

The earnings–price anomaly

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Received March 1992, final version received April 1992

This review explores systematic explanations for the anomalous evidence in the relation between accounting earnings and stock prices. The anomaly is that estimated future abnormal returns are predicted by public information about future earnings, contained in (1) current earnings and (2) current financial statement ratios. The current-earnings anomaly appears due to either market inefficiency or substantial costs of investors acquiring and processing information, the choice depending on one's priors concerning these costs and one's definition of market 'efficiency'. The financial-statement-information anomaly appears due to accounting ratios proxying for stocks' expected returns. Anomaly seems likely to be a permanent state.

1. Introduction

The apparent predictability of abnormal returns after earnings announcements has become one of the most significant anomalies in financial markets research, for several reasons. First, the magnitude is daunting: for example, the estimated abnormal return from trading on 'old' earnings information exceeds the normal return on the market.¹ Second, the anomaly is ubiquitous: earnings announcements occur every quarter for every stock. Third, the anomaly is scientifically indisputable: it appeared in Ball and Brown (1968) and has been replicated, consistently and with increasing precision, in one of the most carefully and thoroughly researched areas of the empirical financial economics literature.² Fourth, taken at face value the anomaly implies that share markets, which are central to the economy and which one would think are paradigm examples of the competitive model, grossly fail the test of competitive economic theory. Fifth, the anomaly challenges the theory underlying most of the widely-used models in modern financial economics. It therefore is not surprising that, while it

*I am grateful to Andrew Christie, S.P. Kothari, G. William Schwert, Ross Watts, Jerold Zimmerman, and workshop participants at UCLA for helpful comments. Financial support was received from the Bradley Policy Research Center at the Simon School, University of Rochester and from the John M. Olin Foundation.

¹The magnitude of the estimated abnormal returns is reviewed in sections 4 and 5 below.

²Surveys of the evidence are in Ball (1978), Joy and Jones (1979), and Bernard (1989, 1992).

is only one property of the relation between accounting earnings and stock prices, the earnings-price anomaly has attracted considerable attention.

For some time, the contentious issue has not been the existence of the earnings-price anomaly, but its explanation. This paper addresses that issue. The following section describes the properties of an anomaly in the context of the theory of efficient markets and canvasses the principal feasible explanations. One possibility is that errors in estimating abnormal returns are correlated with earnings information, so the third section discusses controlling for variables (notably, size) that could proxy for expected returns in an efficient market. Section 4 reviews the evidence on the two principal versions of the anomaly: (1) the 'drift' in abnormal returns after quarterly earnings announcements documented by a sequence of studies, culminating in the novel evidence of Rendleman, Jones, and Latané (1987), confirmed by Freeman and Tse (1989) and Bernard and Thomas (1989, 1990) among others, that current earnings predicts abnormal returns at future earnings announcement dates; and (2) the evidence of Ou and Penman (1989a, b), extending the prior work of McKibben (1972) and others, that current financial statement information predicts abnormal returns via its capacity to predict future earnings. In both versions of the anomaly, the market seems unaware of the full implications of current accounting information for predicting future earnings. As a prelude to the analysis of the evidence in section 6, the fifth section briefly describes the economic magnitude of the unexploited profit opportunities allegedly involved. The sixth section then draws the previous sections together, exploring the consistency of the principal anomaly explanations outlined in sections 2 and 3 with the evidence summarized in sections 4 and 5.

The anomaly takes the form of current earnings (or current financial statement information about future earnings) predicting future abnormal returns. This could reflect a true association between earnings information and abnormal returns, which implies market inefficiency. Alternatively, it could reflect an association between earnings information and errors in estimating abnormal returns, which does not imply market inefficiency. Evaluating the evidence therefore involves evaluating the sensitivity of the research designs to errors in estimating abnormal returns.

I conclude that the Ou and Penman (1989a,b) evidence most likely results from an association between current accounting information and errors in estimating abnormal returns, whereas the evidence in Rendleman, Jones, and Latané (1987), Freeman and Tse (1989), and Bernard and Thomas (1989, 1990), among others, reflects either market inefficiency or substantial costs of investors acquiring and processing information. In one, the failure appears to lie with the research design, by not implementing an unbiased control for expected returns; in the other, the failure appears to lie either with the market or with how scholars have modelled an efficient stock market. Nevertheless, choice among hypotheses is hampered by the low power of the tests.

2. Interpreting earnings-price anomalies in the context of efficient market theory

In the context of the theory of efficient stock markets, an anomaly is a predictable abnormal return. The reasoning is as follows. Market efficiency is a simple application of the theory of competition, in which there are competitive returns, at the margin, to economic activity. If it is assumed to be costless for investors to use (i.e., acquire and process) an item of information, then in a competitive market they can expect no return from using it. Investment positions based on costless information therefore can expect to earn only the normal competitive return for those positions, with no additional compensation for using the information.³ If investors can costlessly acquire and process information that allows them to earn predictable abnormal returns, then they can earn pure economic profits. In the context of the theory of efficient markets, this is anomalous (i.e., inconsistent).⁴

There are two classes of explanation for earnings-price anomalies:

1. The market truly is inefficient: that is, systematic mispricing allows true abnormal returns to be obtained, at zero cost, from using earnings information; or
2. The market is efficient and measured abnormal returns are biased estimates of pure economic profits, because:
 - 2.1. Costs of acquiring and processing earnings information are large enough to cause detectable returns to this economic activity; and/or
 - 2.2. Investors' rates of return are misestimated, for reasons that include failing to allow for taxes and using price estimates based on price quotations, with the estimation error being correlated with the earnings variables studied by researchers; and/or
 - 2.3. Abnormal rates of return (i.e., returns adjusted for expected or normal returns on investment) are misestimated, due to limitations in our knowledge of the determinants of expected returns (i.e., asset pricing models) or misestimation of relevant parameters such as risk, with the

³The theory of efficient markets is surveyed from different perspectives in Fama (1970, 1991), LeRoy (1989), and Ball (1991). This review is based on the perspective taken in the latter survey, in which items of information are distinguished economically, according to their costs of acquisition and processing. Consequently, there are different predictions concerning returns from publicly-available information about past prices and announced earnings, for example, versus returns from privately-held information such as managers' inside knowledge or security analysts' researched recommendations. That is, the so-called 'strong' form is distinguished in terms of information costs from the 'weak' and 'semi-strong' forms of Fama (1970).

⁴The term 'anomaly' was taken from Kuhn (1970, esp. sect. VI), whose definition can be paraphrased as: 'systematic evidence that appears scientifically precise but is inconsistent with the tenets of basic theory'.

estimation error being correlated with the earnings variables studied by researchers.

The first explanation is failure of the capital market, whereas the second is failure of researchers to construct either adequate theory or adequate empirical measures of price behavior in an efficient market. The remainder of this section explores the second explanation, in the spirit of Kuhn's (1970, p. 80) admonition: 'It is a poor carpenter who blames his tools.' Discussion of the consistency of the explanations with the evidence, including the pattern and magnitude of estimated abnormal returns, is deferred to section 6.

2.1. *Information costs*

In Fama, Fisher, Jensen, and Roll (1969) and Ball and Brown (1968), the issue of information acquisition and processing costs was finessed by studying items of simple, publicly-available information. Firms' quarterly and annual earnings reports are widely disseminated in the financial press, on the wire services, to analysts, and to interested parties. The reasoning then is that the cost to investors of *acquiring* (i.e., reproducing) an earnings number, in contrast to the firm's initial cost of producing that earnings number, becomes trivial as a consequence of its public-domain property. Further, provided the information variable studied by the researcher requires little *processing* cost to investors, such as in calculating the change in earnings per share (*EPS*), the combined cost of acquisition and processing remains trivial. This reasoning seems particularly persuasive when, for comparison with rates of return, information acquisition and processing costs are expressed as a percentage of market value, either of the firm or of a typical shareholding in the firm. If there are competitive returns relative to costs, then trivial information costs can be assumed to have only a trivial (and probably undetectable) effect on expected returns.

Subsequent tests of the efficient market theory have come to rely on the researcher identifying information that, to an acceptable approximation, is costless to acquire and process. In contexts where information costs are substantial, they could have a detectable effect on security returns. This could be associated with an upward bias in abnormal returns that investors are estimated as earning. It thus is a potential explanation of the observed anomalies. This is a troublesome issue, because there is little the researcher can rely on, in the form of either theory or data, to gauge the magnitude of information processing and acquisition costs in practice.

The assumption of costless acquisition and processing is unlikely to be equally valid in all research contexts. It seems more valid in the earlier earnings-price research designs, which study simple variables such as increases and decreases in annual *EPS* [Ball and Brown (1968)]. Later designs involve the hypothetical investor in more (and more complex) information acquisition and

processing, such as obtaining the dates of the following four quarters' earnings announcements and computing cross-sectionally standardized prediction errors from a model that exploits the information in the autocorrelation function in seasonally-differenced quarterly earnings [Rendleman, Jones, and Latané (1987), Bernard and Thomas (1990)]. The assumption of zero cost of using information thus has been increasingly tested over time.

The notion of information processing costs is not new to economists. Pioneering contributions include Coase (1937) and Stigler (1961) on the costs of observing prices, Hayek (1945) on the role of information in markets, and Simon (1955, 1957) on the concept of bounded rationality. Information costs are not inconsistent with competitive markets, though they do require a different characterization of price behaviour in competitive markets. This arguably is the central issue in the theory of efficient capital markets, because 'efficiency' is a property of the response of prices to information in competitive markets.⁵ Nevertheless, it largely is an unresolved issue. In addition, little is known about the magnitude of information acquisition and processing costs in relation to accounting information, so their role in explaining the earnings-price anomaly remains unclear.

A related issue is *investor heterogeneity*. Investors differ in prior beliefs and face different costs of acquiring and processing new information. Yet homogeneity is assumed by most relevant theory, including versions of the capital asset pricing model (CAPM) used in testing efficiency and even the models of efficiency that characterize the market as responding essentially mechanistically to objective information.⁶ Questions that remain unanswered include: Whose information costs determine expected returns in an efficient market? The highest-cost investor who is attracted to trade? Are infra-marginal investors (with lower information costs and thus higher net returns) consistent with efficiency?

A more challenging issue is raised by Hayek's (1945) characterization of markets. In his celebrated defence of the price mechanism, Hayek argues that the total information set reflected in prices is unknown, or even unknowable, to individuals. The immediate implication for share markets is that each investor trades without knowing the full information set that other investors have used in trading and thus without knowing the full information set that has influenced prices. An investor who possesses an item of information must process that information, to form a view of its effect on price, but also must decide whether other investors have used that information in setting the transacted price. The Hayekian characterization of markets transforms the role of information processing costs for an investor trading on the basis of information, as distinct

⁵The relation between competitive and efficient markets, including its historical development, is discussed in Ball (1991).

⁶Models incorporating heterogeneity are proposed in Merton (1987), Admati and Pfleiderer (1988), and Shleifer and Vishny (1990), among others.

from a liquidity trader. It is facile to conclude that the role of information processing costs, in tests of simulated information-based trading rules, is not well understood.

2.2. *Errors in estimating rates of return*

The dependent variable in market efficiency tests is the return earned from trading on information, adjusted for normal or expected returns. Rates of return derived from widely-accessible data files, notably those supplied by the Center for Research in Security Prices (CRSP), provide estimates of the returns from trading on information, but are not true returns. They incorporate errors from at least two sources.

First, the price estimates recorded on the data files are not necessarily prices at which one could trade on the basis of earnings information. Either they are last-trade prices (which might be executed at the bid or the ask price) or, particularly for thinly-traded stocks, they are bid-ask averages. Keim (1989, table 6) reports the average bid-ask spread for NYSE/AMEX stocks as 2.8%, suggesting that their rates of return cannot be estimated within this magnitude of accuracy.⁷ Keim also reports systematic changes, correlated with time (e.g., at the turn of the year), in the frequency with which trades occur at ask prices. Systematic movements from bid to ask, or vice versa, appear to bias estimated returns at particular times. Because the level of precision involved is independent of the return interval, short-interval returns are most likely to be affected (i.e., when either studying short periods or requiring repeated trading over longer periods). Abnormal returns over long holding-period intervals are unlikely to be explained by trading-mechanism effects, except for very-low-price stocks.

Second, the return estimates ignore the possible effects on security returns of differential taxation of dividend income and capital gains.⁸ These effects could be correlated with earnings due to: (1) the correlation between dividends and earnings and (2) nonlinearity in the capital gains tax function, due to gains and losses being taxed at different rates, which makes the value of capital gains taxes an increasing function of stock price volatility and thus of the magnitude of information in announced earnings.⁹

Errors induced by quotation-mechanism effects and by imperfect allowance for taxes illustrate the general point that researchers use estimates of rates of

⁷Jones, Kaul, and Lipson (1991, table 1) report an equivalent figure of 4.7% for NASDAQ-NMS stocks.

⁸See Brennan (1973) and Litzenberger and Ramaswamy (1979) for analyses.

⁹The relation between earnings information and volatility was first observed by Beaver (1968). The effect of price volatility on the value of capital gains taxes is analyzed in Ball and Bowers (1983).

return, not true returns.¹⁰ In the context of earnings–price studies, the primary issue is not the effect of errors on efficiency in estimation, due to the large sample sizes available [Bernard and Thomas (1989, 1990) study over 100,000 earnings announcements]. The concern is the potential for bias arising from correlation between errors in measuring returns and the earnings variables studied. This issue is largely unexplored.¹¹

2.3. *Errors in measuring normal (expected) returns*

Abnormal return estimates involve an adjustment for ‘normal’ or ‘expected’ returns. This typically is performed by controlling for risk, as suggested by the simple Sharpe–Lintner form of the CAPM. Yet the CAPM is an abstraction that has clear limitations, some of which are discussed below.

1. The CAPM is a pure-exchange model, ignoring properties of the supply of securities.
2. The CAPM is a partial-equilibrium model, defining ‘normal’ returns relative to returns on the population of assets, as measured by returns on the market index. It thus can only address efficiency with respect to microeconomic information, that is information whose effect on security prices is not reflected in the index.

Due to these limitations, the simple CAPM allows no statements about how an efficient market would behave in several dimensions. One dimension is its response to the component of firms’ earnings variation that is due to economy-wide factors.¹² The following conjecture illustrates this point. Suppose increases in market-wide earnings are associated with opposing effects on share prices: (1) increases, due to the good earnings news, and (2) decreases, due to an increase in the demand for capital by firms, which react to the good news by revising upward their assessment of the profitability of new investment opportunities (thus requiring expected returns to increase, to attract more capital from investors). The net effect on market-wide expected returns would evolve over time, as a function of the time path of new capital creation. In the absence of

¹⁰The related issue of transactions costs, and their effect on estimated returns from simulated trading strategies, is discussed in section 6.2 below.

¹¹Skinner (1991), discussed below, finds no evidence of significant trading-mechanism biases to estimated abnormal returns at earnings announcements. Bernard and Thomas (1989) report that their estimated abnormal returns are not associated with dividend yields (a test of tax effects).

¹²See Brown and Ball (1967) for evidence on the economy-wide ‘market’ factor in earnings and Sloan (1993) for evidence on the relation between it and the equivalent factor in returns. Note that Ball and Brown (1968) and Ball, Kothari, and Watts (1992) remove the market factor in earnings before studying the earnings–price relation.

a macroeconomic theory that provides precise, time-dated predictions of market-wide expected returns, the researcher can neither model nor test the behaviour of an efficient market in response to the market factor in earnings.¹³

Balvers, Cosimano, and McDonald (1990) show that aggregate output predicts the future return on the market and argue this is consistent with market efficiency. Fama (1990) and Chen (1991) report related results. Fama (1990, p. 1090) views the implications for efficiency as unclear: is the response of expected returns to current aggregate variables too large, too small, or 'correct'? These results link to accounting variables because, as Brown and Ball (1967) for example show, indexes of current earnings are correlated with aggregate output. In general, when portfolios are formed on the basis of accounting variables such as changes in earnings, inventories, liquidity, or leverage [Ou and Penman (1989a, b)], a proportion of the individual-firm variability is eliminated by diversification, and the contribution of aggregate economic factors to their remaining time-series variability is increased. Yet this is the component of the accounting variables for which the simple CAPM makes no predictions concerning market reaction. In principle, this problem can be eliminated in research designs that remove the market component of earnings, either by earnings 'market model' regression or by simulating hedge portfolios that have zero beta and no net investment in the market portfolio, but in practice that is not always accomplished.

A second dimension in which the simple CAPM is silent is predictions about securities' risks. Yet risk (and change in risk) likely is endogenous in many research contexts. For example, Ball and Kothari (1991) show that betas estimated from daily returns change in the days surrounding earnings announcements. Ball, Kothari, and Watts (1992) show that betas estimated from annual returns change as a decreasing function of firms' annual earnings. This is due in part to the association of earnings with stock prices and thus with debt/equity ratios. Adjusting for the observed risk changes removes a portion of the 'drift' after announcements of annual earnings. Again, is the observed response of betas to earnings (and thus the adjustment of the estimated 'drift') too large, too small, or 'correct'?

3. Being a partial-equilibrium model, the CAPM is susceptible to deficiencies in sampling from the population of assets, for example when using a sharemarket 'index' portfolio as a proxy.

¹³An advantage of the CAPM is the precision, in both magnitude and time, of its predicted post-announcement return behavior in an efficient market. It predicts a zero expected disturbance, immediately after public information announcements. A disadvantage is that the model addresses only 'micro' information, with zero-sum valuation implications in cross-section.

Share indexes exclude most small corporations, unincorporated businesses, human capital, real estate, and consumer durables, among other assets.¹⁴ Market indexes are dominated by large corporate equities, particularly when they are weighted by sharemarket capitalization. This suggests that sharemarket indexes provide a more effective control for the expected return on large corporate equities than on other assets. Conversely, market indexes seem a less effective control for expected returns on the smallest listed stocks, which are the likely closest substitutes for the assets omitted from the index.

4. The CAPM assumes security returns are continuous and mean-variance.

Fama (1976, ch. 1) concludes that stock returns generally are leptokurtic. There appears to be a higher frequency of 'large' market-wide falls than rises. McNichols (1988) shows that returns are more positively skewed around earnings announcements than during nonannouncement periods. The implications of such results for short-interval expected returns, in general and around earnings announcement dates, are largely unknown.

These and other limitations in our knowledge of security pricing in an efficient market do not in themselves imply that research is fruitless. They do suggest at least three things. First, the power of tests of efficiency or inefficiency hypotheses is an important issue. Second, research designs that are more sensitive to suspected limitations in our knowledge of security pricing can be interpreted more as providing clues concerning those limitations, and less as providing substantive evidence on market efficiency. Third, research can be made less sensitive to these limitations by careful selection of proxies for expected returns in an efficient market.

3. Size as a proxy for expected returns

A promising proxy for expected returns is market value of equity (size). Reasons include the following:

- (1) Over extended periods, size consistently is a better predictor of expected returns than estimated betas.¹⁵ While not fully understood, this 'size effect' does not challenge the efficient market theory. There is no serious alternative hypothesis that the information in firm size, which is public information and easy to process, is so comprehensively ignored by investors in their pursuit of abnormal returns that it predicts abnormal returns over extended

¹⁴This point is due to Roll (1977). Stambaugh (1982) incorporates other assets into CAPM tests.

¹⁵See, for example, Banz (1981), Jaffe, Keim, and Westerfield (1989), and Fama and French (1991).

- periods.¹⁶ The only serious hypothesis is that size is proxying for expected returns.
- (2) Information acquisition and processing costs are likely to be a decreasing percentage of market capitalization. If there are competitive returns to incurring information costs, then expected returns also are a decreasing function of size.
 - (3) The effect of personal taxes on returns is likely to depend on size. Size is correlated with dividend yield and thus with taxes on the divided component of returns. Size also is correlated and with stock return variance, which affects the value of capital gains taxes.¹⁷ For legal and other reasons, small stocks are less likely to be held by tax-exempt institutions. These factors suggest that pre-tax returns could be a function of size.
 - (4) Sharemarket indexes incorporate a nonrepresentative sample of assets by size (see section 2 above). It is feasible that betas estimated from sharemarket data provide biased estimates of expected returns, as a function of size.¹⁸
 - (5) Proportional bid-ask spreads, and thus the quality of stock return data used to estimate CAPM betas, are a decreasing function of size.
 - (6) Amihud and Mendelson (1986) hypothesize that expected returns are an increasing function of spreads, which constitute a round-trip transactions cost. Spreads arise because the flow of buy and sell orders to the market is discrete, both in time and quantity, and thus they decrease with size.
 - (7) Handa, Kothari, and Wasley (1989) show that when betas are estimated from longer-interval returns, they have greater cross-sectional dispersion, the cross-sectional risk/return relation is more consistent with the Sharpe-Lintner CAPM, and the relation between size and expected returns becomes statistically insignificant. This suggests that the 'size effect' in part is due to errors in measuring betas from short-interval returns.
 - (8) Size (market value of equity) by definition is a function of past equity returns. Ball and Kothari (1989) show that betas are a function of past equity returns. Size at a point in time thus can proxy for beta changes up to that instant.

The arguments collectively suggest that size be used in addition to estimated beta as a control for expected returns, in the absence of a better alternative.¹⁹

¹⁶Models that classify investors as informed and uninformed or sophisticated and unsophisticated would predict a size effect in the opposite direction, if the likelihood of being informed or sophisticated is an increasing function of size.

¹⁷Size also is correlated and with stock return variance at earnings announcements.

¹⁸Evidence consistent with this possibility is provided by Stambaugh (1982), in which the performance of the Sharpe-Lintner CAPM is sensitive to the set of assets employed in the tests.

¹⁹The evidence of Fama and French (1991) further suggests that size and the market/book ratio be used *instead of* estimated beta. This could reflect the phenomenon observed in Ball and Kothari (1989), since market/book is highly positively correlated with past equity returns and thus positively correlated with leverage and expected return on equity.

They also suggest there is little to learn about market efficiency from studies that demonstrate predictable CAPM-estimated abnormal returns, if the abnormal returns disappear after controlling for size. Such results are not likely to be either: (1) novel, being a manifestation of the well-documented size effect, or (2) relevant to market efficiency, if size simply is proxying for expected returns. The more interesting research question in these studies is *why* size proxies for expected returns.

4. The anomalous earnings–price evidence

This section reviews the two principal categories of earnings–price anomaly: the ‘drift’ in the apparent market response to earnings and the unexploited implications of financial statement information for future earnings and abnormal returns. These are chosen because they are the largest and most comprehensive earnings-related anomalies and because of the contrasting interpretations placed on them in section 6 below.

4.1. *Quarterly earnings information*

The ‘drift’ in the apparent market response was first observed by Ball and Brown (1968), using annual earnings. It subsequently was shown to be even more pronounced for quarterly earnings, by a string of researchers: Jones and Litzenberger (1970), Brown and Kennelly (1972), Joy, Litzenberger, and McEnally (1977), Watts (1978), Foster, Olsen, and Shevlin (1984), Rendleman, Jones, and Latané (1987), Bernard and Thomas (1989, 1990), Freeman and Tse (1989), Wiggins (1991), and Bartov (1992), among others.

Bernard and Thomas (1989, 1990) report an exhaustive investigation of approximately 100,000 quarterly earnings announcements over 1974–86. Their salient results are:

1. A portfolio that every calendar quarter takes equal-weighted long positions in the top decile of earnings performers, and short positions in the bottom decile, earns + 4.19% average estimated abnormal return over the 60 trading days (approximately one quarter) following the earnings announcement.²⁰ The estimated post-announcement abnormal return is positive for 46 of the 50 calendar quarters studied.

²⁰Following Foster, Olsen, and Shevlin (1984), Bernard and Thomas convert the 4.19% return earned from the average quarter’s earnings announcement to an annualized rate of approximately 18%. This is misleading if the anomaly is due in part to once-off effects such as information costs or Keim’s (1989) bid/ask effect. For example, a 0.25% abnormal return over 5 days might seem comparable to reasonable information acquisition and processing costs, or to bid–ask spreads, but when expressed as a 12.5% annual rate it might not seem comparable at all. Note that Bernard and Thomas standardize the earnings variable and are careful to avoid any hindsight biases in the design.

2. Estimated post-announcement abnormal returns from this trading rule are a decreasing function of size.
3. Over the first five trading days (approximately one week), the portfolio earns + 0.70%, i.e., one sixth of the estimated 60-day abnormal returns.
4. Trading days 61–80 exhibit additional estimated abnormal returns of approximately the same magnitude as those in days 1–60. By day 180 (approximately three quarters) the estimated abnormal return from the trading strategy climbs to + 7.74%.
5. Little or no further ‘drift’ occurs beyond day 180.

These results are consistent with over two decades of prior research. The most intriguing result in Bernard and Thomas (1989, 1990) builds on the hypothesis and evidence of Rendleman, Jones, and Latané (1987), who link a component of the post-announcement ‘drift’ to the market not fully appreciating the time series behaviour of quarterly earnings. Bernard and Thomas report that:

6. A significant component of the predictable post-announcement abnormal return occurs at the announcement of following quarters’ earnings. The sign of *this* quarter’s deseasonalized change in *EPS* is associated with estimated abnormal returns of + 1.32%, + 0.70%, + 0.04%, and – 0.66% at the time of the *following* four quarters’ announcements (*t*-statistics are + 14.63, + 8.46, + 0.45, and – 7.86). What makes this result remarkable is that the pattern of the estimated abnormal returns mimics the (+ , + , 0 , –) pattern of autocorrelation in changes in the average firm’s seasonally-adjusted quarterly *EPS*.

Similar results are obtained by Freeman and Tse (1989), Wiggins (1991), and Bartov (1992). The market seems to assume a seasonal random walk in quarterly earnings, unaware of the complete implications of current *EPS* for the next four quarters’ *EPS*. Bernard and Thomas (1990, p. 338) conclude: ‘The evidence is consistent with the hypothesis that stock prices partially reflect a naive earnings expectation: that future earnings will be equal to earnings for the comparable quarter of the prior year.’

4.2. *Annual report information*

Ou and Penman (1989a,b) propose a more general version of this hypothesis. In the spirit of Graham, Dodd, and Cottle (1962) and McKibben (1972), they hypothesize there is underutilized information about future earnings contained in a variety of financial statement variables, not just in current earnings. This information can be used to predict future earnings, even though it is not so used

by the market, and thus it can generate abnormal returns. They state (1989a, p. 296, parentheses in original):

Firms' ('fundamental') values are indicated by information in financial statements. Stock prices deviate at time from these values and only slowly gravitate towards the fundamental values. Thus, analysis of published financial statements can discover values that are not reflected in stock prices.

They develop a LOGIT model for predicting changes in annual *EPS* one year ahead, using publicly-available financial statement information. Lacking a specific theory of what financial statement information is underutilized by the market, Ou and Penman select 28 financial-statement variables (16 in one subperiod and 18 in the other, with only six in common) from a wide set of 68 variables, purely on the basis of their ability to predict earnings. Those selected include return on assets, return on equity, change in return on equity, debt/equity ratio, percent change in dividend per share, and percent change in inventories. The model parameters then are fitted to subsequent (i.e., out-of-sample) values of firms' financial statement variables, to generate predictions of future earnings. Predictions are based on the estimated LOGIT probability of a future earnings increase, denoted *Pr*. This variable is ranked in pooled cross-section and time-series and extreme observations are selected by a programmed trading rule.

Ou and Penman program a strategy of long positions in the 45.3% of stocks with the highest predicted probability of an earnings increase and short positions in the lowest 10.8%, weighted to produce zero net investment. They report estimated out-of-sample abnormal returns from this strategy over 1973–83. These average +8.3% in the first year after the *EPS* predictions are made (i.e., in the year leading up to and including the announcement of the actual *EPS* outcome), +6.2% in the second year, and +6.3% in the third (i.e., two years after the actual *EPS* is announced). Ou and Penman (1989a, p. 328) conclude: 'The evidence here suggests that financial statements capture fundamentals that are not reflected in prices.'

Ou and Penman use a similar research design, and obtain qualitatively similar results, to McKibben (1972). The approach is similar to Value Line's long-standing method of stock selection.²¹ Their results are replicated, albeit with some qualifications and with more a skeptical interpretation, in three studies published in this issue: Greig (1992), Holthausen and Larcker (1992), and Stober (1992). Lev and Thiagarajan (1991) adopt a different approach in

²¹The ability of financial variables to predict estimated abnormal returns has been known for some time. In the 'modern' literature, *P/E* ratios and market/book ratios have been studied by Basu (1983), Jaffe, Keim, and Westerfield (1989), and Fama and French (1991), among others.

selecting financial statement variables, but obtain qualitatively similar results.

5. Economic significance of the anomalies

As a prelude to discussing the interpretation of these anomalies in the following section, it is useful to reflect on their magnitude, particularly in dollar (rather than rate of return) terms. Bernard and Thomas (1989) estimate that *every quarter* the total feasible pure profit from trading on the 20% extreme-earnings-announcing stocks is 7.74% times 10% of the aggregate market value of all NYSE-AMEX firms. After only thirteen quarters of running their strategy, the total feasible pure profit would be approximately 10% of the total market value of all NYSE-AMEX firms, without reinvestment. Calculated conservatively, it accumulates to the value of the entire NYSE-AMEX market after approximately 34 years.²²

The Ou and Penman result, taken at face value, implies pure profits of far greater scale. Once every year, their strategy earns a +20.8% abnormal return over the following three years, on 55% of the firms in the market. It takes only eight years to earn pure profits in the order of the entire market's capitalization, without compounding.²³ Some free lunch.

6. A survey of feasible interpretations

Several feasible interpretations are surveyed in this section. None appears sufficient to explain all the anomalous evidence, though they are not mutually-exclusive.

6.1. CAPM 'beta' risk

One possibility is beta estimation error that is correlated with earnings. For example, the 'market factor' in quarterly earnings could proxy for errors arising from omitting assets in the market index or from using an incorrectly-specified estimation system.

Beta estimation error also could be due to risk varying with quarterly earnings. Consistent with this explanation, Ball, Kothari, and Watts (1992) and Ball and Kothari (1989, 1990) show that risk is a function of stocks' earnings

²²These calculations are intended to give only a first-order approximation to the scale of the anomaly. They are not intended to be precise or implementable. They assume equal weighting, as in Bernard and Thomas (1989), and take positions equal to the entire amount of outstanding stock in all firms. They assume no reinvestment and ignore possible pure profits from the 80% of firms that are not in the extreme earnings-performance portfolios.

²³If account was taken for Stober's (1991) finding, that the estimated abnormal returns continue beyond three years (discussed below), then this period would be shortened further.

outcomes, past returns, and quarterly earnings announcements, respectively. Bernard and Thomas (1989) replicate these endogenous beta changes in their sample. While endogenous beta changes predict the sign of the estimated abnormal returns, they cannot explain its magnitude. Ibbotson and Sinquefeld (1989, exhibit A-8) report an average risk premium of 3.6% per year over the period studied by Bernard and Thomas. For beta bias to fully explain their estimated abnormal returns over days 1–180, betas thus would need to be underestimated (overestimated) by approximately 1.3 (3.0) for the long (short) position stocks, which is implausible. The corresponding numbers for days 61–180 are 0.3 (2.6). In addition, beta bias cannot explain: (1) the seasonal pattern of the earnings anomaly over the ensuing four quarters of the earnings event cycle, (2) the consistency of the anomaly in chronological time,²⁴ or (3) the high abnormal returns over the short intervals immediately after earnings announcements and at subsequent earnings announcement periods. Risk estimation bias thus is a potential explanation for only a minor part of the quarterly-earnings anomaly. Similar reasoning applies to the Ou and Penman anomaly.

6.2. *Transactions costs*

Nor is transactions costs a sufficient explanation, for a variety of reasons. First, the numbers generally are too large to be explained by transactions costs alone. This is not the case over short periods: Bernard and Thomas estimate trading-rule abnormal returns of only 0.70%, 1.32%, 0.70%, 0.04%, and 0.66% over the five days immediately after earnings announcements, and the three days surrounding each of the four following quarters' announcements, respectively. However, their +7.74% estimate over the first 180 post-announcement days is comfortably in excess of reasonable transactions cost estimates, as is the Ou and Penman (1989a, b) anomaly.

Second, the role of transactions costs in any definition of market efficiency is unclear. Jensen (1978) proposes that predictable abnormal returns are consistent with market efficiency, provided they are less than transactions costs. This has an undesirable implication, that the likelihood a given sequence of prices will be judged consistent with efficiency is an *increasing* function of transactions costs. For example, a predictable abnormal return of 2.5% would be treated as

²⁴In dismissing beta-estimation error as an explanation of the earnings anomaly, Bernard and Thomas (1989, p. 15) take comfort in the fact that the estimated abnormal returns are uncorrelated with the return on the market portfolio. But this result would have been guaranteed if they had used the market model to control for beta risk, and is a characteristic of all CAPM-based tests, because CAPM abnormal returns by construction are uncorrelated with the index. The result cannot shed light upon whether the correct market index (and thus the correct set of betas) is being used, or upon whether the CAPM is a well-specified model of expected returns in this context.

evidence of inefficiency at 2% cost of transacting, but not if the cost is increased to 3%.

Third, it is not even obvious that transactions costs logically can be used to predict abnormal returns. Transactions costs might predict a delayed price response to information in cases where costs inhibit trading upon its announcement. For example, good (bad) earnings news that implies price increases (decreases) of less than 2% might not generate transactions when the cost of trading is 2%. When no trading occurs, the price bias then is bounded by the magnitude of transactions costs. But there is no predicted price bias when a transaction has occurred, for whatever reason, and thus when any transactions cost inertia has been overcome. As demonstrated by Beaver (1968) and others, trading volume increases around earnings announcements, so essentially all of the estimated rates of return in the studies under review are computed from actual transactions prices. The market thus has overcome any inertia of transactions cost in setting most prices studied. Transactions costs of $x\%$ then might explain unremoved price *errors* of $\pm x\%$, independent of the sign of the earnings news, but they cannot explain a systematic *bias* of that magnitude.

The role of transactions costs is clouded by other issues. For example, whose transactions costs are relevant? The lowest-cost trader's? If so, are these zero at the margin, because transactions occur in the absence of information announcements? All factors considered, there is a strong case that transactions costs are an illogical and implausible explanation of the anomalies.

6.3. *Liquidity and trading-mechanism effects*

Amihud and Mendelson (1986) propose an asset-pricing model in which expected returns increase in illiquidity, measured by the bid-ask spread. In this model, the spread influences expected returns because it is a round-trip transactions cost paid by the investor. This raises the possibility that abnormal returns from simulated trading strategies are estimated with error when no allowance is made for spreads. For this effect to explain the earnings-price anomaly, it is necessary that spreads be a function of earnings news.

A related issue, raised by Keim (1989), is the effect of the trading mechanism on prices recorded on the CRSP files, and whether these are biased estimates of prices at which trades could be executed. Any effect would be bounded by the bid-ask spread, which Keim reports averages 2.8% for NYSE/AMEX stocks. It thus would most likely occur in short-interval returns, such as those observed around current and subsequent quarters' announcements. For this effect to explain the earnings-price anomaly, it is necessary that the likelihood of trading at the bid or the ask be a function of earnings news.

The evidence suggests these effects do not explain the anomaly. Skinner (1991, table 6) reports an increase in post-announcement spreads for firms with above-median magnitudes of earnings news, but the increase is at most 0.11%

of price. Skinner (1991, table 9) also reports no change in the frequency of trading at the bid or the ask as a function of earnings news. Liquidity and trading-mechanism effects thus do not appear sufficient to explain the estimated abnormal returns.

A related issue is the variety of seasonals observed in recorded returns. Cross (1973), French (1980), Rogalski (1984), and Harris (1986, 1989), among others, report that returns estimated from transactions prices vary systematically with day-of-the-week, weekends, time-of-day, and overnight versus during trading. Keim (1989) and Lakonishok and Maberly (1990) link these empirical regularities to trading-mechanism effects. Lee (1992) reports a rapid increase in large trades initiated by buyers (sellers) during good (bad) earnings announcements, but a puzzling increase in small buy orders regardless of the sign of earnings news. Patell and Wolfson (1984) report that 35% of their sample announced earnings while the market was closed. These results suggest caution in interpreting estimated average abnormal returns over small intervals, notably the days surrounding current and future quarters' earnings, lest they be trading-mechanism effects.

An intriguing possibility is that: (1) the time and date of earnings announcements is a function of the earnings news, (2) estimated abnormal returns are a function of time and date, and thus (3) a relation is induced between earnings news and estimated abnormal returns. Further, serial correlation in earnings news could induce serial correlation in announcement timing and thus predictable estimated abnormal returns at earnings announcement, as reported in Bernard and Thomas (1990). Such seasonals in announcement effects could explain only a small portion of the total 'drift', but a potentially higher portion of the estimated abnormal returns at subsequent quarters' announcement dates. Further research on trading-mechanism effects appears warranted.

6.4. *Overstated t-statistics*

It is possible that researchers have systematically understated the standard errors of various statistics, due (say) to some undetected form of cross-sectional correlation or to an over-fitting bias.²⁵ This seems unlikely. It is not consistent with the replication of the basic results over different time periods.²⁶ Nor is it

²⁵Typically, portfolios are formed (i.e., securities are grouped) on the rank of the independent variable. Lo and MacKinlay (1989) demonstrate that even weak correlation at the individual-security level, between the independent variable and errors in estimating expected returns, then becomes significant at the portfolio level. Because portfolios are formed in part on the basis of information about errors in estimating expected returns, the distribution of the test statistic (under the null hypothesis that the earnings variable is uninformative concerning errors in estimating expected returns) typically is misrepresented in favor of rejecting the null.

²⁶The exception is Holthausen and Larcker (1992), who cannot replicate Ou and Penman (1989, 1990) beyond 1983, the last year Ou and Penman study, or on OTC stocks.

consistent with the Bernard and Thomas (1990) result that the abnormal returns from their trading rule are positive in each of the thirteen years studied.

6.5. *Earnings variables proxy for expected returns*

An alternative interpretation is that either the CAPM or the empirical market portfolio used in its implementation is misspecified, and the independent variables proxy for errors in estimating expected returns.²⁷ The proxy effect is compounded by: (1) differencing the independent variables which then can contain information about errors in observing nonstationarities in expected returns, (2) ignoring the intermediate range of the independent variables and thus focussing on the extreme nonstationarities, and (3) because earnings changes are leptokurtic [Ball, Kothari, and Watts (1992)] extreme-decile earnings changes tend to be unusually large, thus magnifying potential nonstationarities and proxy effects.

There are several factors suggesting that the Ou and Penman (1989a,b) result is due to their *Pr* variable proxying for expected returns.

- (1) Ou and Penman use several independent variables (*ROA*, *ROE*, debt/equity ratio, dividend payout, gross margin ratio) that individually seem likely to proxy for expected returns. They also use several differenced variables (change in inventories, change in debt/equity ratio, change in *ROE*, growth in total assets) that individually seem likely to proxy for change in expected returns, thus increasing the difficulty of controlling for post-announcement differences in expected returns on the long- and short-position stocks.²⁸ When a combination of 16 or 18 such variables is selected from a set of 68, their combined potential to proxy for expected returns and changes in expected returns is magnified.
- (2) Ou and Penman offer no hypotheses as to which variables predict abnormal returns. Variables are chosen purely on the basis of their empirical association with one-year-ahead earnings in the pre-test period. No theory is involved in the choice. This research design increases the likelihood of discovering an association with estimated future abnormal returns that is due to factors other than those hypothesized.²⁹ Note that there is little

²⁷This hypothesis was raised in Ball (1978).

²⁸See Ball and Kothari (1989).

²⁹Lev and Thiagarajan (1991) attempt to overcome this limitation by pre-specifying the variables. However, their selection process leaves open the possibility of *ex post* selection biases. For example, they appear to choose labor force changes as a predictor of abnormal returns in part because of the favorable reaction of analysts to workforce reductions during the late 1970s and 1980s. They then test the variable as a predictor of abnormal returns over the period 1975–88. It seems unlikely that the favorable analyst reaction to this variable was completely established before 1975.

overlap between the two subperiods in the variables selected and in their weightings.

- (3) Ou and Penman's fundamental hypothesis, that the market underutilizes the earnings implications of publicly-available information contained in firms' financial statements (such as debt/equity ratios, dividend changes, gross margins on sales, working capital ratios, and inventory changes), seems implausible in this context. None of this information can reasonably be viewed as obscure: it is routine accounting information. It seems unlikely to be the type of information that would *routinely* (i.e., for at least the duration of Ou and Penman's sample period) escape the attention of the market *for years into the future*. Nor does it seem consistent with pure profits of such a large magnitude.
- (4) Stober (1992) replicates their analysis and shows that the estimated abnormal returns continue at an almost constant rate for at least six years beyond the earnings prediction date. This suggests the financial statement variables used by Ou and Penman are proxying for expected returns.³⁰
- (5) Stober's result, that the abnormal returns extend for at least six years after the earnings prediction is made, is qualitatively inconsistent with Ou and Penman's own hypotheses and model. Their research design predicts only *one-year-ahead* earnings. It specifically identifies and trades on information about *next* year's earnings that is contained in this year's financial statements [see Ou and Penman (1989a, p. 298), for example]. It does not address six-years-ahead earnings. But not one of the studies on post-announcement drift, surveyed in section 4.1 above, has price responses to earnings lagging by more than three quarters.³¹ The continuation of the estimated abnormal returns for at least four and one quarter years beyond the horizon predicted by the Ou and Penman hypothesis is grossly inconsistent with that hypothesis. It implies that the hypothesis has failed to describe the empirical phenomenon that is observed.
- (6) Holthausen and Larcker (1992) show that the Ou and Penman hypothesis essentially adds noise to our understanding of the behavior of abnormal returns, in the following sense. The hypothesis is that there is an unexploited link from financial statement data to abnormal returns, via the unexploited implications of that data for future earnings. Holthausen and Larcker test the unexploited-implications hypothesis by correlating the financial-statement data directly with abnormal returns, without any hypothesis about earnings. The resulting strategy dominates the Ou and Penman strategy,

³⁰In addition, Holthausen and Larcker (1991) report that the abnormal returns *increase* each year, for the four event-time years after the earnings predictions are made.

³¹Ignoring reversals at quarter + 4, which go in the other direction.

thus implying that the unexploited-implications hypothesis is not what is driving the results.

- (7) Greig (1992) shows that size outperforms Ou and Penman's *Pr* measure in predicting abnormal returns. While size *per se* hardly is a satisfactory explanation, there are reasons to expect that size generally proxies for expected returns (see section 3 above).³²
- (8) Greig (1992) shows that Ou and Penman's research design allows the frequency of long and short positions in stocks to change over time. Their simulated portfolio has positive risk. There is evidence that *Pr* predicts the market index. After controlling for beta and implementing a more precise control for size than Ou and Penman (1989a), *Pr* loses its apparent ability to predict abnormal returns.

For these reasons, the evidence of Ou and Penman (1989a, b) seems consistent with the hypothesis that their *Pr* variable, which is a composite of various financial statement variables, proxies for differences in securities' expected returns.

6.6. *Substantial information production costs or market inefficiency?*

One explanation for the earnings–price anomaly is that substantial costs of information acquisition and/or processing would be encountered in implementing the trading rules simulated by researchers. The principal remaining alternative is that the market consistently has used accounting information inefficiently, leaving unexploited pure economic profit opportunities.³³ These explanations are difficult to distinguish in theory, because the role of information costs in an efficient market is largely unexplored. They also are difficult to

³²Size also is associated with past returns (by definition) and past earnings performance (due to the association between earnings and returns, particularly over long intervals). In the Ou and Penman study, size thus could be related to *Pr* because high (low) *Pr* firms have experienced large past earnings decreases (increases) [Ou and Penman (1989a, table 7) and Brooks and Buckmaster (1976) for evidence]. Thus, the Ou and Penman anomaly overlaps that reported by DeBondt and Thaler (1985, 1987). The ongoing debate on how to measure expected returns in this context thus is relevant [see Ball and Kothari (1989) and Chopra, Lakonishok, and Ritter (1991)].

³³Bernard and Thomas (1989, 1990) provide a variety of evidence aimed at eliminating other explanations. They report that their estimated abnormal returns are not due to the five APT factors identified by Chen, Roll, and Ross (1986) as being priced (a test of CAPM misspecification), are not associated with dividend yields (a test of tax effects), and are positive in 90% of the quarters studied. They argue reasonably that the almost consistently-positive sign of the estimated return to the trading strategy is evidence that it is not a compensation for risk. However, that is not evidence against mismeasurement of expected returns, because risk is not the only feasible determinant of rates of return (though the CAPM induces us to think that way). They also note that Watts' (1978) results are not obtained from Compustat earnings data, thus suggesting that the general 'drift' over the following two or three quarters is not due to Compustat reporting revised earnings data. The clustering of estimated abnormal returns at subsequent quarters' earnings announcements is another matter.

distinguish in practice, because they offer identical predictions about the signs of abnormal returns and because (as discussed in section 2.1 above) little is known about the magnitudes of information costs.

The issue in theory is whether information acquisition and processing costs are consistent with one's definition of market efficiency. Competitive returns on information acquisition and processing costs certainly are consistent with competitive securities markets. If it is too costly for investors to determine the full implications of current financial statement information for future earnings, then they will not do so. They will wait for future earnings (and/or any other information that is less costly to process) to be announced before adjusting prices.³⁴ There will remain a cost-efficient amount of unexploited information in current earnings and other accounting numbers. The term 'efficient' therefore could be used to describe a market in which there is a cost-efficient amount of predictability in security prices, and there are competitive returns from acquiring and processing information, without violating either fundamental economic principles or the spirit in which of the efficient markets hypothesis was developed.³⁵ To date, however, the term has been used to describe price behavior in the absence of information acquisition and processing costs, possibly due to difficulties in developing both the theory and information-cost measures for empirical research.

Here also, the question is whether the explanation is consistent with the magnitude of the estimated abnormal returns. Because little is known about the magnitude of information processing costs and their effect on security returns, one's priors on the cost of processing accounting information in the simulated trading strategies are relevant when interpreting the evidence. In the case of the Ou and Penman (1989a, b) results, several factors assist in forming priors. First, it is difficult to imagine that a competitive market would allow returns of the magnitude they report, viewed either in rate of return or total dollar terms, for processing the financial-statement information incorporated in their *Pr* variable. Second, an information-cost explanation seems inconsistent with the duration of the abnormal returns, which are estimated by Stober (1992) to continue for at least six years. One would imagine that considerable information, less costly than *Pr* information to process, would arrive in the meantime, including but not limited to the actual one-year-ahead earnings announcement that *Pr* information is alleged to be predicting. Third, Stober reports a substantial overlap between the information in *Pr* and in analysts' forecasts. For example, they agree 78% of the time on the sign of their predicted one-year-ahead earnings changes. This suggests the information in *Pr* has been

³⁴Bartov (1992) expands the event window at following-quarters' announcements to encompass the entire quarter, compared with the three-day window in Bernard and Thomas (1989, 1990). One rationale is to capture the market response to all information that is relatively low-cost to process.

³⁵See Ball (1991, sect. 1) for a review of the hypothesis development.

largely acquired and processed by analysts before the estimated abnormal returns emerge. Proxy effects appear to offer the most likely explanation for these results.

Similar doubts apply in the case of the general quarterly-earnings anomaly, where the estimated abnormal returns over the six or nine months following earnings announcements appear well in excess of reasonable costs of discovering the 'drift'. The component of the 'drift' uncovered by Rendleman, Jones, and Latané (1987) is another matter. Here, the market seems unaware of the autocorrelation function for quarterly earnings, and thus its pattern is mimicked in abnormal returns. Compared with what we know about the time-series behaviour of quarterly earnings from the academic literature, this is a relatively unsophisticated use of earnings information.³⁶ It is feasible that the costs of acquiring, processing, and implementing the relevant academic research, on both the time-series behavior of quarterly earnings and its implication for security returns, exceed the additional expected returns generated from trading on it. Factors supporting this view include the complexity of the academic literature and the Hayekian argument (developed in section 2.1 above) that information-processing costs include the cost of determining whether the information one possesses has already been used by other investors, and whether it is reflected in price. An investor might have some knowledge of the pattern of serial correlation in quarterly earnings, but not of whether other investors know it and of whether and how prices incorporate it. Processing costs thus offer a plausible explanation for the anomaly, due to the apparent complexity of the simulated trading strategies in the studies under review, and it correctly predicts both the sign of the post-announcement price behavior and its apparent clustering around subsequent earnings announcements.

A counter-argument is that the information used in Bernard and Thomas' (1990) trading rule is not as costly to process as it first appears. In statistical terms, the market is hypothesized as not fully processing exploitable information in the autocorrelation function of changes in quarterly earnings and as acting as if earnings are a seasonal random walk. Put in simpler language, this says only that investors do not realize that if first-quarter earnings is up on last year's first quarter, then second-quarter earnings tends to be up on last year's second quarter too. One does not have to be much of a statistician to observe that tendency. My reading of the financial press is that reporters and analysts routinely assume that one quarter's earnings result alters expectations for at

³⁶The hypothesis requires investors to be sophisticated enough to realize that earnings are seasonal and to compare earnings with the equivalent past quarter, but not enough to realize that earnings changes are sustained across quarters.

least the following quarter's. The case for substantial information processing costs as an explanation of the anomaly is not clear-cut.³⁷

In sum, it seems difficult to distinguish between information costs and market inefficiency as explanations for the pattern of predictable abnormal returns around future earnings announcement dates. One's choice depends on: (1) whether the concept of 'efficiency' is defined to allow information acquisition and processing costs and (2) priors about information costs. Both of these issues are largely unexplored, in part because the need has not arisen previously.

6.7. *The inefficient-markets hypothesis*

The market-inefficiency explanation requires market prices to systematically provide unexploited pure-profit opportunities from using accounting information. It is important to view market inefficiency as a theory to be tested against the evidence, not as the residual claimant on the evidence. Evidence that is anomalous for the efficient markets hypothesis does not logically prove inefficiency: it simply is anomalous (i.e., inconsistent). Rather, the conclusion that markets are inefficient emerges from failing to reject a specific inefficiency hypothesis, not by a process of eliminating all other known explanations for the evidence. However, direct testing of inefficiency hypotheses is made difficult by the paucity of plausible, testable theory on when and why systematic pricing errors occur in an inefficient market.³⁸

The scarcity of testable inefficiency theories has risked making efficiency an almost irrefutable hypothesis. Thus, it has been the accumulation of anomalous evidence, rather than the creation of clearly preferable alternative theories, that has reduced the appeal of efficient market theory. Correspondingly, treating market inefficiency as the residual claimant on the evidence risks making it an almost irrefutable hypothesis also, because its acceptance then requires only a similar paucity of competing explanations of the anomalies. This overlooks the possibility, argued in section 2 above to be substantial, that the anomalous evidence is inconsistent with theories of *both* efficiency and inefficiency. Even after a generation of research on earnings and prices, substantially incomplete knowledge of the determinants of security prices suggests that one must live with tests of both efficiency and inefficiency theories that are low in power. The literature seems destined to live with anomaly.

³⁷For comparison with rates of return, information costs must be scaled by the market value of the firm or of individual investments in the firm. Thus, their *relative* magnitude is questionable in this context.

³⁸Notable exceptions include De Bondt and Thaler (1985, 1987). If information-acquisition and processing costs are treated as inconsistent with market efficiency, then so is the earnings seasonal hypothesis of Rendleman, Jones, and Latané (1987).

7. Concluding observations

The anomalies reviewed in this paper take the form of current earnings (or current information about future earnings) predicting future abnormal returns. This could reflect a true association between earnings information and abnormal returns, which implies market inefficiency. Alternatively, it could reflect research design biases such as an association between earnings information and errors in estimating abnormal returns, which does not imply market inefficiency. The objective of the review has been to sift the evidence for clues as to which explanation seems most likely.

To conclude that estimated abnormal returns of a given sign, magnitude, or level of significance are inviolate evidence of either efficiency or inefficiency would be to assume a one-for-one correspondence between a construct (efficiency) and its proxy (predictable estimated abnormal returns). This would place absolute reliance on both a theory of asset pricing, to define expected returns, and on its implementation in the research design that produced the estimates. The survey in section 2 above suggests that there are limits to how much one can reasonably rely upon such knowledge. One must examine the evidence and the research designs for clues that are not always transparent.

The pattern of the evidence suggests different explanations for the two principal versions of the earnings-price anomaly. The anomaly documented by Ou and Penman (1989a, b), building on the prior work of McKibben (1972) and others, seems most likely to result from an association between accounting variables and errors in estimating abnormal returns. The anomaly due to Rendleman, Jones, and Latané (1987), Freeman and Tse (1989), and Bernard and Thomas (1989, 1990), among others, is another matter. It seems most likely due to either substantial information-processing costs or market inefficiency. One's choice between these explanations depends on one's priors about information costs and one's preferences for defining 'efficiency'. The anomaly is unlikely due to accounting variables proxying for expected returns, endogenous risk shifts, transaction costs, liquidity, or trading-mechanism effects. It possibly is due to some combination of these.

Nevertheless, the implications of the evidence are not totally clear, as might be expected. Hopefully, future research will provide greater clarity, though our substantially incomplete knowledge of security pricing in a competitive market suggests anomalies are likely to continue. It perhaps is worth recalling that anomalies are not the only property of the relation between accounting earnings and stock prices, that stock prices are not the only measure of the use of accounting earnings by stockholders, and that stockholders are not the only users of accounting information.

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