Efficiency of financial markets

Why should we be interested in the efficiency of financial markets? Are financial markets efficient? Which trading strategy should we implement to profit from market inefficiency?

Definition of market efficiency

A market is said to be efficient if the price of assets traded on this market reflects all available information. [1]

The concept of efficiency is related to information (to be precise we should talk about informational efficiency). In practice, information can refer to the knowledge of historical asset prices and transaction volumes (or any information obtained from a statistical or mathematical model using these variables) or a news about firms like the announcement of its financial results. It can be public information (known to all market participants) or private information (held by a few investors).

Information is the lifeblood of financial markets. Like a raw material, the news flow followed and analyzed by investors is the basis for their financial decisions: buy, sell or do nothing.

Why should we be interested in market efficiency?

The main role of financial markets is to assure an economically efficient allocation of financial resources and financial risks among all the actors of the economy. In order to achieve this objective, it is important that prices reflect the real value of assets. Who would be happy to find out that the price of stock he or she bought €30 is indeed equal to €15 only?

[1] The concept of market efficiency has been developed in the 1960s by economists in the United States including Eugene Fama, Professor of finance at the University of Chicago.

Different degrees of market efficiency

More precisely, Eugene Fama [2] distinguishes three degrees of informational efficiency:

- Weak efficiency: all information contained in historical market data (asset prices and transaction volumes) is reflected in today prices.
- Semi-strong efficiency: in addition of information contained in historical market data, all public information (financial results of firms, analysts reports, etc.) is already reflected in today prices.
- Strong efficiency: all information, public but also private, is already reflected in today prices.

Empirical works carried out by researchers on market efficiency since decades have shown that financial markets tend to be efficient in the weak and semi-strong sense but not in the strong sense.

Market efficiency and trading strategies

In a weakly efficient market, all strategies which try to use historical market data to predict the future evolution of market prices are useless because information contained in past prices is already incorporated in the price when orders are sent to the market. In such a market, methods like technical analysis or statistical models do not allow to beat the market on the long term.

In a semi-strongly efficient market, all strategies which try to use public information of firms to predict the future evolution of prices are useless because information publicly available is already incorporated in the price when orders are sent to the market. In such a market, methods like fundamental analysis do not allow to beat the market on the long term.

In a strongly efficient market, all strategies which try to use all information – private in addition to public information - are useless because information held by well-informed individuals (as firm managers) or institutions (such as banks or investment funds) is already incorporated in market prices.

[2] Fama E. (1970) « Efficient Capital Markets: A Review of Theory and Empirical Work » *Journal of Finance*, 25, 383-417. See also: Fama E. (1991) « Efficient Capital Markets: II » *Journal of Finance*, 46, 1575-617.

Practical implication

In an efficient market, it is difficult to do better than the market in term of trading performance. Over a long time-period, the return of a trading strategy based on information (whatever the approach, technical using historical prices or fundamental using public information about firms) will not be higher on average than the market expected return for the same level of risk. Moreover, in practice, transaction costs such as direct costs of fees, brokerage commissions and taxes, and indirect costs related to the level of market liquidity. Given the transaction costs, the return of a trading strategy based on public information will always be lower than a buy and hold strategy, which consists of buying and holding assets over time.

Market anomalies and market efficiency

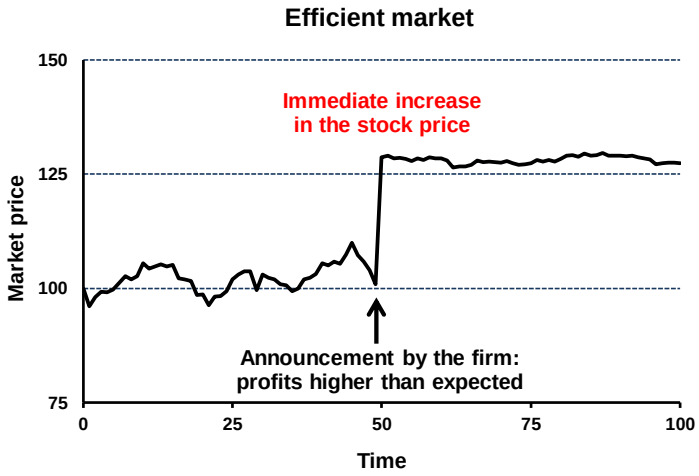
In practice, financial markets are not always efficient. It may appear market inefficiencies (also called market *anomalies* as market efficiency is what is expected). For example, an information given by a firm like the announcement of its financial results may take some time to be incorporated in the stock price due to limited attention of investors.

The simple fact that these market anomalies are exploited by traders (arbitragists for example) implies that they will disappear and at the end make the market more efficient. In the example of an information given by a firm that is not already incorporated in the stock price, the trading strategy allowing to exploit this anomaly is to buy assets if it is a good news or sell assets if it is a bad news, until the market price reaches the new fundamental value of the assets. This is illustrated below.

Illustration of market efficiency

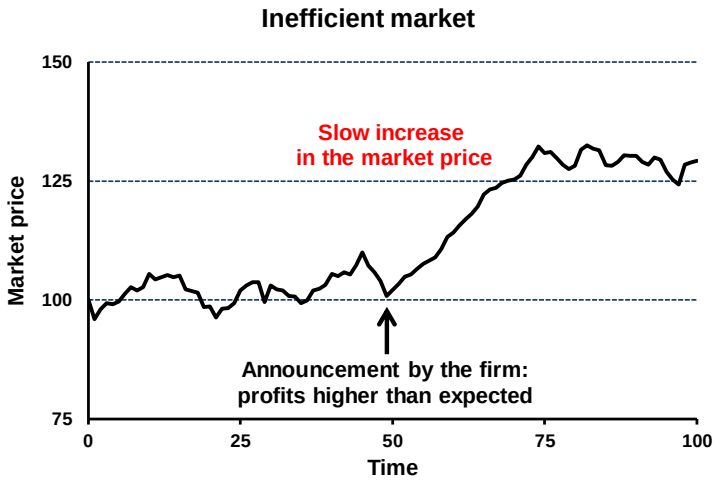
A firm announces its financial results: a profit of M€320 while the market expected a profit of M€290. As such a level was unexpected, this good news was not incorporated in the market price before the announcement. Consider two cases: an efficient market and an inefficient market.

Efficient market



In the case of an efficient market, following the announcement of the profits by the firm, the stock price increases immediately after the news and reaches the new fundamental value of the firm. In such a market, it is extremely difficult – impossible – to implement a trading strategy to exploit public information.

Inefficient market



In an inefficent market, following the announcement of the profits by the firm, the price slowly increased towards its new fundamental value. In such a market, it is possible to implement a trading strategy to exploit public information. As the announced profit is higher that the market expectation (a good news), the strategy is to buy assets until the market price increases and reaches the new fundamental value. Inversely, if the announced profit is lower that the market expectation (a bad news), the strategy is to sell assets until the market price decreases and reaches the new fundamental value.

The level of efficiency is related to the speed at which information is incorporated into the market price, meaning the speed at which the market price converges towards the new fundamental value. This speed depends on the number of traders following the stock.

In terms of return, the exploitation of market anomalies allows one to beat the market (at least temporally). The trader who knows how to exploit a market anomaly gets a return that is higher than the expected return

(expectation that takes into account the level of risk of the trading strategy).

Incorporation of information into market price

In an efficient market, the stock price at a given date incorporates all information available including the expectation of future events. The variation of the market price can then only result from the arrival of new information that hasn't been taking into account by the market.

As illustrated in the two figures above, the evolution of market price is different if the market is efficient or not. In an efficient market, the market price adjusts immediately to unexpected information which arrives to the market (*news flow*). In an inefficient market, the adjustment takes time.

Fisher Black [3] explains clearly this point: « A perfect market for a stock is one in which there are no profits to be made by people who have no special information about the company, and in which it is difficult even for people who do have special information to make profits, because the price adjusts so rapidly as the information becomes available... Thus we would like to see randomness in the prices of successive transactions, rather than great continuity... Randomness means that a series of small upward movements (or small downward movements) is very unlikely. If the price is going to move up, it should move up all at once, rather than in a series of small steps. »

SimTrade simulations

SimTrade is pedagogical tool about financial markets. With simulations, you will understand how financial markets work and learn how to act in financial markets.

In the *SunCar* simulation, there will be news coming out about the company (a producer of cars running with solar energy). This simulation will allow you to appreciate the level of market efficiency and to implement trading strategies to exploit potential market anomalies.

Market efficiency and statistical behavior of financial asset prices

If all information is already incorporated in the market price, then it is impossible to predict the evolution of future prices. In other terms, the

[3] Black F. (1971) « Implications of the Random Walk Hypothesis for Portfolio Management » *Financial Analysts Journal*, 27, 28-35.

evolution of the market price over time will look like a random walk, implying that the price variation over a given period (say yesterday) does not allow to predict the price variation today.

Paradox of acquisition of information

The search for information and the analysis of information is costly. For example, the acquisition of information such as historical data presents an explicit cost (cost of subscription to exchanges or intermediaries). The processing of information to add value needs various skills: knowledge of the real economy, statistical modelling, computer programming, etc.

Sanford Grossman and Joseph Stiglitz [4] studied the problem related to the acquisition of information and emphasized the following paradox: if the market is efficient, meaning that all relevant information is already incorporated into the market price, then no economic agent has incentives to acquire information as the simple observation of market prices is enough to know the value of the shares. But if no economic agent has incentives to acquire information that must be incorporated into the market price, how can the market be efficient?

Grossman and Stiglitz explain this point clearly: « If competitive equilibrium is defined as a situation in which prices are such that all arbitrage profits are eliminated, is it possible that a competitive economy can always be in equilibrium? Clearly not, for then those who arbitrage make no (private) return from their (privately) costly activity. Hence, the assumption that all markets, including that for information, are always in equilibrium and always perfectly arbitraged are inconsistent when arbitrage is costly. » The acquisition of information is then an endogenous phenomenon, in which the number of economic agents deciding to pay the cost of acquisition of information is determined at equilibrium.

[4] Grossman S.J. and J.E. Stiglitz (1980) « On the Impossibility of Informationally Efficient Markets » *The American Economic Review*, 70, 393-408.