Emerging Markets Queries in Finance and Business

# The Efficient Market Hypothesis: review of specialized literature and empirical research

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**Abstract**

The concept of efficiency is central to finance. For many years, academics and economics have studied the concept of efficiency applied to capital markets, efficient market hypothesis (EMH) being a major research area in the specialized literature. There are many opposite views regarding the EMH, some of them rejecting it, other supporting it. But how it all started and the way studies evolved during the last decade is very important. This survey examines the growing body of empirical research on efficient market hypothesis. The conclusion of this article is that testing for market efficiency is difficult and there is a high possibility that, because of changes in market / economic conditions, new theoretical model should be developed to take into consideration all changes. As a reasons, it is important to continue the empirical studies to decide if capital markets are or are not informational efficient.

## 1. Introduction

In the modern theory of finance, a good starting theory is that of efficient capital markets. The term "efficiency" denotes the fact that investors have no opportunity of obtaining abnormal profits from capital market transactions as compared to other investors, they cannot beat the market. So, the only way an investor may obtain a larger profit is by investing in higher risk assets. The theory presented in the next pages, the Efficient Market Hypothesis (EMH), is very controversial and of particular interest for financial economists, professors and researchers as confirmed by the large body of specialized literature. Even if many tried to find the truth behind the EMH, no ultimate conclusion exists. There are many opposing opinions regarding this

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theory; for each article that confirms the hypothesis, there is another that invalidates it. This is true in any economy, without exception, whether it is an emerging economy or a developed one. As a result, the question of whether the markets are efficient or not still remains unanswered.

The hypothesis has its roots in the 1960s when most of the research studies considered the capital markets to be efficient, starting with Fama (1965) and Samuelson (1965). During the next decades, more and more studies started to invalidate the hypothesis in all its three forms, weak, semi-strong and strong.

In 1970, Eugene Fama published in his article, besides the definition of efficient markets, also the distinction between the three forms of efficiency – weak, semi-strong and strong. The efficient market was defined as "a market with great number of rational, profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where current important information is almost freely available to all participants"[1]. Starting with Fama, numerous other researchers came with different definitions.

In 2003, Malkier defined an efficient capital market as being a market in which "prices fully reflect all known information, and even uninformed investors buying a diversified portfolio at the tableau of prices given by the market will obtain a rate of return as generous as that achieved by the experts"[2].

Returning to Fama (1969 and 1970), the weak form of EMH was presented as the state of fact in which the current prices of financial assets incorporate, at any moment, all the existing historical financial information. As a result, the theory supports the idea that investors cannot obtain abnormal profits from investing in these financial assets. This EMH form implies that prices will exhibit random walk.

As compared to the weak form of EMH, the semi-strong form assumes that financial assets' prices reflect, at any moment, all the information existent on a market, including historical prices and other historical information (which means this form incorporates also the weak form of EMH), and, additionally, the prices change rapidly and without biases to incorporate any other new public information released on the market. In case semi-strong form of EMH is present on a capital market, neither technical nor fundamental analysis can determine the way an investor should split his funds so that the obtained profitability is higher than that achieved in case of investment in a random portfolio of financial assets.

The strong form of EMH assumes that prices incorporate all the available information on a market, which includes: historical financial information (weak form), all new public information (semi-strong form) and all private information regarding a financial asset.

During the following years and until nowadays, many different opinions exist regarding the efficiency of the capital markets. There are so many different views that it is worth reviewing them and see if there is a predominant one that can prevail over the others.

A large variety of studies were elaborated to test all the three types of EMH. Most of them invalidated the semi-strong and the strong forms of EMH, forms that are not supported by financial data, while opinions were split for weak form of EMH (including random walk theory). Few of the weak form studies showed that the abnormal returns are mainly caused by chance, the probability of over-reaction being approximately the same as the probability of under-reaction – supporting the weak form of EMH. Another common conclusion is that the anomalies tend to disappear as changes in used models occur, so that they are caused by the methodology implied.

Most of the papers are based on event studies. Some of them analyze the reaction on the first few days after distinct types of announcements, in the idea that the prices of financial assets quickly react to new information, so that the efficiency of capital markets is confirmed. Still, other category of studies have analyzed a longer time horizon, based on the fact that the prices gradually adjust to new information released, thus invalidating the EMH on medium and long term.

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[1] FAMA, E. F., "Efficient Capital Markets: A Review of Theory and Empirical Work", Journal of Finance, Volume 25, Issue 2, Papers and Proceedings of the Twenty-Eighth Annual Meeting of the American Finance Association New York, N.Y. December, 28-30, 1969 (May, 1970), pp. 383-417

[2] Malkiel B., 2003. The efficient market hypothesis and its critics, Princeton University, CEPS Working Paper No. 91;

Because of the very distinct results, on the following pages, I will present the main findings on short term and long term reactions that stock prices have at distinct types of announcements. I will start with presentation of main conclusions regarding weak form EMH.

## 2.     Random walk tests – weak form of EMH

There is an impressive body of literature analyzing the random walk character of stock prices. The random walk theory considers that future evolution of prices cannot be predicted. An increase in a specific day does not automatically imply a further increase or decrease in the following day. As a result, it is considered that prices do not have memory. The term was first considered by Jules Regnault in his book entitled "Calcul des Chances et Philosophie de la Bourse", published in 1863. Afterwards, this theory was restated by Louis Bachelier in his PhD paper from 1900, "Théorie de la speculation". Until early 1930s, the theory of random walk was ignored by researchers and scientists. Between 1930 and 1940, there were a few articles prepared on this subject, one of them being written by Alfred Cowles. In his articles, "Stock Market Forecasting" in 1944 and "A Revision of Previous Conclusions Regarding Stock Price Behavior" from 1960, the author concluded that investors do not manage, on average, to obtain abnormal returns as compared to market. After 1960s', this theory started to be extensively researched and tested. One of the most known authors is Eugene Fama. His earliest studies related to random walk theory were published in late 1960s and early 1970s, after he finished his PhD paper. In his works, the author sustained the random walk theory based on empirical studies. Also Kendall and Hill (1953) sustained the random walk character of financial assets prices. Both authors could not find returns to be correlated.

After this period, around 1990s, a new idea took shape regarding behavioral finances. This new theory started contradicting the random walk hypothesis by emphasizing the influences of investors' behavior. Some of the authors that contradicted the random walk in their articles were Lo and MacKinley (1999), Lo, Mamaynski and Wang (2000). They tested the random walk by using variance ratio test in the idea that the variance and the holding period should be correlated, with a linear relationship.

Horvatic et al., in their paper from 2011, used de-trended fluctuation analysis to infirm the random walk. The same method was used by Peng et al in 1994 to test whether there are long range dependences on financial assets' prices on the market.

## 3.     EMH on short term

The studies on short term reaction of financial assets' prices have contradictory conclusions. Most of them are based on tests regarding the quick response of the prices around new information is released on the market. Fama, Fisher, Jensen and Roll (1969) analyzed 940 split events between 1927 and 1959, concluding that the largest positive abnormal returns are recorded in the first 3-4 months after announcement, sustaining in this way the gradual adjustment of prices on capital markets. Another study from 1968, realized by Ball and Brown, showed that capital markets are inefficient based on a sample of 2340 recordings from 1946-1966 regarding reaction to accounting income announcements. Stock prices react slowly to new information and they adjust during the first 12 months after the announcement – the EMH is invalidated. The same conclusion persisted many years afterwards and can be found also in the article published by Bernard and Thomas in 1990 regarding financial announcements where a sample of 2626 companies is used to test the reaction at quarterly financials' publication between 1974 and 1986. The result was a high autocorrelation of stock prices for the first 3 lags of the regression (for the previous 3 quarters). The autocorrelation tends to decrease slightly between lags, so that it becomes negative for the fourth one. On the same subject, the paper of Jegadeesh and Titman in 1993 invalidated once more the EMH by finding that stocks obtain abnormal negative return in month 12 after portfolio creation and continues in the same trend until month 31. Even though the prices increase in the first 6 months after announcement, they lose 50% of their values until month 24. As a result, past losers tend to be future winners and vice-versa.

Chowdhury, Howe and Lin (1993) as well as Pettit and Vanketash (1995) analyzed the returns obtained by companies' insiders. Both articles concluded that the insiders have constant and significant abnormal returns, so that the EMH cannot be sustained.

Professors Drew and Noland analyzed the Australian capital market in 2000 and found that directors that actively manage investment funds obtained, in regular basis, smaller returns as compared to the average market. This caused EMH to be once again challenged.

Not all the papers conclude that markets are inefficient. In his study from 2003, Malkiel concluded that capital markets are more efficient and less predictable than what many authors show in their works. Additionally, "the evidence is overwhelming that whatever anomalous behavior of stock prices may exist, it does not create a portfolio trading opportunity that enables investors to earn extraordinary risk adjusted returns"[3]. According to this article, the capital markets may be efficient even though anomalies exist, despite the irrational character of investors and no matter how high the prices' volatility really is. Malkiel considered that usually the anomalies are not large enough to cover transaction costs that would be incurred by investors and still obtain significantly positive abnormal returns over the market.

In 2014, Konak and Seker researched the way FTSE 100 evolves and if its evolution sustains the efficient market hypothesis. According to their analysis, between 2001 and 2009, FTSE 100 index respected the random walk theory and sustained the weak form of EMH.

There are numerous articles referring to the Romanian capital market also. Most of these articles demonstrate that EMH does not hold. Dima, Pintea and Murgea (2006) analyzed the evolution of BET, BET-C and BET-FI stock exchange indexes between 2004 and 2005; they concluded that EMH cannot be sustained in any of its forms. The same conclusion was obtained by Barna, Dima and Laburnet in 2007. Their empirical study was based on same indexes but for 1999-2003. One of the reasons the EMH does not hold may be the immaturity of the Romanian capital market.

Few years later, Dragota et al. (2009) considered that the random walk hypothesis cannot be rejected. The study was realized on a sample of 18 companies listed on the Bucharest Stock Exchange between their first listing date and December 2006. The sample was adjusted so that to avoid the Monday and Friday effects. As opposed to Dragota et al., Stănculescu and Mitrică (2012) concluded once again that the Romanian capital market is not efficient. The study was realized on a data series for the 10 most liquid stocks traded at the Bucharest Stock Exchange. By testing the sample, the authors found that it is non-stationary so that the random walk theory was contradicted.

In 2013, Birau published a comparative study between Romanian and Hungarian capital markets regarding the weak form of EMH. BET and BET-C indexes were considered for the Romanian stock market and BUX and BUMX indexes for the Hungarian capital market, with daily data between January 2007 and December 2011. The conclusion was that none of the countries have efficient capital markets in weak form. In the same time, the anomalies recorded for the Hungarian market were smaller than those for Romanian market, one of the possible explanations being the difference in the maturity level of each market.

## 4.      EMH on long term

One of the first works on the efficient market hypothesis was elaborated by Fama et al. in 1969. In this paper, the authors analyzed the way stock prices react in case of split events. The conclusion was that, in general, the split event results in a larger level of distributed profits as dividends. This matter determines the investors to take into consideration a larger future income, meaning that stock prices increase after the announcement, immediately or until the end of the month. The analysis was realized on a large sample of companies with data covering 24 months from the announcement date.

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[3] Malkiel B., 2003. The efficient market hypothesis and its critics, Princeton University, CEPS Working Paper No. 91;

In 1985, DeBondt and Thaler published a paper that analyzed stock long term returns. They concluded that companies with 3-5 years of positive returns continue to obtain negative returns. The vice-versa also holds. This study is based on the idea that investors tend to invest as a result of an increase in stocks' returns during a specific period of time without taking into account the general characteristic of all stocks, that they are mean-reverting. So, weak EMH is invalidated.

Few years later, in 1994, Lakonishok et al. concluded that companies with high values of E/P (earnings/price), CF/P (cash flow/price) and BE/ME (book–to–market equity) tend to have poor historical evolution of stock prices. On the other way around, companies with small values of these indicators appear to have a historical rising average return. As a result, the future performance of the companies included in the first category is expected to be better than that expected for the second category of companies, so that the semi-strong form of EMH does not hold. Also regarding the relationship between financial indicators and stock prices' evolutions, Peavy and Goodman (1983) showed that the shares of companies with low values of P/E obtain, in average, larger returns that the shares of companies with poor indicator's values. Base on the same subject was published also the article of Fluck, Malkiel and Quandt in 1997, according to which, following an investment strategy for a period of 13 years between 1980 and 1993, the shares with poor results 3-5 years before obtained better returns. In return, companies with high stock prices in the previous periods tend to have poor results afterwards – once again showing the prices tend to revert to their average value and that the market is efficient.

Regarding the reaction of stock prices at distinct types of announcements released on the market, a maximum of 40% of this reaction could be attributed to the dividends distribution announcement, according to Fama and French (1993) and to Campbell and Shiller (1988). Still, these articles were elaborated before improvements in theory that states that companies usually redeem shares instead of paying dividends in case they are not sure of the dividends policy stability over long term run.

Regarding IPOs (initial public offers), there are numerous studies analyzing the efficiency of capital markets. In their articles, Mitchell and Stafford (2000), Loughran and Ritter (1995), Spiess and Affleck – Graves (1995), Levis (1993a) and Marsh (1979), prove that, after an IPO, stock prices tend to increase reaching a level to high compared to their normal level and their adjustment gradually reaches the average level. Dharan and Ikenberry (1995) also concluded that the stock price reduction on long run after finalization of the IPO is caused by investors' over-reaction at the moment of the events' announcement.

The investors' reaction after M&A announcement release was found to be distinct depending on the analyzed period of time and the type of merger or acquisition. Agrawal, Jeffe and Mandelker (1992) as well as Asquith (1983) concluded that the shareholders of the acquiring company tend to lose approximately 10% of shares' value in a 5-years period. Langetieg (1978) and Malatesta (1983) showed that the acquiring companies do not record significant losses in the first three years after the event. These studies have opposite results as compared to Loderer and Martin (1996) who concluded that acquiring companies record losses in the first 3-5 years but after 5 years the returns tend to revert to normal.

Not all papers prove that investors' reaction after the release of an event is moving in a single direction. In this case, the investors would choose to invest in a single way, which is impossible. Also regarding the long term reaction of stock prices to event announcements, some works conclude that there are also cases when prices have a poor reaction to an event release. In these cases there is a larger period on which prices adjust to their normal value – most cases were elaborated regarding the period needed so that prices correctly adjust to financials release, like Ball and Brown (1968), Jegadeesh and Titman (1993), Joy, Litzenberger and McEnally (1977), Watts (1978), Rendleman, Jones and Latane (1982), Foster, Olsen and Shevlin (1984), Fama (1991), Poterba and Summers (1988), as well as Bernard and Thomas (1990). Once again the capital market inefficiency is proved.

In his article from 2012 about London capital market (analysis of Don Jones Industrial Index) between 1928-2012, Sewell found out that the weak form of EMH does not hold. According to the author, the index tends to record increasing returns for a 1 year period followed by decreasing returns for next 3 years.

## 5.    Conclusions

One of the reasons for the markets' possible inefficiecy or prices' responses to event announcements are delayed is that investors are inattentive. This is a heavily debated theme in specialized literature: DeLong et al. (1990), Shleifer (2000), Baker, Ruback, and Wurgler (2007), DellaVigna and Pollet (2009), Hirshleifer, Lim, and Teoh (2009), Hou, Peng, and Xiong (2009) and Hirshleifer, Hsu and Li (2013). Some argue that this inattention may cause under-reaction of prices and predictability of returns over the time.

The EMH is simple in theory but was proved to be very difficult to test and have a precise result. Because there is no consensus among economists regarding any of the three forms of EMH, some researches and well known scientists issued the hypothesis that the reason the EMH is not validated by models is that the models themselves are biased and may provide erroneous results.

According to Fama (1998), "market efficiency survives the challenge from the literature on long-term return anomalies. Consistent with the market efficiency hypothesis that the anomalies are chance results, apparent overreaction to information is about as common as under reaction and post-event continuation of pre-event abnormal returns is about as frequent as post-event reversal. Most important, consistent with the market efficiency prediction that apparent anomalies can be due to methodology, most long-term return anomalies tend to disappear with reasonable changes in technique".

Another defender of random walk hypothesis is Malkiel, who, in his paper from 2003, considers that many studies on this subject are wrong because there should be a difference between statistically significant results and significant data from economic point of view. According to the author, the statistically significant results are not able to offer an investor the opportunity to obtain abnormal returns compared to buy-and-hold strategy because of the high transactional costs incurred.

Gromb and Vayanos (2010) considered that explaining the existence of anomalies and understanding the reasons why they may not be eliminated requires a strong analysis of the arbitrage process, including understanding the reason why the arbitrage strategies fail to adjust rapidly the prices so that they reach their fundamental value implied by standard techniques.

As a result, there continues to be room for further empirical researches but this time more focused on the veracity of the models.

## Acknowledgements

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