beginning of period 1):

$$E(X_2) = E(X_1) + E(I_1)(p^* - p) \tag{18}$$

$$E(X_3) = E(X_2) + E(I_2)(p^* - p)$$

$$= E(X_1) + E(I_1)(p^* - p) + E(I_2)(p^* - p)$$

$$\vdots$$

$$= E(X_t) = E(X_1) + \sum_{\tau=1}^{t-1} E(I_t)(p^* - p) \tag{appl.1}$$

Substitute equation appl.1 into the expectational form of our original equation for firm value:

$$V_0 = \sum_{t=1}^{\infty} [E(X_t)/(1 + p)^t]$$

$$= \frac{E(X_1)}{1 + p} + \frac{E(X_1) + E(I_1)(p^* - p)}{(1 + p)^2} + \ldots + \frac{E(X_1) + \sum_{\tau=1}^{t-1} [E(I_\tau)(p^* - p)]}{(1 + p)^t}$$

$$+ \ldots$$

$$= \frac{E(X_1)}{1 + p} + \frac{E(X_1)}{(1 + p)^2} + \ldots + \frac{E(I_1)(p^* - p)}{(1 + p)^2} + \frac{E(I_1)(p^* - p)}{(1 + p)^3} + \ldots .$$

$$\ldots\ldots + \frac{E(I_2)(p^* - p)}{(1 + p)^3} + \frac{E(I_2)(p^* - p)}{(1 + p)^4} + \ldots$$

$$= \sum_{t=1}^{\infty} \frac{E(X_1)}{(1 + p)^t} + E(I_1) \sum_{t=2}^{\infty} \frac{(p^* - p)}{(1 + p)^t} + E(I) \sum_{t=3}^{\infty} \frac{(p^* - p)}{(1 + p)^t} + \ldots$$

$$= \frac{E(X_1)}{p} + \sum_{t=1}^{\infty} E(I_t)(p^* - p) \sum_{\tau=t+1}^{\infty} \frac{1}{(1+p)^{\tau}} \qquad \text{(appl.2)}$$

Then,

$$\sum_{\tau=t+1}^{\infty} \frac{1}{(1+p)^{\tau}} = \frac{1}{(1+p)^{t}} \sum_{\tau=1}^{\infty} \frac{1}{(1+p)^{\tau}} = \frac{1}{p} \frac{1}{(1+p)^{t}} .$$

Therefore, equation appl.2 becomes

$$V_0 = \frac{E(X_1)}{p} + \sum_{t=1}^{\infty} \frac{E(I_t)(p^* - p)}{p(1+p)^{t}}$$

which is equation 21 in the text.

Equation 22:

$$E(V_1) = E(X_1) + \frac{E(X_1) + E(I_1)(p^* - p)}{p} + \sum_{t=1}^{\infty} \frac{E(I_t)(p^* - p)}{(1+p)^{t-1}} .$$

$$= E(X_1) + \frac{E(X_1)}{p} + \frac{(p^* - p)}{p} \sum_{t=1}^{\infty} \frac{E(I_t)}{(1+p)^{t-1}} ,$$

which is equation 22 in the text.

Equation 26:

$$V_1 = X_1' + \frac{X_1' + E(I_1)(p^{*\prime} - p)}{p} + \frac{(p^{*\prime} - p)}{p} \sum_{t=2}^{\infty} \frac{E(I_t)}{(1+p)^{t-1}}$$

$$= X_1' + \frac{X_1'}{p} + \frac{(p^{*\prime} - p)}{p} \sum_{t=1}^{\infty} \frac{E(I_t)}{(1+p)^{t-1}} ,$$

which is equation 26 in the text.

APPENDIX 2

THE EFFECT OF NONRECURRING ITEMS ON EARNINGS EXPECTATIONS

This appendix examines the relation between the nonrecurring/recurring income classification present in GAAP and revisions in expectations of earnings.

The following notation is used:

A_0 is the beginning endowment of assets at time 0 (the start of period 1);

r is the expected return on assets;

X_t is net income for period t;

C_t is net income from continuing operations for period t;

E_t is net income from nonrecurring operations for period t.

To simplify the analysis, we assume that a submartingale process describes expectations for continuing and net income figures:

$$E(C_{t+1}) = C_t + \delta \qquad \text{(app2.1)}$$

$$E(X_{t+1}) = X_t + \delta. \qquad \text{(app2.2)}$$

At the end of the first period, $X_1 = A_0 r$. The drift term may be interpreted as the growth in income resulting from reinvestment of annual net income, which earns a rate of r in the next period:

$$E(X_2) = A_0 r + X_1 r$$

$$\vdots$$

$$E(X_t) = r(A_0 + \sum X_i) \quad . \qquad \text{(app2.3)}$$

Nonrecurring items are described as a white noise process:

$$E(E_{t+1}) = 0 \ . \qquad \text{(app2.4)}$$

Therefore,

$$E(X_{t+1}) = C_t. \qquad \text{(app2.5)}$$

at the beginning of the second period (time 1):

$$E_1(X_2) = r(A_0 + X_1), \text{ and} \qquad \text{(app2.6)}$$

$$E_1(X_3) = r(A_0 + X_1 + E_1(X_2)). \qquad \text{(app2.7)}$$

We now examine the differing effects on expectations of period three net income caused by:

1. A period two income realization less than expectations due to recurring factors in the business; and

2. A period two income realization less than expectations due to a nonrecurring charge.

In alternative one, period two income may be represented as:

$$X_2' = r'(A_0 + X_1), \qquad \text{(app2.8)}$$

so that the expectation at time two of period three income is:

$$E_2(X_3) = r'(A_0 + X_1 + X_2') \ . \qquad \text{(app2.9)}$$

In alternative two, period two income is again shown as:

$$X_2' = r'(A_0 + X_1), \qquad \text{(app2.10)}$$

but period three expectations are:

$$E_2(X_3) = r(A_0 + X_1 + X_2') \ . \qquad \text{(app2.11)}$$

In examining the second alternative, the change in expectations of period three income due to the second period income information is:

$$\begin{aligned} d2 &= E_1(X_3) - E_2(X_3) \\ &= r(A_0 + X_1 + E_1(X_2)) - r(A_0 + X_1 + X_2') \\ &= r(E_1(X_2) - X_2'). \end{aligned} \qquad \text{(app2.12)}$$

This is the amount by which any expectation is affected by net income in the second period falling short of expectations due to a one-time charge.

The effect of a recurring change on the expectation of third period income is:

$$d(1) = E_1(X_3) - E_2(X_3)$$

$$= r(A_0 + X_1 + E_1(X_2)) - r'(A_0 + X_1 + X_2')$$

$$= (r - r')(A_0 + X_1) + r(E_1(X_2)) - r'X_2' \,. \qquad \text{(app2.13)}$$

The amount by which d(1) is greater than d(2) is:

$$d(1) - d(2) = (r - r')(A_0 + X_1 + X_2'). \qquad \text{(app2.14)}$$

Equation app2.14 represents the amount by which the effect of a recurring change in income exceeds the effect of a nonrecurring change in income on the expectations of any given income figure. The equation indicates that the effect on expectations of a change in recurring income is substantially greater than that of a nonrecurring charge.

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