Understanding stock prices through Efficient Market Hypothesis: A Study on Literature

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Abstract

Every finance professional employs the concept of market efficiency. This paper is the review of the efficient market hypothesis theory, evidence and counter-evidence focus on a couple of dozen highly influential articles published during the twentieth century. We summarize the origins of and interlinkages between these contributions to the history of finance. Market efficiency refers to the speed and accuracy with which current market prices reflect investor expectations, such that mispriced securities are rare. This study, which is essentially a literature review, intends to explain the general evolution of the theory.

Keywords:*market efficiency, histories of finance, literature review etc.*

Introduction

The concept of efficiency is central to finance. Primarily, the term efficiency is used to describe a market in which relevant information is impounded into the price of financial assets. The main thrust of capital markets is the transference of resources from the savings – surplus unit (lenders/savers) to the savings-deficit unit (borrowers/producers) efficiently. The borrowing/lending rate is used as a vital piece of information by each producer, who will accept project until the rate of return on the least profitable project just equals the opportunity cost of external funds (the borrowing/lending rate). If capital markets are sufficiently competitive, then simple microeconomics indicates that investors cannot expect to achieve superior profits from their investment strategies. An efficient securities market ensures that all participants are price takers. Information efficiency implies that information is costless (or of negligible cost) and is received simultaneously by all individuals. But although this appears self-evident today, it was far from obvious for the majority of the century.

Up to the end of the 1950s, there were few theoretical or empirical studies of securities markets; and until Cootner (1964) collated a selection of papers from a wide variety of sources, the literature was dispersed across journals in statistics, operations research, mathematics and economics. The concept of market efficiency had been anticipated at the beginning of the century in the dissertation submitted by Bachelier (1900) to the

Sorbonne for his PhD in mathematics. Bachelierrecognises that 'past, present and even discounted future events are reflected in market price, but often show no apparent relation to price changes'. Bachelier had concluded that commodity prices fluctuate randomly, and later studies by Working (1934) and Cowles and Jones (1937) were to show that US stock prices and other economic series also share these characteristics. These studies were largely overlooked by researchers until the late 1950s. Alfred Cowles III, founder of the Cowles Commission and benefactor of the Econometric Society, published in the launch issue of Econometrica a painstaking analysis of many thousands of stock selections made by investment professionals. Cowles (1933) found that there was no discernible evidence of any ability to outguess the market. Subsequently, Cowles (1944) provided corroborative results for a large number of forecasts over a much longer sample period. By the 1940s, there was therefore scattered evidence in favour of the weak and strong form efficiency of the market, though these terms were not yet in use.

A Formal Definition of the Value of Information

The notion of efficient capital markets depends on the precise definition of information (Copeland and Weston, 1988: 332). An information structure may be defined as a message about various events which may happen. The value of an information structure,
$V(\eta) = \Sigma\, q(m)\, MAX\, \Sigma\, p(e/m)\, U(a,e) - V(\eta\, o)$ (1) m a e
where
q(m) = the marginal probability of receiving a message m; p(e/m) = the conditional probability of an event e, given a message m; U(a,e) = the utility resulting from an action a, if an event e occurs; $V(\eta\ o)$ = the expected utility of the decision make without the information.

Efficient Capital Markets

Fama (1976,1991) defines efficient capital markets as those where the joint distribution of security prices at a period, given the set of information that the market uses to determine security prices, is identical to the joint distribution of prices that would exist if all relevant information available at that period were used. This implies that there must be no distinction between the information the market uses and the set of all relevant information. In other words, the value of the gain from information to an ith individual must be zero.
$V(\eta\ i) - V(\eta\ o) = 0$

Market Efficiency with Costly Information

This concept challenges the market efficiency theory and raises the question of existence of analyst in the market whose purpose is to beat the market and wipe out the abnormal profits. Cornell and Roll (1981) and Elton, et al (1993) have shown that sensible asset market equilibrium must leave some room for analysis. Their articles make the more reasonable assumption that information acquisition is costly activity. Cornell and Roll showed that it is reasonable to have efficient markets where people earn different gross rates of return because they pay differing costs for information.

The Random Walk Model

The drunk left analogy was discussed by Karl Pearson (1905). In the early 1950s, the assumption of economists was that one could 'analyse an economic time series by extracting from it a long-term movement, or trend, for separate study and then scrutinising the residual portion for short-term oscillatory movements and random fluctuations' (Kendall, 1953).When Kendall examined 22 UK stock and commodity price series, however, the results surprised him. He concluded that 'in series of prices which are observed at fairly close intervals the random changes from one term to the next are so large as to swamp any systematic effect which may be present. The data behave almost like wandering series.' The near-zero serial correlation of price changes was an observation that appeared inconsistent with the views of economists. Nevertheless, these empirical observations came to be labelled the 'random walk model' or even the 'random walk theory'. Roberts (1959) demonstrated that a time series generated from a sequence of random numbers was indistinguishable from a record of US stock prices—the raw material used by market technicians to predict future price levels. 'Indeed,' he wrote, 'the main reason for this paper is to call to the attention of financial analysts empirical results that seem to have been ignored in the past, for whatever reason, and to point out some methodological implications of these results for the study of securities.' Alexander (1961) independently discovered that there was a realisation that autocorrelation could be induced into returns series as a result of using time-averaged security prices. Fama's (1965) doctoral dissertation was reproduced, in its entirety, in theJournal of Business. Fama reviews the existing literature on stock price behaviour, examines the distribution and serial dependence of stock market returns, and concludes that 'it seems safe to say that this paper has presented strong and voluminous evidence in favour of the random walk hypothesis.'

Market Efficiency

The switch of emphasis began with observations such as that of Samuelson (1965), whose 'Proof That Properly Anticipated Prices Fluctuate Randomly' began with the observation that 'in competitive markets there is a buyer for every seller.Building on Samuelson's microeconomic approach, together with a taxonomy suggested by Harry Roberts (1967), Fama (1970) assembled a comprehensive review of the theory and evidence of market efficiency. Though his paper proceeds from theory to empirical work, he notes that most of the empirical work preceded development of the theory.The weak form of the efficient market hypothesis claims that prices fully reflect the information implicit in the sequence of past prices. The semi-strong form of the hypothesis asserts that prices reflect all relevant information that is publicly available, while the strong form of market efficiency asserts information that is known to any participant is reflected in market prices.

Supporting Models of the Emh

This section presents a concise mathematical representation of the various models that have found extensive use in the EMH research.

The Expected-Returns Model

The model, suggested by Fama (1970), is given by:
$Zi,t+1 = ri,t+1, - E[ri,t+1,/ * t]$

WithE[zi,t+1,/ * t) = 0
Where Zi,t+1, is the unexpected return for security i in period t+1, the difference between the observed return ri,t+1, and the unexpected return based on the information set *t. the expected return could, for instance, be determined by the CAPM.

The Capital Asset Pricing Model (CAPM)

The CAPM, as developed by Sharpe (1964), Linter (1965) and Mossin (1966), may be mathematically expressed as:
E(rit) = rft + [E(rmt) – rft] βi + εitOther CAPM – related models are the market model and the empirical market line. The market model argues that returns on any security on any security are linearly related to returns on a "market" portfolio. Mathematically described thus:
rit = ai + βiRmt + εit
where E(εit) = 0
σ(Rmt, εit) = 0
σ(εitεjt) = 0
rit = return on security i in period t
rmt = general market factor in period t
εit = the stochastic portion of the individualistic factor representing the part of security i's return which is independent of Rmt.
ai, βi = intercept and slope coefficients respectively, which are assumed to be constant over the time period during which the model is fit to the available data.

It is instructive to note that the general market factor in equation is designed to reflect general market and economic conditions that are related to the returns on a particular security. This is a different notion than the return on the market portfolio in the CAPM given by rmt.

Sometimes, we see the empirical market line which is expressed as:
rit = Yot + Y1t βit + εit
Although related to the CAPM, it does not require the intercept term to equal the risk – free rate. Instead, both the intercept Yot, and the slope, Yit, are the best linear estimates taken from crosssection data each time period (typically each month). Furthermore, it has the advantage that no parameters are assumed to be constant over time.

All three models use the residual term εit as a measure of risk-adjusted abnormal performance. However, only one of the models, the CAPM, relies exactly on the theoretical specification of the Sharpe-Litner-Mossin Model.

The Abnormal Performance Index (API)

Performance measures of mutual funds include the Sharpe Index (reward to variability ratio), Treynor Index and Jensen Abnormal performance. Shape Index = (rit – rft) / σi (C1) Treynor Index = (rit – rft) / βi (C2) Abnormal Performance = ait = (rit - rft) – [βi (rmt - rft)] (C3) where ri = return of the ith mutual fund rf = return on a risk-free asset (usually Treasury bills) σi = the standard deviation of return on the ith mutual fund βi = the estimated systematic risk of the ith mutual fund. According researchers have used the models above together with the expected-returns and CAPM to examine empirically the

effects of accounting numbers. One of other more imaginative developments in this approach was the API by Ball and Brown (1968) to study the association between unexpected changes in accounting earnings and unexpected changes in prices. The unexpected price changes are aggregated (for the portfolios formed using the sign of the earnings forecast error) using the relationship: API = 1 Π(1 + εit) – 1 (C4) Nit where T = number of time periods: t = 1,2, ….., T N = number of securities: i = 1,2, …., N εit = individualistic component of rit, or, alternatively, the forecast error.The API traces out the value of a naira invested in equal amounts in each security in the portfolio from time t up to T. At time T the earnings number is assumed to be made public. As Beaver (1972) notes, the API has an appealing intuitive interpretation. It represents one measure of the value of the information contained in the earnings number (actually the sign of the earnings forecast error) T months prior to the release of the earnings number. In this sense, the API concept has some aspects of similarity to the notion of perfect information as the concept is used in decision theory. The analogy is not perfect, however, for the API is an ex post concept while the value of perfect information is an ex ante notion. It suffices to note that the discussion of the foregoing models given here is intentionally brief. A more extensive coverage is available in Beaver (1972). Dyckman et.al.(1975), Copeland and Mayers (1982), Sharpe and Cooper (1972), and Brealey& Myers (1996:143-90).

Conclusion

The efficient markets hypothesis is simple in principle, but remains elusive. Evolving from an initially puzzling set of observations about the random character of security prices, it became the dominant paradigm in finance during the 1970s. During its heyday, the efficient markets hypothesis came to be supported by a growing body of empirical research demonstrating the difficulty of beating the market, whether by analysing publicly available information or by employing professional investment advisors. A number of scientific research focusing on the stock market has not only developed new theories on capital markets but refined existing ones which are considered sophisticated and efficient in the interpretation of relevant information.

The main focus of this paper is to review some past financial studies on market efficiency especially informational efficiency with a view to bringing out the behavioural paradigin that reflects the Efficient Market Hypothesis reliance on the activities of arbitrageurs and experts who create demand and supply patterns to sustain the market in equilibrium. It is also indicated that the value of any information structure should be considered net of costs, so that any claim to abnormal returns as a result of monopoly of relevant information may not be significant relative to the cost of obtaining the information which is applicable to both portfolio managers and individual investors.

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