

SOME ANOMALOUS EVIDENCE REGARDING MARKET EFFICIENCY

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1. Why a special issue on market efficiency?

I believe there is no other proposition in economics which has more solid empirical evidence supporting it than the Efficient Market Hypothesis. That hypothesis has been tested and, with very few exceptions, found consistent with the data in a wide variety of markets: the New York and American Stock Exchanges, the Australian, English, and German stock markets, various commodity futures markets, the Over-the-Counter markets, the corporate and government bond markets, the option market, and the market for seats on the New York Stock Exchange. Yet, in a manner remarkably similar to that described by Thomas Kuhn in his book, *The Structure of Scientific Revolutions*, we seem to be entering a stage where widely scattered and as yet incohesive evidence is arising which seems to be inconsistent with the theory. As better data become available (e.g., daily stock price data) and as our econometric sophistication increases, we are beginning to find inconsistencies that our cruder data and techniques missed in the past. It is evidence which we will not be able to ignore.

The purpose of this special issue of the *Journal of Financial Economics* is to bring together a number of these scattered pieces of anomalous evidence regarding Market Efficiency. As Ball (1978) points out in his survey article: taken individually many scattered pieces of evidence on the reaction of stock prices to earnings announcements which are inconsistent with the theory don't amount to much. Yet viewed as a whole, these pieces of evidence begin to stack up in a manner which make a much stronger case for the necessity to carefully review both our acceptance of the efficient market theory and our methodological procedures.

It is my hope that bringing the studies contained in this volume together in one place will help to highlight and hasten the progress of what I believe is a coming mini-revolution in the field. Focusing the attention of scholars

throughout the world on these disturbing pieces of evidence will, I hope, result in the resolution of the questions they raise.

In most cases our tests of market efficiency are, of course, tests of a joint hypothesis; market efficiency and, in the more recent tests, the two parameter equilibrium model of asset price determination. The tests can fail either because one of the two hypotheses is false or because both parts of the joint hypothesis are false. The pieces of evidence contained in this issue are particularly interesting in view of this jointness and the recent criticisms of our asset pricing models.¹ The eventual resolution of these anomalies will result in more precise and more general theories of market efficiency and equilibrium models of the determination of asset prices under uncertainty.

2. The efficient market hypothesis

The Efficient Market Hypothesis is an important concept, and it has become increasingly widely accepted since interest in it was reborn in the late 1950's and early 1960's under the rubric of the 'theory of random walks' in the finance literature and 'rational expectations theory' in the mainstream economics literature.

Indeed, the Efficient Market Hypothesis progressed from the state of a curiosity taken seriously by only a few scientists in the economics and finance communities, to that of a dominant paradigm in finance and the basis of an emerging revolution in macroeconomics (where the principle is still generally referred to as rational expectations). In the literature of finance, accounting, and the economics of uncertainty, the Efficient Market Hypothesis is accepted as a fact of life, and a scholar who purports to model behavior in a manner which violates it faces a difficult task of justification.

The Efficient Market Hypothesis is in essence an extension of the zero profit competitive equilibrium condition from the certainty world of classical price theory to the dynamic behavior of prices in speculative markets under conditions of uncertainty. The proposition has been stated in many ways, but I believe the simplest and most general way to express it is the following:

A market is efficient with respect to information set θ_t if it is impossible to make economic profits by trading on the basis of information set θ_t .

By economic profits, we mean the risk adjusted returns net of all costs. Application of the zero profit condition to speculative markets under the

¹See Fama (1976, chs. 5 and 9) and Roll (1977) for more details of these criticisms. Fama (1976) provides a detailed discussion of the nature of the joint hypothesis in tests of market efficiency.

assumption of zero storage costs² and zero transactions costs gives us the result that asset prices (after adjustment for required returns) will behave as a martingale³ with respect to the information set θ_t .

Several versions of the Efficient Market Hypothesis have been widely discussed and tested in the literature. The differences revolve primarily around the definition of the information set θ_t used in those tests. The three broad categories of hypotheses which have developed are:

- (1) the Weak Form of the Efficient Market Hypothesis, in which the information set θ_t is taken to be solely the information contained in the past price history of the market as of time t .
- (2) the Semistrong Form of the Efficient Market Hypothesis, in which θ_t is taken to be all information that is publicly available at time t . (This includes, of course, the past history of prices so the weak form is just a restricted version of this.)
- (3) the Strong Form of the Efficient Market Hypothesis, in which θ_t is taken to be all information known to anyone at time t .

Version 3, the Strong Form of the Efficient Market Hypothesis, is an extreme form which few people have ever treated as anything other than a logical completion of the set of possible hypotheses. Although there is evidence inconsistent with the Strong Form of the Efficient Market Hypothesis, if there is anything surprising about it, it is the fact that such inconsistent evidence is so scarce.

Version 2, the Semistrong Form of the Efficient Market Hypothesis, represents the accepted paradigm and is what is generally meant by unqualified references in the literature to the 'Efficient Market Hypothesis'. Of course, the precise meaning of 'publicly available' must be defined to give the hypothesis content. In specific tests that definition is usually made clear, but exactly where those boundaries are in a general sense is something that will profitably receive more attention in the future.

3. The contents of the issue

In his survey paper 'Anomalies in Relationships Between Securities' Yields and Yield-Surrogates', Ball (1978) examines the evidence contained in 20 previous studies of stock price reaction to earnings announcements. He finds that the post-announcement risk adjusted abnormal returns are systematically non-zero in the period following earnings announcements in a fashion

²For markets such as the stock, bond and commodity futures markets zero storage costs are a good approximation to reality. In these cases it is the certificates or sometimes only the record of ownership which is being 'stored'.

³That is $E(P_{t+1}|\theta_t) = P_t(1 + \rho_t)$, where ρ_t is the required return on the asset for period t and $E(P_{t+1}|\theta_t)$ is the expected end of period price conditional on knowledge of the information set θ_t .

inconsistent with market efficiency. Ball argues that the non-zero abnormal returns are due to inadequacies in the two parameter asset pricing model used in the studies to adjust for risk differentials and not to inefficiencies in the pricing of shares. He provides methodological suggestions for reducing the estimation bias due to inadequacies in the asset pricing model.

Watts (1978) in his paper 'Systematic 'Abnormal' Returns After Quarterly Earnings Announcements' finds statistically significant abnormal returns even after taking all the steps suggested by Ball. He then goes on to provide the first explicit test to determine whether those abnormal returns emanate from market inefficiency or from deficiencies in the asset pricing model. He concludes that the abnormal returns are due to market inefficiencies and not asset pricing model deficiencies. However, the inefficiencies occurred only in the period 1962–1965, and not in the period 1965–1968. Furthermore, after allowance for transactions costs, only a broker could have earned economic profits in the 1962–1965 period.

Thompson (1978) in his study of 'The Information Content of Discounts and Premiums on Closed-End Fund Shares' finds that a relatively simple trading rule (based on discounts for closed-end funds) earned statistically significant abnormal returns of about 4% per year over the period 1940–1971. In addition, the results are quite uniform throughout the period. Thompson is unable to distinguish on the basis of the evidence whether the abnormal returns are due to market inefficiencies or inadequacies of the two parameter asset pricing model. He argues that the abnormal returns are likely to be due to inadequacies of the asset pricing model and not to market inefficiency since the data on the closed end fund discounts was widely available over the entire period and extensively discussed in the professional press.

Galai (1978) in his paper 'Empirical Tests of Boundary Conditions for CBOE Options' tests (1) whether the prices of stocks on the NYSE and the prices of their respective call options on the Chicago Board Options Exchange behave as a single synchronized market, and (2) whether profits could have been made through a trading rule on call options on the CBOE and their respective stocks on the NYSE. He finds that the two markets do not behave as a single synchronized market. In addition, he finds that positive profits (ignoring risk differentials) could have been made from the trading rule (which is based on violations of the lower boundary condition of the option price). However, the average profit is small relative to the dispersion of the outcomes, and it appears that most of this would be wiped out by transactions costs for non-members of the exchange.

Chiras and Manaster (1978) in their study of 'The Information Content of Option Prices and a Test of Market Efficiency' use the Black–Scholes–Merton option pricing model and actual option prices to calculate implied variances of future stock returns. These variances prove to be better

predictors of future stock return variances than those obtained from historical stock price data. In addition, a trading strategy that utilizes the information content of the implied variances yields abnormally high returns, and the returns appear to be high enough to allow profits even for non-members of the exchange. Chiras and Manaster conclude that in the period covered by their data, June 1973 to April 1975, the prices of options on the Chicago Board Options Exchange provided the opportunity to earn economic profits and, therefore, that the CBOE market was inefficient.

In his paper 'The Market Valuation of Cash Dividends: A Case to Consider', Long (1978) examines the history of the relative prices of two classes of stock of the Citizens Utilities Company. The two classes are virtually identical in all respects except for dividend payout: one pays only stock dividends and the other pays only cash dividends. The stock dividends are not taxable as ordinary income under a 1955 IRS ruling and a grandfather clause in the 1969 Tax Reform Act. Thus, this company provides a unique laboratory-type experiment in which we can observe the effects on market prices of cash dividend policies. The evidence indicates that the market prices assets in such a way that it places a slight premium on cash dividends over capital gains. Thus, the case provides strong evidence which is inconsistent with the famous dividend irrelevance proposition of Modigliani and Miller (1961). In addition, for all practical purposes, most holders of the cash dividend-paying shares of Citizens Utilities could realize an almost perfectly correlated but *higher* after-tax return by holding the non-cash dividend-paying shares. That is, the price difference between the two classes of shares goes in the *opposite* direction to that predicted by straightforward consideration of tax effects. This implies that either (1) the market is inefficient, or (2) the two parameter asset pricing model is deficient in that it does not take account of an apparently significant demand for cash dividends (in spite of a lower after-tax total return to recipients of such dividends). At this time we know of no rational motivation for such a demand for cash dividends. Because, however, of the wide publicity accorded the Citizens Utility situation in the financial press in the past and the widely supporting evidence for market efficiency, Long (like Ball and Thompson in their studies) concludes that the explanation for the phenomenon lies in the inadequacy of the two parameter valuation model.⁴

In his two-part study on 'Split [and Dividend] Information, Stock Returns and Market Efficiency', Charest (1978a, 1978b) examines a variety of methodological issues associated with the techniques of estimating abnormal returns. He applies these techniques to the proposals, approvals, and realizations of stock splits and to the announcement of cash dividend

⁴Tax effects can be quite complex. Further analysis of these effects, such as that by Miller and Scholes in their paper 'Dividends and Taxes' (forthcoming in a future issue of the *Journal of Financial Economics*), may well be important to a complete understanding of Long's results.

changes in common stocks on the NYSE over the period 1947–1967. The evidence from the stock split study shows some indication of non-zero abnormal returns, but they are sensitive to the precise estimation techniques used and the particular time intervals covered. Charest concludes that the evidence on market price adjustment to stock splits is generally consistent with market efficiency.

Charest's findings with respect to the market price reaction to changes in cash dividend are, however, quite different from the stock split results. His evidence reveals significant abnormal returns in the months following dividend changes. Furthermore, unlike the split results, the abnormalities are not sensitive to the particular estimation procedure used. On average the prices of stocks on the NYSE under-react to the announcement of dividend changes—particularly decreases. That is, it takes a considerable period of time after the announcement for the full impact of the dividend change to be impounded in stock prices. Again, the evidence is inconsistent with the joint hypothesis that the market is efficient in the Semistrong Form sense and that asset price determination is adequately described by the two parameter model. Charest is unable to determine the exact cause of the abnormal returns.

4. Conclusions?

It would be presumptuous as well as foolhardy for me to attempt to reconcile the many issues raised by the studies contained in this Symposium. The studies viewed individually are interesting, stimulating, and puzzling. Unlike much of the 'inefficiency literature' of the past, each and every one of these studies is a carefully done scientific piece. Each of the authors displays in varying degrees a commonly held allegiance to the Efficient Market Hypothesis—witness the general reluctance to reject the notion of market efficiency.

Viewed as a whole, however, the studies provide a powerful stimulus and serve to highlight the fact that there are inadequacies in our current state of knowledge. My reaction to this is one of excitement and enthusiasm. I have little doubt that in the next several years we will document further anomalies and begin to sort out and understand their causes. The result will not be an abandonment of the 'efficiency' concept, nor of asset pricing models. Five years from now, however, we will as a profession have a much better understanding of these concepts than we now possess, and we will have a much more fundamental understanding of the world around us. I intend to do my best to see that the *Journal of Financial Economics* continues to play a positive role in this process.

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