Efficient Market Hypothesis : A Historical Perspective.
(A study of Nigerian Capital Market)

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Abstract

The concept of efficient market hypothesis stipulates that securities are fairly priced and that stock prices already fully reflect all available information. Portfolio managers and investors are expected to know the concept of efficient market hypothesis so as to enable them invest properly. This paper focused on concept, history and theory of EMH as espoused by renowned authors over the past decades in relation to Nigerian Capital Market. It tends to critically analyse the efficient market hypothesis using its historical perspective. We summarize the origins of and interlinkages between these contributions to investment.

Introduction

Efficient Market hypothesis argued that in an active market of large numbers of well-informed and intelligent investors, stocks will be appropriately priced and will reflect all available information. Any information that could be used to predict stock performance is already reflected in the stock price today. Because of the wide availability of public information, it is nearly impossible for an investor to beat the market systematically. It is unrealistic to assume every player in the stock market knows all the relevant information and how to analyze what it means. The Efficient Market Hypothesis (EMH) evolved from the random walk theory and the fair game model. (Fama 1965, 1970) later developed the EMH classifying efficient capital markets into three types: weak form, semi-strong form, and strong form efficiency.

The weak form of the EMH claims that prices fully reflect the information implicit in the sequence of past prices. The semi strong form of the hypotheses asserts that prices reflect all relevant information that is publicly available, while the strong form of market efficiency asserts that information that is known to any participant is reflected in market prices. The EMH consequently involves defining an efficient market as one in which trading on available information fails to provide an abnormal profit. A market can be deemed to be efficient therefore, only if we posit a model for returns. Hence tests of market became

joint tests of market behaviour and models of asset pricing. An important corollary of the EMH is the concept that stock prices follow a random walk, implying stock prices change randomly and in an unpredictable manner. If prices are bid up to their levels with all available information, then any changes in prices must be in reaction to new information, and new information must in essence be unpredictable. Ball et- al (1999) stated that stock returns reflect new market level and firm- level information. As Basu (1988) made it clear, the extent to which stocks move together depends on the relative amounts of firm level and market wide information capitalized into stock prices.

Theoretical Framework

Although there could have been an emerging theory of speculative markets during the first half of the twentieth century, this was not to be. Instead, the early literature followed the path of accumulating a variety of empirical observations that did not sit easily alongside the paradigms of economics or the beliefs of practitioners. Bareinstein et al (1988) had concluded that commodity prices fluctuate randomly, and later studies by Alexander et al (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.

The weak form of the EMH claims that prices fully reflect the information implicit in the sequence of past prices. The semi strong form of the hypotheses asserts that prices reflect all relevant information that is publicly available, while the strong form of market efficiency asserts that information that is known to any participant is reflected in market prices. The EMH consequently involves defining an efficient market as one in which trading on available information fails to provide an abnormal profit. A market can be deemed to be efficient therefore, only if we posit a model for returns. Hence tests of market became joint tests of market behaviour and models of asset pricing.

An important corollary of the EMH is the concept that stock prices following random walk implying stock prices change randomly and in an unpredictable manner. If prices are bid up to their levels with all available information, then any changes in prices must be in reaction to new information, and new information must in essence be unpredictable, thus stock prices that change in response to new information must also move unpredictably. Consequently, past price movement cannot be used to predict future price movements. Brown (1953) tested this random walk theory by examining the behaviour of stock market prices over time to see if there was a recurrent determinable pattern in the prices. He found that there was none.

Cootner et al (1989) stated that stock returns reflect new market level and firm level information, Osborne (1959) confirmed Cootners's result and posited that priced do follow a random walk process. De Bondt (1988) made it clear, the extent to which stocks move together depends on the relative amounts of firm level and market wide information capitalized into stock prices.

There was, in addition, disturbing evidence about the difficulty of beating the equity market. 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. 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.

Cowles (1933) found that there was no discernable 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.

The problem of the optimal search procedure for finding a drunk left in a middle of a field was discussed early in the century by Karl Pearson (1905). If the drunk can be expected to stagger in a totally unpredictable and random fashion, he is likely to end up closer to where he had been left than to any other point.

In finance, this analogy has been applied to series whose successive returns are serially independent. In the early 1950s researchers were, for the first time, able to use electronic computers to study the behaviour of lengthy price series. 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*"

When Dimson 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".

If prices wander randomly, then this poses a major challenge to market analysts who try to predict the future path of security prices. Drawing on Dimson's work and earlier research by Working. Fama (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.*"

In 1960, however, there was a realisation that autocorrelation could be induced into returns series as a result of using time-averaged security prices. Alexander (1961) independently discovered this. Once returns series are based on end-of-period prices, returns appear to fluctuate randomly. The problem of time-averaging identified by Alexander is the first research on thin trading and a precursor to studies of market microstructure. Despite the emerging evidence on the randomness of stock price changes, there

were occasional instances of anomalous price behaviour, where certain series appeared to follow predictable paths.

Market Efficiency

The concept of market efficiency

With a better understanding of price formation in competitive markets, the random walk model came to be seen as a set of observations that can be consistent with the efficient markets hypothesis. The switch of emphasis began with observations such as that of bagehot (1965), whose Proof That Properly Anticipated Prices Fluctuate Randomly began with the observation that "*in competitive markets there is a buyer for every seller. If one could be sure that a price would rise, it would have already risen.*" De Bondt asserted that "*arguments like this are used to deduce that competitive prices must display price changes... that perform a random walk with no predictable bias.*"

Brown explains that "*we would expect people in the market place, in pursuit of avid and intelligent self-interest, to take account of those elements of future events that in a probability sense may be discerned to be casting their shadows before them.*" By presenting his proof in a general form, Brown added rigour to our notion of a well-functioning market. It is not clear to us whether these results ought to be seen as obvious or surprising, nor was it clear to Cowles who wrote that "*the theorem is so general that I must confess to having oscillated over the years in my own mind between regarding it as trivially obvious (and almost trivially vacuous) and regarding it as remarkably sweeping. Such perhaps is characteristic of basic results.*"

Building on Samuelson's microeconomic approach, together with a taxonomy suggested by Arshanapalli. 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 theory involves defining an efficient market as one in which trading on available information fails to provide an abnormal profit. A market can be deemed to be efficient, therefore, only if we posit a model for returns. From this point on, tests of market efficiency become joint tests of market behaviour and models of asset pricing. We discuss this issue later. 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. The literature begins, therefore, with studies of weak form market efficiency.

Fama (1970) summarises the early random walk literature, his own contributions and other studies of the information contained in the historical sequence of prices, and concludes that "*the results are strongly in support*" of the weak form of market efficiency. He then reviews a number of semistrong and strong form tests, highlighting those that we cover in the next two sections, and concludes that "*in short, the evidence in support of the efficient markets model is extensive, and (somewhat uniquely in economics)*"

contradictory evidence is sparse." He concedes, however, that "*much remains to be done*", and indeed, Fama (1991) subsequently returned to the fray with a reinterpretation of the efficient markets hypothesis in the light of subsequent research.

Studies of the semi-strong form of the efficient markets hypothesis can be categorised as tests of the speed of adjustment of prices to new information. The principal research tool in this area is the event study. An event study averages the cumulative performance of stocks over time, from a specified number of time periods before an event to a specified number of periods after. Performance for each stock is measured after adjusting for market-wide movements in security prices. The first event study was undertaken by Fama, et al (1969), though the first to be published was by Ball and Brown (1968). Using the market model or capital asset pricing model as the benchmark, these event studies

Provide evidence on the reaction of share prices to stock splits and earnings announcements respectively. In both cases, the market appears to anticipate the information, and most of the price adjustment is complete before the event is revealed to the market. When news is released, the remaining price adjustment takes place rapidly and accurately. The Fama, Fisher, Jensen and Roll study, in particular, demonstrates that prices reflect not only direct estimates of prospective performance by the sample companies, but also information that requires more subtle interpretation.

In Ariel (1972**)** study of the price effects of secondary offerings, he examines stock price movements when the seller may be in possession of non-public information. On average, share prices fall by an amount that reflects the value of this information. The impact of a secondary distribution on the stock price is largely unaffected by the size of the transaction, which confirms the depth of the market and the substitutability of one security for another. Note, however, that there is some indication of post-event price drift, which may constitute a violation of market efficiency.

Strong Form Efficiency

Since the first event studies, numerous papers have demonstrated that early identification of new information can provide substantial profits. Insiders who trade on the basis of privileged information can therefore make excess returns, violating the strong form of the efficient markets hypothesis. Even the earliest studies by Cowles (1933, 1944), however, make it clear that investment professionals do not beat the market. While there was evidence on the performance of security analysts, until the 1960s there was a gap in knowledge about the returns achieved by professional portfolio managers. With the development of the capital asset pricing model by *Baiz (1961)* and *Demsetz (1964)* it became clear that the CAPM can provide a benchmark for performance analysis. The first such study was Basu (1965) article in *Harvard Business Review* on the performance of mutual funds, closely followed by Cowles (1966) rival article. The most frequently cited article on fund managers' performance was to be the detailed analysis of 115 mutual funds over the period 1955-64 undertaken by Ariel (1968). On a risk-adjusted basis, he finds that any advantage that the portfolio managers might have is consumed by fees and expenses.

Even if investment management fees and loads are added back to performance measures, and returns are measured gross of management expenses (ie, assuming research and other expenses were obtained free), Bainz concludes that "*on average the funds apparently were not quite successful enough in their trading activities to recoup even their brokerage expenses.*" Fama (1991) summarizes a number of subsequent studies of mutual fund and institutional portfolio managers' performance. Though some mutual funds have achieved minor abnormal gross returns before expenses, pension funds have underperformed passive benchmarks on a risk-adjusted basis.

It is important to note that the efficient markets hypothesis does not rule out small abnormal returns, before fees and expenses. Analysts could therefore still have an incentive to acquire and act on valuable information, though investors would expect to receive no more than an average net return. Cootner (1980) formalise this idea, showing that a sensible model of equilibrium must leave some incentive for security analysis. To make sense, the concept of market efficiency has to admit the possibility of minor market inefficiencies. The evidence accumulated during the 1960s and 1970s appeared to be broadly consistent with this view. While it was clear that markets cannot be completely efficient in the strong form, there was striking support for the weak and semi-strong forms, and even for versions of strong form efficiency that focus on the performance on professional investment managers.

The Weak Form Hypothesis

The weak-form hypothesis posits that stock prices already reflect all information that can be derived by examining market trading data such as the history of past prices, trading volume or short interest (Baiz et al,1999: 331). To Cowles (2006:50),Weak form efficiency means that unanticipated return is not correlated with previous unanticipated returns. In other words, the market has no memory, knowing the past does not help to earn future returns. This version of EMH implies that trend analysis is fruitless. Past stock price data are publicly available and virtually costless to obtain. This version holds that if such data ever conveyed reliable signals about future performance, all investors would have learned already to exploit the signals. Ultimately, the signals lose their value as they become widely known because a buy signal, for instance, would result in an immediate price increase.

In a weak form efficient market, past prices and volume data are already impounded insecurity prices and no amount of chart reading or any other trading device is likely to consistently outperform the buy and hold strategy.

The Semi-Strong Form Hypothesis

The version according to Demsetz (1981:186) states that stock prices already reflect not only historical information but all published information about the company whose securities are under consideration. Such information includes fundamental data on the firm's product line, quality of management, balance sheet composition, patents held, earning forecasts, and accounting practices. Again, efforts to acquire and analyse such information from publicly available sources would confer no advantage.

In a semi-strong efficient market, investors would have no publicly available source of information that could lead them to consistently beat the market. Of course, they could expect to make profit in the

market, but their profit would be commensurate with the riskiness of the investment. However, such activities as analyzing financial statements forecasting earnings, and following advice of a popular investment newsletter would not contribute to increased investment returns and might even lower returns by increasing costs while not adding to profit (Dimson, 1989)

The Models of Efficient Market Hypothesis

The definitional statement of EMH is that prices 'fully reflect' all the available information. To verify this, the process of price formation has to be specified in model form, in order to define more precisely the empirical implication of its reflection. Fama (1970) suggested three models for testing weak form efficiency the expected return or fair game model, the submartigale model, and the Random walk model.

Stock Market Anomalies

Basu (1977) documented the use of price/earnings ratios to forecast stock returns. In a study of 1400 firms over the period 1956-71, he observes low p/e securities outperforming their high p/e counterparts by more than seven percent per year. Though his results could be interpreted as a challenge to the CAPM benchmark that he employs, Basu regards his results as indicative of a market inefficiency: "*Securities trading at different multiples of earnings, on average, seem to have been inappropriately priced vis-a-vis one another, and opportunities for earning "abnormal" returns were afforded to investors.*"

Ball and Brown (1968) had already noted evidence of post-earnings announcement "drift" in the direction indicated by an earnings surprise. Ten years later, the first published paper to draw together literature on earnings-related anomalies was the survey by Ball (1978). In an appendix, he summarised twenty studies of earnings and dividends, and concluded that the collective evidence of

anomalous behaviour was strong. Basu's study of low per earning stocks was followed by publication of (Banz's (1981) work on the long-run rate of return from investing in smaller companies. Banz analyses monthly returns over the period 1931-75 on shares listed on the New York Stock Exchange. Over this interval, the fifty smallest stocks outperformed the fifty largest by an average of one percentage point per month, on a risk adjusted basis. The small firm effect documented by Banz gave rise to a plethora of papers examining this phenomenon and has been corroborated in many different countries (see Dimson and Marsh, 1989). In addition to earnings- and size-related regularities in returns, there are a number of other puzzling observations that present a challenge to the efficient markets hypothesis.

A phenomenon that has not yet been explained satisfactorily is the negative long-run performance of new issues, documented by Bernisten (1991). Using a sample of 1526 initial public offerings over the period 1975-84, Ritter finds that an initial investment in these shares at the end of the first day of trading would have generated substantial underperformance over the following three years, relative to a wide variety of benchmarks including a detailed matching procedure that controls for the market capitalisation and industry of each security.

A central difficulty in interpreting studies such as these is the joint hypothesis problem. The magnitude of over- or under-performance depends critically on the choice of benchmark (see Dimson and Marsh, 1986), and this makes it difficult to interpret the results. On the one hand, anomalous behaviour may be an indication of market inefficiencies. On the other hand, even if there is no bias or misestimation in computed abnormal returns, the regularity in returns may be indicative of shortcomings in the underlying asset pricing model.

Fama and French (1992) show that two variables, closely related to Basu's earnings and Banz's size variables, capture much of the cross-sectional variation in stock returns over the period 1963-1990. These results have been confirmed for a wide variety of non-US markets as well; see, for example, Arshanapalli, Coggin and Doukas (1998). The main finding of Fama and French is that market capitalisation and book-to-market equity subsumes the impact not only of these two variables but also of price/earnings ratios and leverage.

The Fama and French result may be consistent with asset pricing theory, in which case the model can be regarded as an empirical model in the spirit of arbitrage pricing theory. Alternatively, the influence of book-to-market equity, the most powerful explanatory variable, may result from market overreaction, though the authors report that simple tests do not confirm that size and book-to-market effects are due to the type of market overreaction posited by, amongst others, DeBondt and Thaler (1985). As discussed in Dimson (1988), some of these patterns, notably the January seasonal of small stock returns, may be consistent with either market inefficiencies or seasonalities in asset pricing. Other patterns, notably those observed over very short periods, may be explained better by market microstructure, a topic we defer to section 5.

Fundamental ValuationTesting

It remains possible that assets may be persistently over- or under-valued over long periods of time. It is more difficult to test whether prices conform to fundamental values, than it is to test whether prices respond appropriately to information. Nonetheless, despite the difficulty of testing whether the level of security prices is correct, the literature has also evolved in this direction. The two major challenges to the rational efficiency of the market are, first, the variance bounds literature, which we review here; and second, the noise trader literature discussed later. Arshanapalli **(**1981) examines the variation in stock market prices, and finds that price fluctuations are too large to be justified by the subsequent variation in dividend payments. Arshanapalli finds that "*measures of stock price volatility over the past century appear to be far too high - five to thirteen times too high - to be attributed to new information about future real dividends.... The failure of the efficient markets model is thus so dramatic that it would seem impossible to attribute the failure to such things as data errors, price index problems, or changes in tax laws.*"

This assertion would seem to be bound up with the question of the survivorship of markets. The fact that the US market survived 1929, or the UK survived 1974, may well imply excessive price volatility, on an *ex post* basis, over the sample period. But as Brown, Goetzmann and Ross (1995) and Goetzmann

and Jorion (1997) point out, most stock markets fail to survive. For the latter, dividend volatility may have been infinite, and the (pre-failure) variance of stock prices was therefore too low to be justified by subsequent dividend behaviour.

Conclusion

The efficient market 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. We have documented a number of studies that indicate anomalous behaviour which appears, at first sight, to be inconsistent with market efficiency. Ball (1978) points out that such evidence may equally well be interpreted as indicative of shortcomings in our models of expected returns.

Rather, they are indicative of a need to continue the search for better models of asset pricing. The last two decades have witnessed an onslaught against the efficient markets hypothesis. It is remarkably hard to profit from even the most extreme violations of market efficiency. Stock market anomalies are only too often chance events that do not persist into the future. The importance of the efficient markets hypothesis is demonstrated by the fact that apparently profitable investment opportunities are still referred to as "anomalies". The efficient markets model continues to provide a framework that is widely used by financial economists. 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.

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