Market Efficiency: Definitions and Tests

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Abstract:

Stock markets are considered to be one of the key indicators of the economic health of countries. The major attribute of capital market is that the prices of securities must reflect all available information, and new information should swiftly adjust into prices so that no investor can generate excess returns by the use of such information. A large number of tests on the relevance and applicability of the random walk hypothesis and **EMH which** is carried out across the globe.

Keywords : weak-form, Semi-Strong form, Strong -form.

المستخلص:

تعتبر أسواق الأسهم أحد أهم المؤشرات الدالة على صحة الاقتصاد في الدول، كما يعتبر مدى انعكاس المعلومات المتاحة على أسعار الأوراق المالية أحد أهم السمات الرئيسية لأسواق رأس المال، على هذا الاساس يجب على المعلومة الجديدة ضبط السعر في فترة زمنية قصيرة حتى لا يمكنه تحقيق عوائد زائدة عن طريق تلك المعلومة، هناك العديد من الاختبارات على اهمية وإمكانية تطبيق فرضية السير العشوائي.

الكلمات المفتاحية: المستوى الضعيف، المستوى الشبه قوي ، المستوى القوي

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Introduction:

In order to stimulate their economic growth and foster international integration, many Arab countries reconsidered the role of stock markets. However, different steps have resulted in some growth in terms of capitalization and the number of listed companies and many reforms have been undertaken in order to improve their liquidity and efficiency.

Since Fama (1970) established the weak, semi-strong and strong form of market efficiency, there have been numerous studies focused on empirically testing the weak and semi-strong forms. In the literature, autocorrelation in stock returns is the predominant method for testing weak-form market efficiency. Lim and Brooks (2011) provide a comprehensive survey of the literature about weak form efficiency. In the case of the semi-strong form, many studies have focused on how delays in stock prices responses to new information might create arbitrage opportunities that should not exist in an efficient market. There is an extensive body of knowledge on sources of information that affect the stock price dynamics such as new releases of firm fundamentals, macroeconomic news and announcements from other markets are just a few[1].

The aim of our study is to shed the light on efficiency types in financial and the different methods of measuring it.

1 Efficiency: Concepts and Definitions

The concept of efficiency is widely used in engineering and in natural sciences. Engineering efficiency is defined as the ratio of the amount of work performed by a machine to the amount of energy consumed in the process. Since machines must be operated according to the law of conservation of energy, their efficiency ratios are always less than or equal to unity.

This concept of engineering efficiency is not immediately applicable to economic production because the value of output is expected to exceed the value of inputs due to the "value added" in production. Nevertheless, under certain circumstances, an economic efficiency standard—similar to the engineering standard; can be defined and used to compare the relative efficiencies of economic entities.

1.1 Efficiency, Effectiveness and Performance

We need to a distinction between the two concepts efficiency and Effectiveness.

In many papers written on the subject of performance measurement, there been confusion in the use of terms efficiency, effectiveness and performance.

Norman & Stoker defined "Effectiveness" as the attainment of pre-determined goals (outcomes or outputs), and they defined "Efficiency" as the use of resources in the attainment of outputs, in the context of environmental factors[2] .

Ho and Zhu defined "Efficiency" as "doing things right" and "Effectiveness" as "doing the right things". If manager maximizes the output for given level of input, we could say that he has achieved efficiency. Effectiveness refers to the degree of achieving the set goal of the organization[3].

For a long time, efficiency was assessing by measuring the average productivity of labor[4].

Organizational performance: the accumulated results of all the organization's work processes and activities, and whether that activity is hours or intense practice, whether it is carrying out job responsibilities as efficiently and effectively as possible[5].

1.2 Efficiency Concepts:

A few definitions by some of the prominent scholars on the efficiency, are given below:

The performance of any institution is often evaluated in terms of its efficiency in the use of its resources. The concept of efficiency is concerned with measuring the value of output for a given level of input. In a wider context, efficiency management is concerned with fuller utilization of available inputs to achieve an optimum mix of outputs within the boundaries of feasibility in operations[6].

The efficiency of a certain decision-making unit DMU in the case of multiple input and output is established by combining all inputs and outputs into a single efficiency ratio. This ratio reflects a DMUs ability to transform all inputs into outputs simultaneously.

Efficiency can be defined in this context, as the extent to which a decision-making unit (DMU) can increase its outputs without increasing its inputs, or reduce its inputs without reducing its outputs[7].

Farrell (1951) extended the work of Debreu (1951) and Koopmans (1951) to define a simple measure of firm efficiency, which accounts for multiple outputs. Farrell (1951) defined efficiency consisting of two dimensions: technical efficiency and allocative efficiency. Technical efficiency reflects the ability of a firm to obtain maximal output from a given set of inputs. Allocative efficiency reflects the ability of a firm to use the inputs in optimal proportions, given their respective prices and the production technology. The above two measures when combined provide a measure of total economic efficiency[8].

1.3 Efficiency: Composition

Economic efficiency is about maximizing the aggregate or collective wellbeing of the members of the community. Economists commonly say that economic efficiency requires satisfaction of three components.

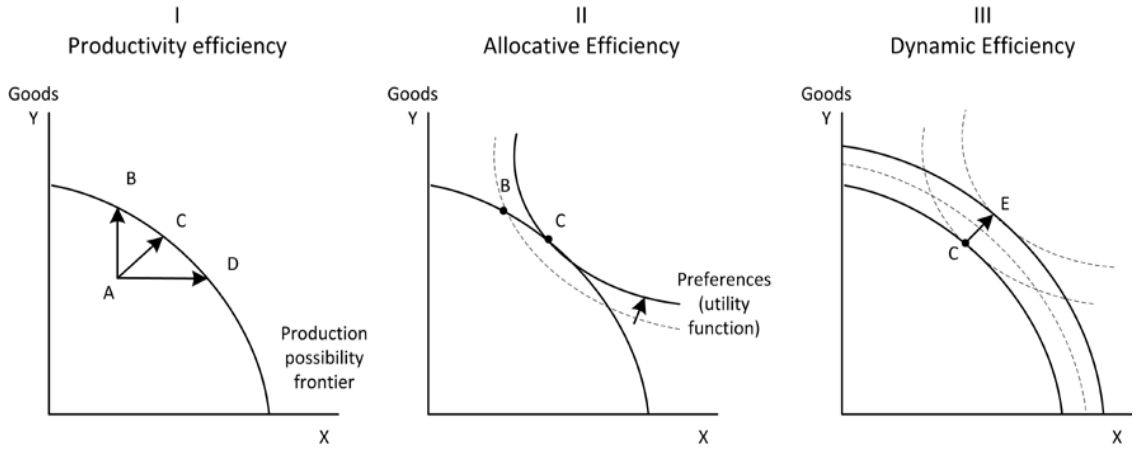
Productive efficiency is achieved when output is produced at minimum cost. This occurs where no more output can be produced given the resources available, that is, the economy is on its production possibility frontier (PPF). In panel I below, a shift from A to B, or to C or to D is an improvement in productive efficiency.

Productive efficiency incorporates technical efficiency, which refers to the extent to which it is technically feasible to reduce any input without decreasing the output, and without increasing any other input. When more than one input is used, or more than one output is produced, the ratio of outputs to inputs can be formed only if inputs and outputs are summed into two scalars. If prices are used for that purpose, then technical efficiency merges into productive efficiency[9].

Allocative efficiency is about ensuring that the community gets the greatest return (or utility) from its scarce resources. A country's resources can be used in many different ways. The best or 'most efficient' allocation of resources uses them in the way that contributes most to community wellbeing. In panel II below the move from B to C is an improvement in allocative efficiency as a higher level of utility can be achieved by better matching the output mix to preferences.

Dynamic efficiency refers to the allocation of resources over time, including allocations designed to improve economic efficiency and to generate more resources. This can mean finding better products and better ways of producing goods and services. In panel III this is represented as a shift out in the production possibility frontier, with consumption rising as the economy moves from C to E. This shift can arise from innovation (producing more with less) and from growth in resources such as capital and labour. Improvements in dynamic efficiency bring growth in living standards over time[10].

Figure 01:



Source : Productivity Commission Staff Research Note, On efficiency and effectiveness: some definitions, australian goverment, prodectivity commition, may 2013, AUSTRALIA, P 03.

This concept is also meaningful in the case of financial markets. The efficiency of the financial marktes has been a critical research stream that draws considerable attention from both academicians and policy makers.

2 Financial Markets Efficiency

An efficient capital market is an arena in which many participants, with similar investment objectives and access to the same information, actively compete. The stock market—with numerous profit-motivated professional and private investors continually searching for misvalued securities—certainly provides such a setting. Profit-motivated investors do have strikingly similar objectives. Each prefers a high rate of return to a low one, certainty to uncertainty, low risk to high risk, and so forth. Furthermore, securities law provides that both parties to a transaction must have access to the same material facts[11].

Definitions of market efficiency have to be specific not only about the market that is being considered but also the investor group that is covered. It is extremely unlikely that all markets are efficient to all investors, but it is entirely possible that a particular market (for instance, the New York Stock Exchange) is efficient with respect to the average investor. It is also possible that some markets are efficient while others are not, and that a market is efficient with respect to some investors and not to others. This is a direct consequence of differential tax rates and transactions costs, which confer advantages on some investors relative to others.

Fama (1970) introduced an efficient market as: "*a market where there are large numbers of rational profit maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants*." Market Efficiency is divided among three interrelated theories: allocation efficiency, operational efficiency and informational efficiency[12]:

- **Allocation Efficiency**: All the players in a market (both public and private) can get funding for the projects which will result in overall economic growth.
- **Operational Efficiency:** Transactions in the market are executed with least cost and on time with minimum errors.
- **Informational Efficiency**: All the information available in the market is already reflected in the current market prices.

An efficient market is one where the market price is an unbiased estimate of the true value of the investment. Implicit in this derivation are several key concepts[13]:

(a) Contrary to popular view, market efficiency does not require that the market price be equal to true value at every point in time. All it requires is that errors in the market price be

unbiased, i.e., that prices can be greater than or less than true value, as long as these deviations are random1.

(b) The fact that the deviations from true value are random implies, in a rough sense, that there is an equal chance that stocks are under or over valued at any point in time, and that these deviations are uncorrelated with any observable

variable. For instance, in an efficient market, stocks with lower PE ratios should be no more or less likely to under valued than stocks with high PE ratios.

(c) If the deviations of market price from true value are random, it follows that no group of investors should be able to consistently find under or over valued stocks using any investment strategy.

Financial markets are efficient if current asset prices fully reflect all currently available relevant information.

An efficient capital market is a market that is efficient in processing information… In an efficient market, prices 'fully reflect' available information"[14].

An efficient capital market is one in which the purchase or sale of any security at the prevailing market price is a zero–NPV transaction. That is, you can expect to earn only a return adequate to compensate you for the risk you bear[15].

Conditions needed for an Efficient Market:

- Information is widely and cheaply available to all investors
- A large number of investors who seek to maximize their welfare

3 Forms of financial Market Efficiency

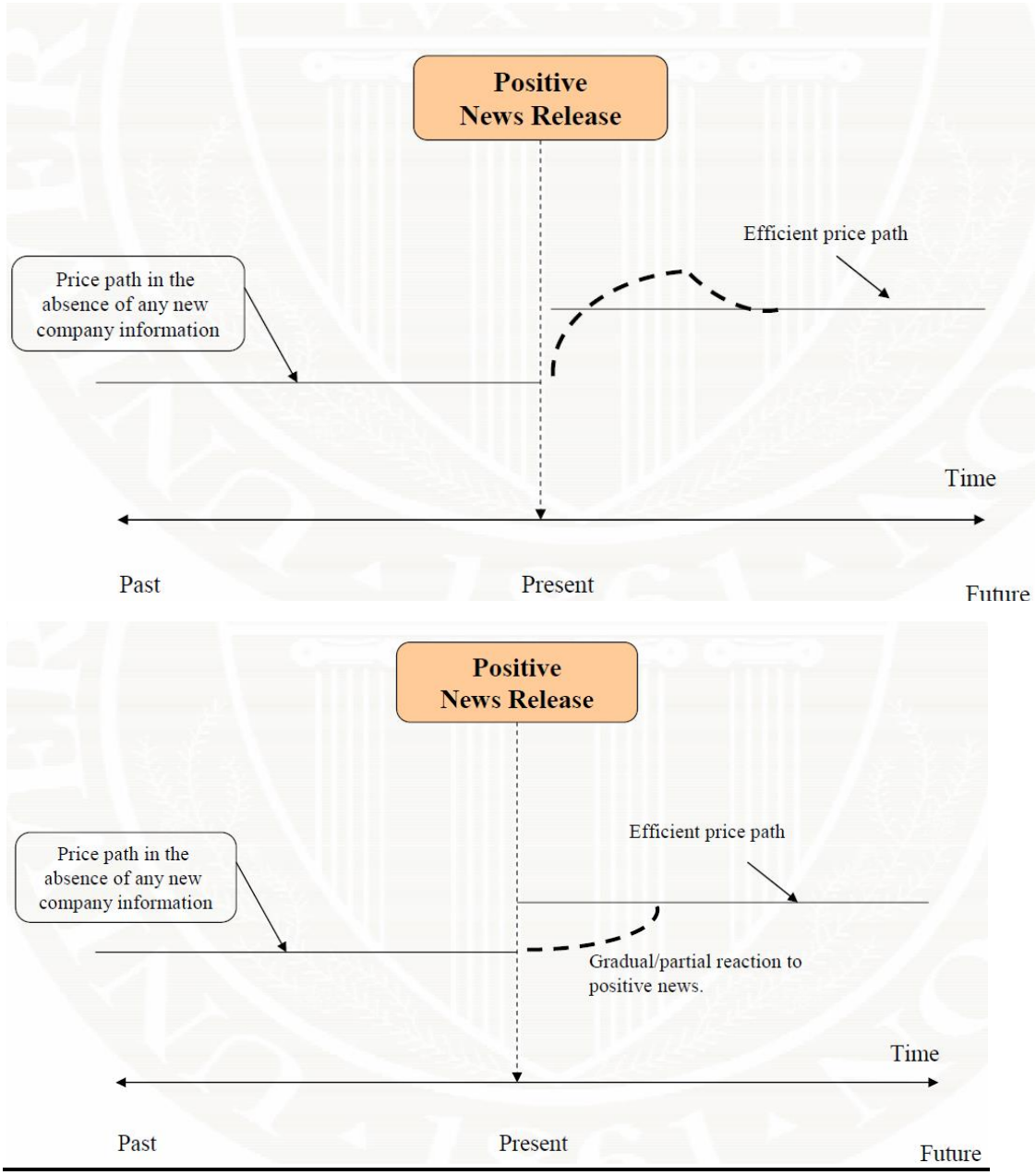
The term market efficiency is used to explain the relationship between information and share prices in the capital market literature. Fama classifies market efficiency into three categories namely, weak-form, semi-strong form and strong form. The EMH, popularly known as the Random Walk Theory, simply points out that current stock prices fully reflect available information about the value of the firm and there is no way to earn excess profits (more than the market overall) by using this information. Thus the efficient market hypothesis (EMH) is a concept of informational efficiency and refers to market's ability to process information into prices[16].

Three Forms of efficiency were put forward by Fama which started the discussion on efficient markets which are :

- **The Weak Form:**

A market is efficient in the weak form when current prices reflect past market information (prices and volumes) in such that a technical analysis is no longer a viable tool for generating abnormal returns[17].

Also, The "Weak" form asserts that all price information is fully reflected in asset prices, in the sense that current price changes cannot be predicted from past prices. The implication of the weak-form of efficiency is the random walk hypothesis, which indicates that successive price changes follow the random walk hypothesis, which indicates that successive price changes are random and serially independent[18].



- **Semi- The Strong Form:**

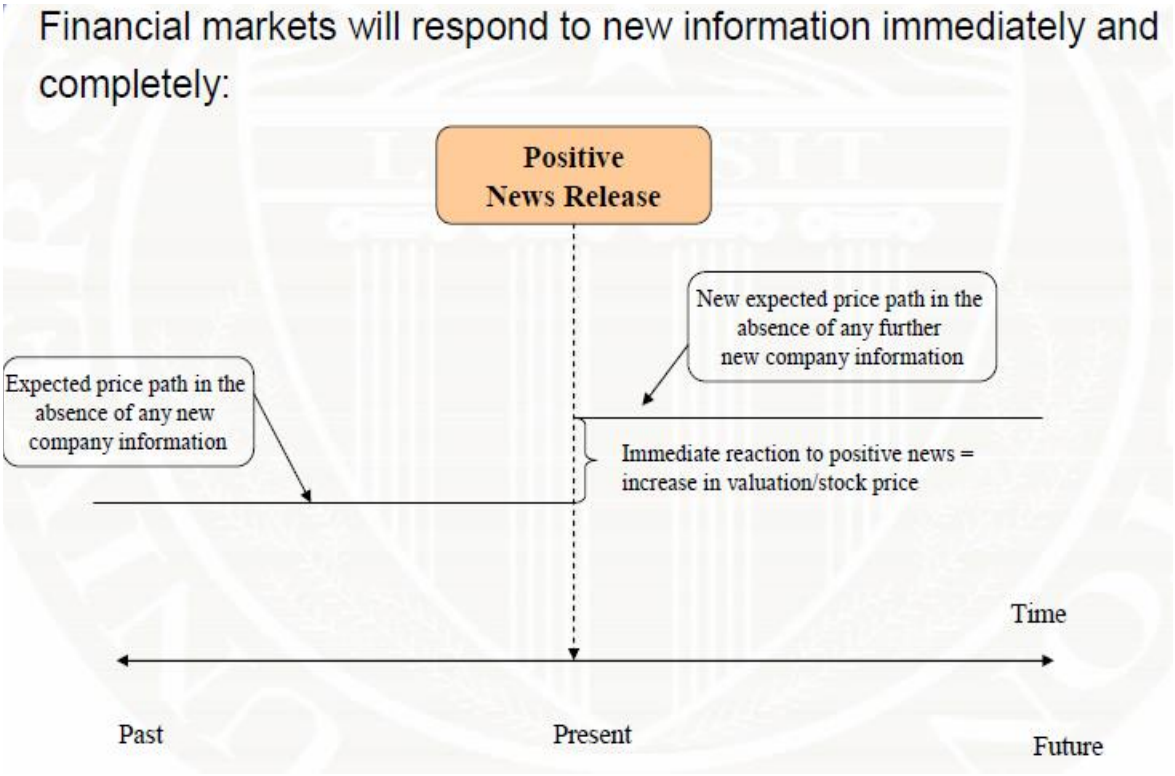
The semi-strong form EMH affirms that current prices reflect all publicly available information including non-market information[19].

The "Semi-strong" form suggests that no profits can be made even when all public information can be used for trading. The semi-strong-form of efficiency implies that neither fundamental analysis nor technical analysis will be able to reliably produce excess returns.

- **The Strong Form**

According to this level of efficiency, the share prices in the market reflects all information concerning including public and private information, which includes a strong level of efficiency that the internal information are difficult to use in realizing abnormal returns, because the information reflects an ongoing basis by the market[20].

The "Strong" form postulates that prices fully reflect information even if some investors or group of investors have a monopolistic access to some information. Therefore, no one can have advantage on the market in predicting prices since there is no data that would provide any additional value to the investors.



We conclude from this paper research that the issue of efficiency is fundamental in finance, in general terms, market efficiency means that prices "fully reflect all the available information" (Fama, 1970, p 383). Efficiency is defined at three different levels, according to the level of information reflected in the prices. Three levels of the efficiency market hypothesis (EMH) are expressed as follows: weak-form, semi-strong and strong form.

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