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Efficient Capital Markets: A Review of Theory and Empirical Work: Discussion

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DISCUSSION

ROBERT A. SCHWARTZ*: Professor Fama has successfully synthesized a large body of material in his review of theoretical and empirical work on financial capital markets. Studies of a) the random walk and martingale processes, b) the effects of announcements of stock splits, of earnings, etc., and c) the relative profitability of mutual funds, all have implications about the efficiency with which the capital market functions, and it is under the "roof" of efficiency implications that Fama has achieved a most valuable integration of studies which might otherwise appear to be quite disparate.

I wish to focus my comments on the efficiency implications derived from the analyses Professor Fama has discussed. While Fama appears to conclude that the capital market is basically efficient, I feel that, in relation to this most important and complex institution, questions of a critical disposition can, and should, be raised. I believe that Fama's very successful review would have been further enhanced by the inclusion of such questions; their articulation could, furthermore, usefully suggest future research.

Fama's definition of efficiency is simple and, for his purpose, serviceable. Fundamentally, he posits that the capital market is efficient a) if all security prices fully reflect all known market information, and b) if no traders in the market have monopoly control of information. He then presents a tri-chotomization of information: 1) a strong form, which encompasses all information, including that possessed by insiders; 2) a semi-strong form, which includes all public information; and 3) a weak form, which includes only that information which can be gleaned from an examination of an historical series of security prices. He uses this trichotomy to structure his discussion according to three classes of market studies.

Clearly, if markets are efficient in the strong form, then they must, as well, be efficient in both the semi-strong and weak forms. While noting the paucity of strong form oriented analyses, Fama presents evidence (the Neiderhoffer-Osborne, and Scholes studies) which he feels is sufficient to reject the hypothesis of strong form efficiency. On the other hand, he cites Jensen's mutual fund studies which quite strongly suggest that deviations from complete efficiency do not extend very far through the investment community.

In any event, Fama suggests that efficiency in the strong form is not clearly met, and we are thus led to consider analyses of the semi-strong form. Here, Fama cites his own study (with Fisher, Jensen and Roll) of the reaction of security prices to stock splits,¹ Ball and Brown's study of price reaction to earnings announcements, Ward's examination of the effect of discount rate changes by the Federal Reserve banks, and Scholes analysis of the effect on prices of large secondary offerings of common stock. In all cases, the observed affect on stock prices appears to precede the event in issue; e.g., prices are observed to incorporate, fully and early, new information of the type considered in these studies.

For instance, in their study of the effect of the announcement of stock splits, Fama *et al.* present evidence which suggests that investors cannot systematically realize

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1. E. F. Fama, L. Fisher, M. Jensen, and R. Roll, "The Adjustment of Stock Prices to New Information," *International Economic Review*, Vol. X, February 1969.

profits from split securities, not only after the effective date of the split, but after the date of the announcement of the split. Security prices thus appear, not only to adjust to new information, but to anticipate new information.

While Fama rightly points out that analyses of the semi-strong form have been "limited to only a few major types of information generating events," he does suggest that the evidence supports the semi-strong efficiency model. This conclusion appears, to me, to be only partially valid. Anticipatory price adjustments do indicate that, on average, new information is quickly gleaned and responded to by the investment community. This aspect of efficiency, however, is not an explicit part of Fama's definition; furthermore, it does not suggest the manner in which new information is *dispersed* among traders. Yet, the dispersal of information (or, the across-trader variance in receipt time) is more clearly related to Fama's efficiency definition which focuses upon the absence of monopoly control of information. Relatively early receipt of information gives a trader a transitory monopoly position: persistently early receipt of a stream of information, to a trader, suggests superior access to sources of information which give the trader a market advantage that Fama would, presumably, consider inefficient in the semi-strong form.

Again, let us consider Fama's analysis of the affect of stock splits. He employs the "market model" originally suggested by Markowitz to calculate residual return behavior. In this review, he shows that for a sample of 940 stocks, the average residual return becomes positive 29 months before the split date, and remains positive (and, in fact, increases) up to the split date, at which time it returns to zero. While the market adjustment is thus completed before the occurrence of the event which stimulates it, this evidence also indicates that the process of adjustment takes place over a 29 month period.

Fama *et al.* refer, as well, to the behavior of the residuals computed for specific stocks, and note that, preceding the split date, successive residuals are not serially dependent, and tend to be "abnormally large and positive" for only a few months. Apparently, the few months of large, positive residuals varies from stock to stock, and thus the average, across stocks, is observed to be positive over the longer time span. This suggests that the adjustment process spans a few months rather than a 29 month period.

The length of the adjustment process is relevant for considerations of market efficiency, and a few months might appear long enough to suggest inefficiency. Because the Fama, Fisher, Jensen, and Roll study utilized monthly price data, it does not provide a sufficiently precise measure of the length of the adjustment period which might be of about a month's duration. Thus, it does not yield evidence for or against efficiency in this particular sense. Further examination, utilizing, perhaps, weekly data, might clarify the issue. One would also like to have knowledge of the systematic dispersion of information during the adjustment period before formulating a final judgment of market efficiency.

This leads us, therefore, to a consideration of efficiency in the weak form. The volume of research in this area far outnumbers the more recent semi-strong and strong form studies. In essence, these studies consider whether information gathered from analyses of historical price movements can enable traders to realize above normal returns. If the market does operate efficiently (in the sense of setting prices that fully reflect all information) one would expect that these studies would not yield information that could be used for the formulation of investment strategies. Fama reasons in the opposite direction: if historical price studies do not yield useful information, the market must, in the weak form at least, be efficient. While this logic is correct, the empirical approach is most challenging.

Autoregressive tests, filter analyses, and runs tests do yield, quite consistently, evidence of "positive dependence in day-to-day price changes and returns on common stocks." Fama concludes, however, that "this positive dependence does not seem of sufficient importance to warrant rejection of the martingale efficient markets model." Yet, this methodology can yield a "proof" only if the tests are all inclusive. Unfortunately, an alternative way of examining past data might always be conceived by future analysts. Thus, the debate between chartists on the one side, and random walkers and fundamentalists on the other, will never be fully settled until we are willing to accept the statement, to paraphrase John Stuart Mill, "happily there is nothing in the laws of the historical behavior of stock prices which remains for the present or any future writer to clear up; the theory of the subject is complete."

For instance, some further characteristic of the distribution of stock prices, such as the variance, might yield serial dependence. The volatility of prices, however, is not a simple, unambiguous statistic as is the level or the first differences of price. A variety of approaches to defining and measuring volatility exist; some, such as high-low spreads or ratios are quite simple, while others employ rather sophisticated econometric techniques. The complexity surrounding this characteristic of the distribution of the stock prices causes me to have little *a priori* conviction that market prices fully reflect the type of information which a volatility analysis might yield.

If there are persistent inter-stock volatility differences, and if, for a stock, volatility does behave in a stable fashion over time, a trader might be able to utilize information distilled from an analysis of historical price series. He might be able to formulate profitable strategies, not on the basis of expectations of a specific directional price change, but rather on the expectation that one stock's price is simply more apt to change than another's. The ability to predict future price volatility from past volatility could lead to the development of strategies for the trading of options, particularly spreads and straddles.

The implication this would have for market efficiency, in terms of Fama's formulation, is not clear. Is the market more efficient when no traders have knowledge of a particular type of serial dependence in price changes, then when *some* of the traders obtain this information? One might hold that markets are efficient in some narrow sense of the term if there is an equal or non-monopolized distribution of existing knowledge: yet, they might be efficient in a broader sense if more complete knowledge, regardless of its distribution, is developed. These are definitional issues which should be clarified.

Fama has attempted to evaluate the efficiency of the market by considering the extent to which prices reflect knowledge. One might also attempt to consider, more directly, the actual dynamic processes by which new market information is distributed throughout the investment community.

By so clearly synthesizing the objectives and results of a major number of stock market studies, Professor Fama has accomplished much in this review. He has also provided a valuable service by so strongly focusing attention on the fundamental issue of market efficiency. If, this focus, along with clarifying existing issues, causes new questions to be raised, I believe his work should be doubly valued.