Efficient market hypothesis

Literature Review

2. 0 Introduction

In order to better understand the origin and the idea behind the Efficient Market Hypothesis (EMH), the first section deals with an overview of the EMH. Section 2 deals with the Random Walk Model which is a close counterpart of the EMH. We then have examine the different degrees of information efficiency that exist, namely the weak form efficiency, semi-strong form efficiency and the strong form efficiency. In section 4, we have a brief overview of the different types of statistical tests that have been used in the literature to examine the weak form efficiency. Section 5 explains the implications of efficient markets for investors.

2. 1 Efficient Market Hypothesis (EMH)

The concept of efficiency is one of the essential concepts in finance. Market efficiency is a term used in many different contexts with many different meanings. Market efficiency involves three related concepts- allocation efficiency, operational efficiency and informational efficiency.

- Allocation efficiency: A characteristic of an efficient market in which capital is allocated in a way that benefits all participants. It occurs when organizations in the public and private sectors can obtain funding for the projects that will be the most profitable, thereby promoting economic growth
- Operational efficiency: A marketcondition that exists when participants can execute transactions and receive services at a price that fairly equates to the actual costs required to provide them. Economists use this term to describe the way resources are employed to facilitate the

operation of the market. It is usually desirable that markets carry out their operations at as low a cost as possible.

- Information efficiency: The actual market price of a share should reflect its intrinsic value. Information efficiency implies that the observed market price of a security reflect all information relevant to the pricing of the security. The investor can manage to earn merely a risk-adjusted return from his investment, as prices move instantaneously and in an unbiased manner to any news.

The efficiency in the market for financial assets and assets returns refers here to the information efficiency and should not be confused with the other types of efficiency.

As explained by Rahman and Hossain (2006):

For a stock market to be efficient, stock prices must always fully reflect all relevant and available information. This definition can be expressed as Æ'(Ri, t, Rj, t … … … | Ï†M t-1) = Æ'(Ri, t, Rj, t … … … | Ï†M t-1, Ï†a t-1), where Æ'(.) = a probability distribution function, Ri, t = the return on security i in period t, Ï†M t-1 = the information set used by the market at t — 1, Ï†a

t-1 = the specific information item placed in the public domain at t — 1. This equation has two important implications.

1. Specific information item at t-1 (Ï†a t-1) cannot be used to earn non zero abnormal return.

2. When a new information item is added to the information set Ï†M, it is instantaneously reflected on market prices.

The concept of market efficiency was first introduced by Bachelier (1900). Since then, there has been many studies like Working (1934), Cowles and Jones (1937), Kendall (1953), Cootner (1964). However it was Fama (1965) who first used termed it as " efficient market". Fama (1970) later stated the sufficient but not necessary conditions for efficiency:

i. there are no transaction costs in trading securities;

ii. all available information is costlessly available to all market participants, and

iii. all agree on the implications of current information for the current price and distributions of future prices of each security

He also identified three degrees of informational efficiency namely the weak form, the semi-strong form and the strong form.

2. 2 Random Walk Model (RWM)

The Random Walk Model is a close counterpart of the Efficient Market Hypothesis. The model was originally examined by Kendall (1953). It states that stock price fluctuations are independent of each other and have the same probability distribution. Thus the Random Walk theory suggests that stock price change randomly, making it impossible to predict stock prices. The Random Walk Model is linked to the belief that markets are efficient and that investors cannot beat or predict the market because stock prices reflect all available information and the new information arises randomly. As mentioned in Fama (1970) the two hypotheses constituting the Random Walk Model , that is (i) successive price changes are independent and (ii)

successive changes are identically distributed, are implicitly assumed in the Efficient Market Hypothesis.

The Random Walk Model is in direct opposition to technical analysis, which suggests that a stock's future price can be forecasted based on historical information through observing chart patterns and technical indicators.

2. 3 Forms of Market Efficiency

2. 3. 1 Weak-Form Efficiency

Fama (1970) stipulates that no investor can earn excess returns by formulating trading strategies based on historical price or return information in a weak-form efficient market. The weak-form efficiency thus assumes that the price of a stock fully reflects all information contained in past prices, that is the historical sequence of prices, rate of returns and other historical market information. A weak-form efficient market implies that it is of no use to engage in technical analysis that use past prices alone to find undervalued stocks.

In order to test whether past share prices can be used to predict future share prices(that is, weak-form efficiency), statistical or econometric tests can be used. These studies seek to study the evolution of share prices from one period to the next period and try to detect correlation between the successive price changes. Technical analysts study the evolution of past share prices, with the aim of predicting share prices to make gains.

2. 3. 2 Semi-Strong Form Efficiency

Fama (1970) described the semi-strong form efficiency as one where share price fully reflect all information contained not only in past prices but all public information. All public information includes capital market information as used in the weak form Efficient Market Hypothesis(EMH) as well as non-market information such as earnings, dividend announcements, price earnings ratio, information about the economy and political news (Reilly1997). New public information is almost instantaneously integrated in share price and the share price is adjusted so as to reflect the true value of the share. This means that an investor cannot use public information to generate gains on the stock market.

In order to test for semi-strong form efficiency, event studies are often used. These event studies are performed by analyzing the effect of the release of new public information on the share price. If the market is semi-strong form efficient, the new public information (for example annual reports, earning announcement or dividend announcement) is instantaneously integrated in the share price, so as to reflect the intrinsic value of the share. New information can be both good or bad. Thus they can cause increases or decreases at their release.

2. 3. 3 Strong Form Efficiency

Under strong form efficiency, the current price reflects all information, public as well as private. Private information, in this context, means information not yet published. On the stock market, there are professionals (for example security analysts, fund managers) who have private as well as public

information. Efficient Market Hypothesis (EMH) assumes that no investor has monopolistic access to any information. This means that as new public and private information is released, it is incorporated in share price to reflect its true value. An investor will not be able to consistently find undervalued or overvalued shares and make gains on the strong form efficient market. Fama (1970) perceives a strong form efficient market as one where investors are not expected to earn excess returns by relying on inside information.

To test whether past share prices, public and private information can used to predict future share prices, the investment records and gains generated by professional investors are often studied. Investors should not be consistently able to make gains by using public and private information. At all moments, the share prices incorporate all public and private information to reflect the true value of the shares.

2. 4 Statistical Tests to examine validity of Weak-Form EMH

In order to examine the validity of the weak form efficiency, a number of statistical tests have been used in the literature. These tests can be categorized into two groups:

i. Using mechanical trading rules also known as filter rules.

These rules test for the possibility of non-linear dependence existing in the price data. Filter rules were first used by S. A Alexander (1961) and later Fama and Blume (1966) added to the literature. Professor Alexander's filter techniques attempts to apply a sophisticated criteria to identify movements in stock prices. An x percent filter is defined as follows: If the daily closing price of a particular security moves up at least x percent, buy and hold the

security until its price moves down at least x percent from a subsequent high, then sell and go short (Fama and Blume, 1966). The short position is then maintained until the daily closing price rises at least x percent above a subsequent low when one is going to cover and buy. Moves less than x percent in either direction are ignored.

ii. Statistical tests of independence between successive price changes.

Serial autocorrelation tests and run tests are among the most popular tests. Some of the researches in this field use Spectral Analysis which decomposes a time series into a spectrum of cycles of different length. This spectral decomposition of a time series yield a spectral density function that measures the contribution of each of the frequency bands to the overall variance of the times series. There is also a relatively new test introduced by Lo and Mackinlay (1988), it is called the Variance Ratio which is based on the heteroscedasticity problem. The basic idea behind the Lo and Mackinlay (1988) variance-ratios test is that if a natural logarithm of a time series is a pure random walk, then, the variance of its k-differences in a finite sample grows linearly with the difference, Let (pt) denote a time series consisting of T observations p1, p2,..., pT of asset returns. Then, the variance-ratio of the k-th difference, VR(k), is defined as:

VR(k)= Ïƒ2(k)/Ïƒ2(1)

where, VR(k) is the variance-ratio of the share's returns k-th differences; Ïƒ2(k) is the unbiased estimator of 1/k of the variance of the share's returns k-th differences, under the null hypothesis; Ïƒ2(1) is the variance of the first-

differenced share returns series, and k is the number of days of base observations interval or lag (Ntim et al. , 2007).

2. 5 Implications of EMH

Market efficiency has important implications for both investors and authorities. If a market is inefficient, investors should doubt the “ hold the market” strategy and should try to “ beat the market”. While the authorities on their part should restructure the stock market by enacting effective law and enhancing financial media.

The graph below shows the effect of EMH on stock prices.

The straight line shows the reaction under EMH while the dotted lines show the over-reaction and under-reaction that occur with the existence of market imperfections.

If a market is efficient, investors:

1. should not worry about investment analysis. They should rather concentrate on holding a well diversified portfolio. Investors holding an inefficient diversified portfolio will be exposed to risk which could be avoided and for which they will not be rewarded. In other words, the market only provides return for systematic risk, while specific risks have to be diversified away.

2. Should adopt a buy and hold policy once they have established their portfolios. This is because there is no advantage in changing from one group of securities to another. By doing this, there would be transaction costs which they would have to incur and as a result, the risk-adjusted return

would be affected. Altering the composition of a portfolio can only be justified

a) if the risk exposure has changed due to relative changes in the market value of the constituent securities.

b) if tax payments can be minimized.

Other implications of EMH are:

- Price changes are random and unpredictable
- Investors are not easily fooled by the glossy financial reports or ‘ creative accounting’ techniques
- Timing of new issues of securities are not important since prices represent the intrinsic and will reflect the degree of risk in the share.

Thus under EMH neither fundamental nor technical analysis can be used to achieve superior gains. Investors should concentrate on constructing and holding efficiently diversified portfolios.

2. 6 Empirical Evidences

Based on the literature, it can be seen that there are two competing schools of thoughts about market efficiency. The first school argues that markets are efficient and as a result, returns cannot be predicted. For example early studies (Working, 1934; Kendall, 1943, 1953; Cootner, 1962; Osborne, 1962; Fama, 1965) on developed markets support the weak form efficiency of the market with a low degree of serial correlation and transaction cost. The studies in this school of thought, support the Efficient Market Hypothesis

(EMH) and show that price changes could not be used to forecast future price changes, especially after transaction costs were taken into account.

The second school, on the other hand, provides empirical evidence of ‘ anomalies’ that contradict the theory of efficient markets. Some of these studies are Summers (1986), Keim (1988), Fama and French (1988), Lo and MacKinlay (1988) and Poterba and Summers (1988). They found some ‘ anomalies’, which could not be explained by the theory of Fama (1965). Some of the market anomalies that they found are:

January Effect/Turn of The Year Effect

Stock returns are usually abnormally high during the first few days of January. The January effect occurs because many investors choose to sell some of their stock right before the end of the year in order to claim a capital loss for tax purposes. Then they quickly reinvest their money after the new year, causing stock prices to rise. Rozeff and Kinney (1976) was among the first to prove this market anomaly. Rozeff and Kinney (1976) methodology gives smaller companies greater relative influence than would be true in value-weighted indices where large firms dominate. Subsequent researches (Reinganum, 1983; Roll, 1983, among others) later confirm that the January effect is a small cap phenomenon.

Size Effect/Small Firm Effect

The Size Effect is the tendency for firms with a small market capitalization to outperform larger companies over the long term. For example Banz (1981) and Reinganum (1981) showed that small-capitalization firms on the New York Stock Exchange (NYSE) earned a return in excess of what would be

predicted by the Sharpe (1964) Linter (1965) capital asset-pricing model (CAPM) from 1936-1975. However as mentioned by G. W. Schwert (2003, p. 943), it seems that the small-firm anomaly has disappeared since the initial publication of the papers that discovered it. Alternatively, the differential risk premium for small-capitalization stocks has decreased over the years.

Weekend Effect/Day of The Week Effect

This is a phenomenon in which stock returns on Mondays are often significantly lower than those of the immediately preceding Friday. French (1890) observed this anomaly. He noted that the average return to the Standard and Poor's (S&P) Composite Portfolio was reliably negative over weekends in the periods 1953-1977. Again, like the size effect, the weekend effect seems to have disappeared, or at least substantially attenuated, since it was first documented in 1980.

Value Effect/Price Earnings Ratio Effect

The value effect refers to the tendency for stocks with low price earnings ratio to outperform portfolios consisting of stocks with a high price earnings ratio. Basu (1977) shows that investors holding low price earnings ratio portfolio earned higher returns.

The existence of market anomalies have important implications. If stock returns do not follow a random process, then it is possible to design profitable trading strategies based on historical information

2. 6. 1 Empirical Evidences from Developing Countries

Despite the large number of empirical studies that have been conducted to test the validity of the Efficient Market Hypothesis (EMH) in developed countries with booming financial markets, studies to support or dispute the efficiency or inefficiency of the African stock markets are quite limited. There is a small number of empirical studies analyzing emerging African equity markets with regards to weak form of market efficiency test. While some of these studies have analysed single markets (e. g. Samuels and Yacout 1981; Parkinson 1984; Ayadi 1984; Dickinson and Muragu 1994; Osei 1998; Olowe 1999; Mecagni and Sourial 1999; Asal 2000; Adelegan, 2004; Dewotor and Gborglah, 2004; Ntim et al., 2007), others have analysed groups of countries (e. g. Claessens et al., 1995; Magnusson and Wydick, 2002; Smith et al., 2002; Appiah-Kusi and Menya, 2003; Simons and Laryea, 2004; Jefferis and Smith, 2005).

However, while there are only a few empirical studies, their conclusions as to the efficiency and predictability of future stock returns have been mixed. For example Dickinson and Muragu (1994) shows that the Kenyan stock market is weak form efficient, in contrast to the results of Parkinson (1984).

Also, most of the existing studies made use of conventional weak form testing techniques such as serial correlation tests. Samuels and Yacout (1981) and Parkinson (1984) were among the first to use serial correlation tests to examine the weak form efficiency on the African continent. Samuels and Yacout analysed the weak form market efficiency in weekly price series of 21 listed Nigerian firms from 1977 to 1979 and provided empirical evidence that the market was efficient. Parkinson on his part, analysed

monthly price series of 30 listed Kenyan firms from 1974 to 1978 and rejected the weak form efficiency. Dickinson and Muragu (1994) reinvestigated the Kenyan market by applying run and serial correlation tests to weekly stock price series of 30 listed companies on the Nairobi Stock Exchange and their results were in contrast with Parkinson (1984). They demonstrated that successive price changes are independent of each other for the majority of the companies investigated.

Most of the developing countries suffer from the problem of thin trading (Mlambo and Biekpe, 2005). The problems caused by thin trading have been widely acknowledged in financial market researches (e. g., Dimson, 1979; Cohen et al. , 1983; Butler and Simonds, 1987; Lo and Mackinlay, 1990a and b; Bowie, 1994; Muthuswamy and Whaley, 1994) . Fisher (1966) who was the first to identify the bias caused by thin trading in the serial correlation of index returns, explained that recorded prices of securities are not necessarily equal to their underlying theoretical values. This is because when a share does not trade, the price recorded remains the closing price when the share was last traded.

However, while most of the African stock markets suffer from thin trading, many existing studies fail to adjust for thin trading. For example recent studies conducted on the Stock Exchange of Mauritius (Appiah-Kusi and Menya, 2003 and Simons and Laryes, 2004) made used of conventional techniques and did not adjust for thin trading. Other studies (Kabba, 1998; Roux and Gilberson, 1978 and Poshawale, 1996) which have examined the behavior of stock price and rejected the weak-form efficiency, have

explained that the inefficiency might be due to delay in operations and high transaction cost, thinness of trading and illiquidity in the market.