
UNIT 9 EFFICIENT MARKET HYPOTHESIS

Objectives

After reading this Unit, you should be able to:

- Explain the concept of market efficiency
- Differentiate various forms/degrees of market efficiency
- Undertake various empirical tests of market efficiency
- Pinpoint implications of Efficient Market Hypothesis (EMH) for security analysis and portfolio management.

Structure

- 9.1 Introduction
- 9.2 Definitions of Market Efficiency
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9.1 INTRODUCTION

In the last three units, we have discussed two different approaches namely, the Fundamental Analysis and the Technical Analysis that are used by the investors in taking investment decisions. These approaches were used under the assumption that the current market prices are different from its intrinsic value and such analyses will help investors in finding under-priced and over-priced stocks. The validity of the assumption that the market price is not equal to the intrinsic value is questionable. The third approach, called 'Efficient Market Hypothesis', is based on the premise that current market price is a true reflection of the value of the securities (stocks) and hence it is futile to expect that fundamental or technical analysis will yield a superior return by identifying under-priced or over-priced stocks. Under efficient market hypothesis, investors can expect a return commensurate with the risk associated with such investments.

Efficient Market Hypothesis was an issue that was the subject of intense debate among Academics and Finance Professionals during the last four decades. The Efficient Market Hypothesis states that at any given time, security prices fully reflect all available information. The implications of the efficient market hypothesis are truly profound. Most individuals who buy and sell securities (stocks in particular), do so under the assumption that the securities they are buying are worth more than the price that they are paying, while

securities that they are selling are worth less than the selling price. But if markets are efficient and current prices fully reflect all information, then buying and selling securities in an attempt to outperform the market will effectively be a game of chance rather than skill.

Under efficient investors can not outperform the market since there are numerous knowledgeable analysts and investors who would not allow the market price to deviate from the intrinsic value due to their active buying and selling. The current market price therefore reflects the intrinsic value at all time and hence, there is no need for fundamental analysis or technical analysis. Empirically also market prices have been observed to move randomly or independently. A net outcome of all this had been a good deal of confused surroundings of the efficient market model or random walk model. It is perhaps for the same reason that we still talk of efficient market hypothesis and not efficient market approach to equity investment decision.

In this Unit, you will get introduced with the concepts and forms of market efficiency, some empirical tests of EMH and also the anomalies in EMH. Efforts have also been put to enlighten you on some of the Indian studies on market efficiency and to a certain extent on the implications of EMH for security analysis and portfolio management.

9.2 DEFINITIONS OF MARKET EFFICIENCY

The efficient market theory was discovered by chance, in 1953, by Maurice Kendall distinguished statistician. Kendall had been looking for regular price cycles, but to his surprise he could not find any. He came to a finding that there exists no pattern in the movement of share prices and that the change in prices is a random event. To quote Maurice Kendall himself "As if once a week the demon of chance drew a random number and added it to the current price to determine the next weeks price." Initially, this result disturbed many economists because they interpreted the random behaviour of stock prices as an outcome of erratic market psychology and it follows no logical rules. However, over a period of time, they started appreciating that in a well functioning or efficient market, prices will indeed change randomly reflecting the impact of new information.

The Efficient Market Hypothesis slowly evolved in the 1960s from the Ph.D. dissertation of Eugene Fama. Fama persuasively made the argument that in an active market that includes many well-informed and intelligent investors, securities will be appropriately priced and reflect all available information. If a market is efficient, no information or analysis can be expected to result in out performance of an appropriate benchmark.

An **efficient market** is defined 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. In an efficient market, competition among the many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities already reflect the effects of information based both on events that have already occurred and on events which, as of now, the market expects to take place in the future. In other words, in an efficient market at any point in time the actual price of a security will be a good estimate of its intrinsic value.

William Sharpe stated that "a perfectly efficient market is one in which every security price equal its market value at all times". An efficient capital market is a market that is efficient in processing information. The prices of securities observed at any time are based on "correct" evaluation of all information available at that time. In an efficient market, prices fully reflect all available information. Substantial evidence has been presented by empirical studies regarding the validity of EMH. Conclusion of these studies is not that superior performance is impossible, but that consistently superior performance for a given risk level is extremely rare.

The random walk theory asserts that price movements will not follow any patterns or trends and that past price movements cannot be used to predict future price movements. Much of the theory on these subjects can be traced to French mathematician Louis Bachelier whose Ph.D. dissertation titled "The Theory of Speculation" (1900) included some remarkably insights and commentary. Bachelier came to the conclusion that " *The mathematical*



expectation of the speculator is zero" and he described this condition as a "fair game." Unfortunately, his insights were so far ahead of the times that they went largely unnoticed for over 50 years until his paper was rediscovered and eventually translated into English and published in 1964

Market efficiency has implications for corporate managers as well as for investors. This takes a lot of the "gamesmanship" out of corporate management. If a market is efficient, it is difficult to fool the public for long. For instance, only genuine "news" can move the stock price. It is hard to pump-up the stock price by claims that are not verifiable by investors. "Fake" news will not move the price, or if it does, the price will quickly revert to the pre-announcement value when the news proves hollow. Publicly available information is probably already impounded in the price. This is hard for some managers to believe. An example is the Sears' attempt to sell the Sears Tower in Chicago in the late 1950's. The company believed that since it carried the property on its balance sheet at greatly depreciated values, the public did not credit the company with the full market price of the building and thus Sears's stock was underpriced. This proved to be false. In fact, it seems that Sears was overestimating the value of the building and the stock price was relatively efficient!

Another lesson: accounting tricks don't fool anybody. Don't worry about timing accounting charges and don't worry about whether information is revealed in the footnotes or in the statements. An efficient market will quickly figure out the meaning of the information, once it is made public.

Rational investors seek to maximize returns at a given level of risk. If a security is underpriced, investors will quickly identify it and rush to pick it up. Competition for the underpriced security drives the price up. Hence it would be difficult to consistently achieve superior performance. Most securities are correctly priced and it should be possible to earn a normal return by randomly choosing securities of a given risk level.

Notion of financial market efficiency is in fact akin to the concept of profit in a perfectly competitive market. Abnormal or excess profits, in such a market are competed away. In an efficient market new information is discounted as it arrives. Price instantaneously adjusts to a new and correct level. An investor cannot consistently earn abnormal profits by undertaking fundamental analysis (to identify undervalued/overvalued securities) or by studying the behaviour of share prices with a view to discerning definite patterns. Isolated instance of windfall gains from the stock market does not negate the theory that markets are efficient.

Paradox of the efficient market is that it is efficient because of the organized and systematic *efforts* of thousands of analyst to evaluate intrinsic values. It ceases to be efficient the moment such efforts are abandoned by the investing community and analyst firms. Market prices will promptly and fully reflect what is known about the companies whose shares are traded only if investors seek superior returns and analyze information promptly and.. perceptively. If the efforts were abandoned, the efficiency of the market would diminish rapidly. In order for EMH to be true, *it is necessary for many investors to disbelieve it!*

9.3 FORMS OF MARKET EFFICIENCY

Eugene Fama gave three flavours to market efficiency and subsequently all empirical testing has proceeded on these lines. These three forms have been discussed in detail.

a) Weak form of Efficiency

The weak form means that the current prices of stock already fully reflect all the information that is contained in the historical sequence of prices. Hence abnormal profits cannot be earned by studying the past behaviour of share prices. In other words, weak form of efficiency implies that you can't make excess profits by trading on past trends. You may be surprised to note that a lot of people do exactly just that. They are called technical analysts, or chartists. By implication, technical analysis that relies on charts of prices, moving averages and momentum and volume of trading is not a meaningful analysis for making abnormal trading profits if the markets are efficient in weak form. What would you do if you

notice that every time the market went up by 1%, the next day on average, it went up again by 1/2 %? What would you do if you notice that every time the market went down by 1%, the next day on average, it went down again by 1/2 %? If your answer is that you would buy on an up day and sell on a down day, you have the makings of an active technical trader and you are using a trading rule.

Academics have been testing trading rules like this for forty years, and traders have been exploiting them for even longer. The concept behind the simple rule described above is momentum. Although it is a widely used concept for technical investing, there is no evidence that any short-term market-timing rule actually makes money. The reason for this is the following: **What if everyone followed the same strategy?** Wouldn't the opportunity go away? Further, you have to buy and sell stocks every day, and in doing so, you have to pay brokerage fees. Thus, while major patterns in stock prices should not exist, weak patterns that are too costly to arbitrage may persist. If these simple trends are arbitrated away, then the market will follow a random walk, i.e. past deviation from expected returns tell you nothing about future deviations from expected returns.

A weak-form efficient market is one in which past security prices are impounded into current prices. Since past prices are deemed public information, weak form of efficiency implies semi-strong form of efficiency and semi-strong form efficiency implies strong form efficiency.

b) Semi-Strong form of Efficiency

How about all public information? That is, all information available in annual reports, news clippings, gossip columns and so on? If the market price impounds all of this information, the market is then called Semi-Strong Form Efficient. Most people believe that the U.S. equity markets by and large reflect publicly available information. But one has to consider certain things. Whether the information put on the Internet **public?** Are government files available under the freedom of information act public? There must be subtle shades of semi-strong market efficiency, but they are not typically differentiated. Each new piece of information an analyst gathers should be carefully considered with regard to whether it is already impounded in the stock price. The easier it was to get, the more likely it is to have already been traded upon.

Semi-strong form strikes at the very heart of the analyst profession. Tests of semi-strong have dealt with the speed at which market participants react to public releases of new information. Empirical evidence generally supports the contention that the public reacts quickly to information; but there is also some evidence that the market does not always digest new information correctly.

c) Strong Form of Efficiency

This represents the extreme case of market efficiency. What kind of information is impounded in the stock price? It turns out that there are lots of different levels of market efficiency, depending upon the source or the information being impounded. The best way to illustrate this is through example. Suppose you had a hyper-efficient market that impounded all private information. This means that even a personal note passed between the CEO and the CFO regarding a major financial decision would suddenly impact the stock price! If so, this is called **Strong-Form Efficiency**. Few people believe that the market is strong-form efficient, but it is nice to have this benchmark!

To test the strong form three groups of investors having potential access to private information have been examined. These are:

- a) Corporate Insiders
- b) Stock Exchange Specialists
- c) Mutual Funds

9.4 EMPIRICAL TESTS OF EMH

What is the degree of efficiency witnessed in, the stock market? Is it efficient of the weak form or semi-strong form or strong form? In order to be able to answer these questions, certain empirical tests have been devised. This section would discuss in detail some of the tests used:



9.4.1 Tests of Weak Form

Weak form efficiency should be the simplest type of efficiency to prove, and for a time it was widely accepted that the U.S. stock market was at least weak form efficient. Recall that weak form efficiency only requires that you cannot make money using past price history of a stock (or index) to make excess profits. Recall the intuition that, if people know the price will rise tomorrow, then they will bid the price up today in order to capture the profit. Researchers have been testing weak form of efficiency using daily information since the 1950's and typically they have found *some* daily price patterns, e.g. momentum. However, it appears difficult to exploit these short-term patterns to make money. Interestingly, as you increase the *horizon* of the return, there seems to be evidence of profits through trading. Buying stocks that went down over the last two weeks and shorting those that went up appears to have been profitable. When *you really* increase the horizons, stock returns look even more predictable. Eugene Fama and Ken French for instance, found some evidence that 4-year returns tend to revert towards the mean. Unfortunately, this is a difficult rule to trade on with any confidence, since the cycles are so long that in fact, they are as long as the patterns conjectured by Charles Henry Dow some 100 years ago!

Does this all lend credence to the chartists, who look for cryptic patterns in security prices - perhaps. But in all likelihood there is no easy money in charting, either. Prices for widely traded securities are pretty close to a random walk, and if they were not, then they would quickly become so, as arbitrageurs moved in to buy the stock when it is underpriced and short (sell) it when it is overpriced. But who knows. May be a retired rocket scientist playing around with fractal geometry and artificial intelligence will hit upon something. Of course, if he or she did, it wouldn't become common knowledge, at least for a while! There have been empirical tests of weak-form market efficiency for equities, bonds and futures contracts. Random walk hypothesis suggests that even bond price changes should be essentially random or unpredictable.

Tests of Weak form efficiency

Two groups of tests have been formulated by researchers to test the weak form of EMH. One approach looks for statistically significant patterns in security price changes. Another approach searches for profitable short-term trading rules. Serial independence, filter rules, run tests and distribution pattern test for weak form are described below:

a) Statistical tests of independence

EMH contends that security returns over time should be independent of one another because new information comes to market in a random, independent fashion and security prices adjust rapidly to this new information. Does return of day t correlate with day $t-1$, $t-n$? Two major statistical tests have been used to verify this independence. One is the Autocorrelation test and the other is the Run test.

(i) Serial Independence (Autocorrelation): Autocorrelation measures the significance of the positive or negative correlation in return over time. Does the rate of return on day t correlate with the rate of return on day $t-1$ or $t-2$ or $t-3$. If the capital market is believed to be efficient then one should expect insignificant correlation for all combinations. Randomness in stock price movements can be tested by calculating the correlation between price changes in one period and changes for the same stock in another period.

If the autocorrelation is close to zero, the price changes are said to be serially independent. This is tested for over-short periods (1 to 4 days, even 9-16 days). Fama, for instance, calculated the autocorrelation for the period 1958-1962 for US stock prices. The autocorrelation was found to be insignificant. A similar analysis is done for the BSE Sensitive Index (Sensex) and few other stocks for the period from April 1997 to March 2001 using the daily index value and the results are reported in Table 9.1. The results show that the serial or auto correlation values between the returns of various lags are very low and statistically insignificant except in a few cases. A very low autocorrelation provides some evidence that Indian market is also showing efficiency at weak form and hence any analysis on historical price data is of little use. One of main reasons for achieving weak form of efficiency is creating an environment for active trading and reducing the transaction cost. These two actions will attract a large number of investors to trade and bring some level of efficiency in the market.

**Table 9.1: Serial Correlation (Autocorrelation) of select securities**

Days Lag	Sensex	HLL	Infosys	Reliance	Telco	Tisco
1	0.0332	0.0751	0.1796	0.0359	0.1014	0.0300
2	0.0052	-0.0123	0.0312	0.0167	0.0178	0.0153
3	-0.0018	-0.0582	-0.0173	0.0381	0.0153	0.0309
4	0.0250	0.0097	-0.0548	0.0180	0.0181	0.0450
5	-0.0237	-0.1045	-0.0295	-0.0076	0.0058	-0.0126
6	-0.0366	-0.0647	-0.0384	-0.0136	-0.0541	-0.0518
7	-0.0060	-0.0403	-0.1144	0.0351	-0.0514	-0.0125
8	0.0228	-0.0129	-0.0241	0.0133	-0.0196	-0.0070
9	0.1076	0.0255	0.0622	0.0431	0.0984	0.0469
10	0.0142	-0.0130	0.0248	0.0213	-0.0194	0.0668

(ii) Runs tests confirm efficiency: Price changes may be random most of the time, but occasionally become serially correlated for varying period of time. Further serial correlation coefficients can be affected by extreme values. To overcome these problems, the run test is used. Run tests ignore the absolute values of the numbers in the series and observe only their signs. Given a series of price changes, each price change is either designated a plus (+) if it is an increase in price or a minus (-) if it is a decrease in price. The result is a set of pluses and minuses just like this - +++ - + - +++ - + - ++. A run occurs when two consecutive price changes are the same, two or more consecutive positive or negative price changes constitute one run. For example + + + - - + - + - has three runs. When the price changes in a different direction then, such as a negative price change is followed by a positive price change, the run ends and a new run begins.

The actual number of runs observed is compared with the number that are expected from a series of randomly generated price changes. If no significant differences are found, then price changes are random in character. Studies that have examined the stock price runs have confirmed the independence of stock price changes over time. The actual number of runs for stock price series consistently fell over the range expected for a random series.

(iii) Distribution Pattern: The sum or the distribution of random occurrences will statistically conform to a normal distribution. If proportionate price changes are randomly generated events, then their distribution should be approximately normal. Fama has tested for normal distribution and found only slight difference from the normal. Studies have also been undertaken on technical trading strategies based on information other than historical prices, such as odd-lot figures, volume of short sales, advance-decline ratios, chart pattern, etc. The general conclusion is that such strategies have failed to outperform a naive buy-and-hold strategy.

b) Tests of Trading Rules

The statistical tests of independence were too rigid to identify the intricate price patterns examined by technical analysis. Technical analysis do not accept a set number of positive or negative price changes as a signal of a move to a new equilibrium in the market. They typically look for a general consistency in the price and volume trends over time. Such a trend might include both positive and negative changes. For this reason technical analysts felt that their trading rules were too sophisticated and complicated to be simulated by rigid statistical tests. Advocates of EMH, hypothesized that investors could not derive profit above a buy and hold policy or abnormal profits using any trading rule that depended solely on any past market information about factors such as price, volume, odd lot shares or specialist activity.

Filters can be prescribed for trading as follows:

A share price is increasing and a 20 per cent filter has been set. Suppose it starts declining and when it reaches a level 20 per cent below its peak, it is a sell signal. Similarly, if the share is declining in price and it reverses its trend and level, then it is a buy signal. By using such buy and sell signals, using filters ranging from 1 to 50 per cent several studies found that it was not possible to earn abnormal returns.



Studies of this trading rule have a range of filters from 0.5 percent to 50 percent. The results indicated that small filters would yield above average profits before taking account of trading commissions. However some filters generate numerous trades and therefore substantial trading costs. When these trading commissions were considered all the trading profits turned to losses. Alternatively, larger filters did not yield returns above those of a simple buy and hold strategy (Fama and Blume, 1966).

On a before transaction cost basis these trading rules do appear to work, but there is no evidence that you can profitably trade on this - when transaction costs are included the profitability disappears.

Researchers have generated other trading rules that used past market data other than stock prices. Trading rules have been devised that use odd-lot figures, advanced-decline ratios, short sales, short positions and specialist activities. These simulation tests have generated mixed results. Most of the early studies suggested that these trading rules generally would not outperform a buy and hold policy on a risk-adjusted basis after taking account of commissions (George Pinches, 1970), while a couple of studies have indicated support for the specific trading rules (Brush, 1986 and Proitt and White, 1988). Therefore most evidence from simulation of specific trading rules indicate that these trading rules have not been able to beat a buy and hold policy. These results support the weak form of EMH.

9.4.2 Tests of Semi-Strong Form

Semi-Strong form contends that all public information is fully reflected in security prices. Public information includes company financial statements, earnings and dividends, bonus announcements and macro-economic data.

The most obvious indication that the market is not always and everywhere semi-strong form efficient is that money managers frequently use public information to take positions in stocks. While there is no evidence that they beat the market on a risk-adjusted basis, it is hard to believe that an entire industry of information production and analysis is for naught. It seems likely that there is value to publicly available information, however there are probably degrees to which information really is public knowledge. What is surprising is that recent studies have shown some evidence that excess returns can be made by trading upon very public information. These tests usually take the form of "backtesting" trading strategies. That is, you play a "what-if" game with past stock prices, and pretend you followed some rule, using information available only at the time of the pretend trade. One common rule that seems to perform well historically is to *buy stocks when the dividend yield is high*. This apparently has made money in the past, even though the information about which of the stocks have high yields and which of them have low yields is widely available. Another rule that generates positive excess returns in back-tests is to buy stocks when the earnings announcement is higher than expected. This seems simple, since current announcements and even forecasts are widely available as well.

Does this mean that it is easy to become rich in stock market? Hardly! The profitability of these simple trading rules depends upon the liquidity of the stocks involved and trading costs ("frictions"). Sometimes the costs outweigh the benefits. While many investment managers explain that they pursue a strategy of buying "Value" stocks (such as low PIE firms) few of these managers have consistently superior track records.

The assumption of semi-strong form efficiency is a good first approximation for a market with as many sharp traders and with as much publicly available information as the U.S. equity market. Fama, Fischer, Jensen and Roll have tested the speed of the market's reaction to a company's announcements of a stock split and with respect to a change in dividend policy. They estimated the abnormal returns using "residual analysis". Security returns were regressed against the returns on a market index and the error term in the following linear equation represented the residual or abnormal return.

Fama, Fischer, Jensen and Roll examined 940 Stock Splits on the New York Stock Exchange from 1927 to 1959. Price of the Stocks was examined for a period of 29 months before the date of the split and 20 months after the split. The actual act of splitting did not have any impact on the wealth of shareholders. Further, buying stocks after a stock split did not appear to produce abnormal returns.

Ball and Brown did an analysis of the stock market's ability to absorb the informational content of reported annual earnings per share. They found that those companies which reported "good" earnings experienced price increases and those with "bad" earnings reports experienced price declines. Nearly 85 per cent of the informational content of the earnings announcements was reflected in stock price movements, prior to the release of the actual figure.

9.4.3 Tests of Strong Form

Strong form argues that all information is fully reflected in security prices. The top management has access to corporate and financing strategies. In the same way specialists have access to the book limit orders for any share. Knowledge of the price and quantities of the limit order represent private information. Professional portfolio managers who have large research database and also access to top management may also have access to such private. Merchant banking firms, for example, may have private information on a new company that has not yet been disclosed to the public. To disprove strong form EMH, one has to find an insider who has profited from inside information.

The strong form of EMH is of two types:

- a) Super-strong form which includes insiders and specialists (who possess monopolistic information)
- b) Near-strong form which includes private estimates developed by (who possess information) financial analysts, portfolio managers, etc.

In USA, corporate managers or say one who owns more than 10 per cent of an issue of securities are deemed to be "insiders" under the Securities and Exchange Acts of 1933 and 1944. Insiders are required to report their transactions within 10 days to the Securities and Exchange Commission. Such insider trading information is published in the SECs Official Summary of Securities Transactions and Holdings. Nearly 2 months elapse before information on insider transactions becomes publicly available. Several studies have found that insiders and specialists in USA use such monopolistic information to advantage and earn positive abnormal returns. Hence the super-strong form of EMH was by and large not valid.

Under the Insiders Trading Regulation, 1992, the Securities and Exchange Board of India defined an insider as "a person who, is or was connected with the company or is deemed to have been connected with the company, and who is reasonably expected to have access, by virtue of such connection, to unpublished price sensitive information in respect of securities of the company, or who has received or has had access to such unpublished price sensitive information". Hence an insider could be the company promoter, director, executive, auditor, a lawyer, stock broker, a fund manager or even a newspaper correspondent who may be privy to a certain critical development in the company which could affect the company's share prices, before the general public come to know of the development.

The regulation has also given an illustrative list of information that may be construed upon as price sensitive information. It includes financial results (both half yearly and annual), declaration of dividends (both half yearly and annual), issue of shares by way of public, rights or bonus, any major expansion or execution of new projects, amalgamation, mergers and takeovers, taxation charges, extra-ordinary events like strikes, etc.

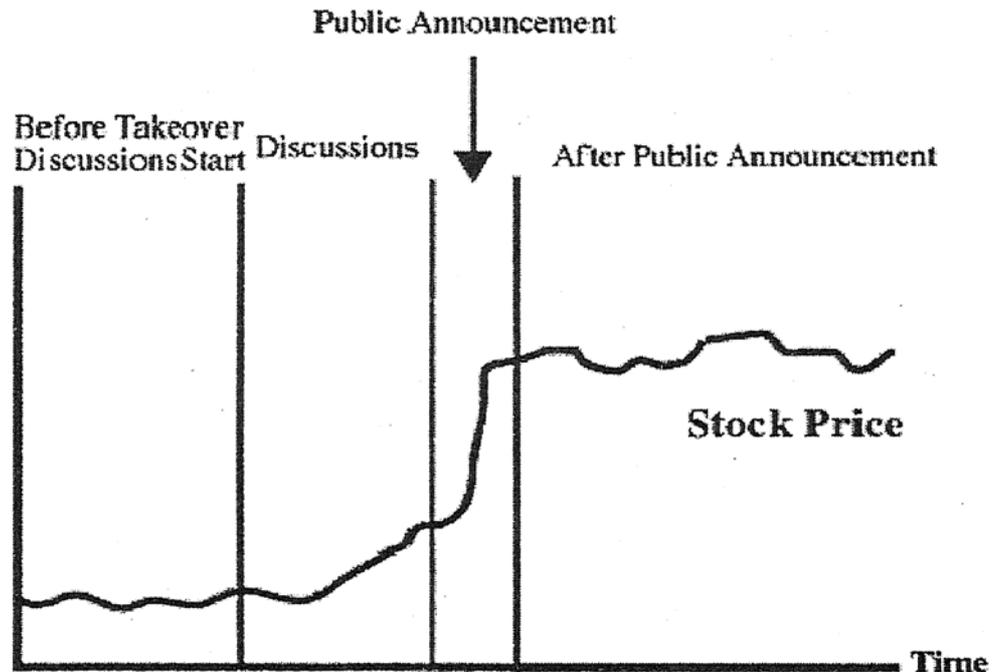
Further the regulation say that a person guilty of insider trading based on reports submitted by the inspection of SEBI is liable to be punished with a civic penalty not exceeding three times of the profit gained or loss avoided as a result of dealing, subject to a minimum of Rs. 5,00,000 or punishable with rigorous imprisonment not exceeding two years, or a fine not exceeding Rs. 5 lakhs or both as the court may decide. (More information on the regulation could be obtained from the SEBI web site: www.sebi.gov.in). With the implementation of the regulation to curb insider trading, it is hoped that stock market would become more efficient and devoid of malpractice.

Even studies in USA that rejected the superstrong form of EMH did not report exceedingly large returns. Insiders have been able to earn abnormal returns of the order of 4-5 per cent over a period of 8 months before transaction costs. Between 1968 and 1977, the performance



of more than 83 per cent of all mutual funds in USA was worse than S&P 500 index. The fact that mutual funds did not outperform randomly selected portfolio probably means that mutual fund managers compete in an efficient market with other portfolio managers of equal competence.

A simple test for Strong Form of Efficiency is based upon price changes close to an event. Acts of nature may move prices, but if private information *release* does not, then we know that the information is already in the stock price. For example, consider a merger between two firms. Normally, a merger or an acquisition is known about by an "inner circle" of lawyers, investment bankers and the firm managers before the public release of the information. When these insiders violate the law by trading on this private information, they may make money. They also make it to the SEC's wall of shame.



Unfortunately, stock prices typically move up before a merger, indicating that someone is acting dishonestly. The early move indicates that the market has a *tendency* towards strong-form of efficiency, i.e. even private information is incorporated into prices. However, the public announcement of a merger is typically met with a large price response, suggesting that the market is not strong-form efficient. Leakage, even if illegal, does occur, but it is not fully impounded in stock price. By the way, until recently, insider trading was legal in Switzerland.

The efficient market theory is a first and good approximation for characterizing how price in a liquid and free market reacts to the disclosure of information. In a word, "Quickly!" If they did not, then the market is lacking in the opportunity we have come to expect from an economy with arbitrageurs constantly collecting, processing and trading upon information about individual firms. The fact that information is impounded quickly in stock prices and that the windows of investment opportunity are fleeting, is one of the best arguments for keeping the markets free of excessive trading costs, and for removing the penalties for honest speculation. Speculators keep market prices close to economic values, and this is good, not bad.

Activity-1

- a) List out three forms of market efficiency.

.....

- b) List out four test of weak form of market efficiency and point out which of the four are statistical in nature?

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9.5 ANAMOLIES IN EMH

Securities markets are flooded with thousands of intelligent, well-paid, and well-educated investors seeking under and over-valued securities to buy and sell. The more participants and the faster the dissemination of information, the more efficient a market should be. The debate about efficient markets has resulted in hundreds and thousands of empirical studies attempting to determine whether specific markets are in fact "efficient" and if so to what degree. Many novice investors are surprised to learn that a tremendous amount of evidence supports the efficient market hypothesis. Early tests of *the* EMH focused on technical analysis and it is chartists whose very existence seems most challenged by the EMH. And in fact, the vast majority of studies of technical theories have found the strategies to be completely useless in predicting securities prices. However, researchers have documented some **technical anomalies** that may offer some hope for technicians, although transaction costs may reduce or eliminate the advantage.

a) Technical Anomalies

A question that has been subject to extensive research and debate is whether past prices and charts can be used to predict future prices. "Technical Analysis" is a general term for a number of investing techniques that attempt to forecast securities prices by studying past prices and related statistics. Common techniques include strategies based on relative strength, moving averages, as well as support and resistance. The majority of researchers that have tested technical trading systems (and the weak-form efficient market hypothesis) have found that prices adjust rapidly to stock market information and that technical analysis techniques are not likely to provide any advantage to investors who use them. However others argue that there is validity to some technical strategies. In particular, an excerpt from the sixth edition of Malkiel's book goes like this - "The central proposition of charting is absolutely false, and investors who follow its precepts will accomplish nothing but increasing substantially the brokerage charges they pay. There has been a remarkable uniformity in the conclusions of studies done on all forms of technical analysis. Not one has consistently outperformed the placebo of a buy-and-hold strategy."

Ball and Brown analyzed annual earnings, Joy, Litzenberger and McEnally tested the impact of quarterly earnings announcement on stock prices. They found that favorable information published in quarterly reports is not instantaneously reflected in stock prices. Researchers have also uncovered numerous other **stock market anomalies** that seem to contradict the EMH. The search for anomalies is effectively the search for systems or patterns that can be used to outperform passive and/or buy-and-hold strategies. Theoretically though, once an anomaly is discovered, investors attempting to profit by exploiting the inefficiency should result its disappearance. In fact, numerous anomalies that have been documented via back testing have subsequently disappeared or proven to be impossible to exploit because of transactions costs.

b) Stock Market Anomalies

The stock market related anomalies include-

(i) Fundamental anomalies:

Value investing is probably the most publicized anomaly of the fundamental anomalies and is frequently touted as the best strategy for investing. There is a large body of evidence documenting the fact that historically, investors mistakenly overestimate the prospects of growth companies and underestimate value companies. S. Basu in a well-researched article tested for the informational content of the price earnings multiple. His study inquired into whether low price earnings multiple tended to outperform stocks with high P/E ratios. His study indicates that low P/E portfolio experienced superior returns relative to the market.



Over 20 different studies of market reaction to earnings announcements reported post-announcement excess returns.

(ii) Calendar Anomalies:

These includes anomalies like the January effect, turn of the month effect, the Monday effect and Year ending in 5 effect.

January Effect: According to Robert Haugen and Philippe Jorion, "The January effect is, perhaps the best-known example of anomalous behaviour in security markets throughout the world." The January Effect is particularly intriguing because it doesn't appear to be diminishing despite being well known and publicized for nearly two decades. Theoretically an anomaly should disappear as traders attempt to take advantage of it in advance. The bottom line is that January has historically been the best month to be invested in stocks.

The effect is usually attributed to small stocks rebounding following year-end tax selling. Individual stocks depressed near year-end are more likely to be sold for tax-loss recognition while stocks that have run up are often held until after the new year. Many believe the January effect has moved into November and December as a result of mutual funds being required to report holdings at the end of October and from investors buying in anticipation of gains in January. Some studies of foreign countries have found that returns in January were greater than the average return for the whole year. Interestingly, the January effect has also been observed in many foreign countries including some (Great Britain and Australia) that don't use December 31 as the tax year-end. This implies that there is more to the January effect than just tax effects.

Empirical study has also established that over one-half of the small firm effect occurs in January and most of the abnormal return associated with January takes place during the first 5 days of trading.

Turn of the Month Effect: Stocks consistently show higher returns on the last day and first four days of the month. Chris R. Hensel and William T. Ziemba presented the theory that the effect results from cash flows at the end of the month (salaries, interest payments, etc.). The authors found returns for the turn of the month were significantly above average from 1928 through 1993 and "that the total return from the S&P 500 over this sixty-five-year period was received mostly during the turn of the month." The study implies that investors making regular purchases may benefit by scheduling to make those purchases prior to the turn of the month.

The Monday Effect: Monday tends to be the worst day to be invested in stocks. The first study documenting a weekend effect was by M. J. Fields in 1931 in the Journal of Business at a time when stocks traded on Saturdays. Fields had also found in a 1934 study that the DJIA commonly advanced the day *before* holidays. Several studies have shown that returns on Monday are worse than other days of the week. Interestingly, Lawrence Harris has studied intraday trading and found that the weekend effect tends to occur in the first 45 minutes of trading as prices fall but on all other days prices rise during the first 45 minutes. This anomaly presents the interesting question: Could the effect be caused by the moods of market participants? People are generally in better moods on Fridays and before holidays, but are generally grumpy on Mondays (in fact, suicides are more common on Monday than *on* any other day). Investors should however, keep in mind that the difference is small and virtually impossible to take advantage of because of trading costs.

Year ending in 5

In its existence, the DJIA has never had a down year in any year ending in 5. Of course, this may be purely coincidental. Unfortunately we have to wait till 2005 to see if the streak will continue.

c) Other Anomalies

The Size Effect: Some studies have shown that small firms (capitalization or assets) tend to outperform. The small stock affect was first documented by Rolf W. Banz. He divided the stocks on the NYSE into quintiles based on market capitalization. The returns from 1926 to 1980 for the smallest quintile outperformed the other quintiles and other indexes. Others have argued that it is 'not size that matters, it is the attention and the number of analysts that follow the stock.



Announcement Based Effects: Price changes tend to persist after initial announcements. Stocks with positive surprises tend to drift upward, those with negative surprises tend to drift downward. Some refer to the likelihood of positive earnings surprises to be followed by several more earnings surprises as the "cockroach" theory because when you find one, there are likely to be more in hiding. Robert Haugen in his book *The New Finance: The Case Against Efficient Markets* argued that the evidence implies investors initially underestimate firms showing strong performance and then overreact. Haugen concluded that "The market overreacts-with a lag" and that "we apparently have a market that is *slow* to *overreact*."

IPOs, Seasoned Equity Offerings, and Stock Buybacks: Numerous studies have concluded that Initial Public Offerings (IPOs) in aggregate underperform the market and there is also evidence that secondary offerings also underperform. Several recent studies have also documented arguably related market inefficiencies. Bala Dharan and David Ikenberry found that firms listing their stock on the NYSE and AMEX for the first time subsequently underperform. Tim Loughran and Anand M. Vijh recently found that acquiring firms that complete stock mergers underperform, while firms that complete cash tender offers outperform. The study implies that acquirers who use their stock to effect transactions may believe the stock is overvalued.

Stock repurchases, on the other hand, can be viewed as the opposite of stock issues, and studies have shown that firms announcing stock repurchases outperform in the following years (David et al. 1995). This evidence seems to confirm the theory that managers tend to have inside information regarding the value of their company's stock and their decisions whether to issue or buy back their stock may signal over or undervaluation. The implication of these studies seems to be that investors may do better buying stocks of firms that are repurchasing their own stock rather than from firms that are selling or issuing more of their own stock.

Insider transactions: There have been many studies that have documented a relationship between transactions by executives and directors in their firm's stock and the stock's performance. Insider buying by more than one insider is considered by many to be a signal that the insiders believe the stock is significantly undervalued and their belief that the stock will outperform accordingly in the future. However, many researchers question whether the gains are significant and whether they will occur in the future.

The S&P Game: "The S&P Game" involves buying stocks that will be added to the S&P 500 index (after the announcement but before the stock is added several days later). The fact that stocks rise immediately after being added to S&P 500 was originally documented by Andrei Shleifer as well as Lawrence Harris and Eitan Gurel in 1986 (Also see Messod D. Beneish and Robert E. Whaley). Opportunities may also exist with other indexes.

9.6 INDIAN STUDIES ON MARKET EFFICIENCY

There have been numerous empirical studies on testing the different forms of market efficiency in the developed markets. Though the empirical work is not comparable to the quantity of work in the developed markets, Indian literature on this is not a neglected subject. For instance a study on weak form of efficiency by Ramasastri (2001) tested the efficiency of the Indian capital market for the period from 1996 through 1998 using a powerful technique called the Spectral Analysis. As per his findings, autocorrelation for different lags were found to be statistically insignificant. Further correlogram, based on Sensex, established that Indian stock market has been efficient. Spectral analysis revealed that there is a presence of periodic cycles in the movement of share prices. Yet confirms market efficiency as power function flattens at higher frequencies. Other studies that validated the Weak form of efficiency include Studies by Rao and Mukherjee (1971) Sharma and Kennedy (1977) SK Barua (1980), OP Gupta (1985) and YB Yalawar (1985)

Abhijit Dutta (2001) tested the semi strong form of market efficiency. He attempted to analyze the behaviour of Indian individual investor's reaction to the good and bad news and their effect on the stock market. The statistical inferences were based on three major factors namely, the individual investors confidence in the market, Indian individuals reaction to the market and their portfolio decision. The findings revealed that the Indian



individuals have high confidence in themselves and are not guided by the market discounted asymmetric information. However, since their number is less, their influence is not felt.

A study by Rao and Nageshwara (1997) on the BSE index shows that market react to totality and specifically administered prices react the sharpest in the context. Similarly Arora and Natarajan (1997) concluded that if equilibrium with regard to investment had to be reached then priority assignments amid the goals are to be rather discouraged.

Maiti (1997) had observed the various aspects of shareholding pattern and concluded that institutional investors showed loyalty to blue chip companies leading to an asymmetry in market information as regards investment in stocks. J Ramachandran had studied the impact of bonus issues on share prices and found the market to be efficient in semi-strong form. Other Indian Studies by Desai M (1965), Ojha PR (1976), Prasanna Chandra (1975) and Ramachandran G (1989) showed the dividends have a positive influence on share price behaviour. There has been no empirical study validating the strong form of EMH in India.

9.7 IMPLICATIONS OF EMH FOR SECURITY ANALYSIS

There are three reasons why security analysis remains relevant even in a generally efficient market. In an efficient but less than perfect market, there is a time lag between the arrival of information and its subsequent reflection in price. During the interval, security analysis provides an opportunity to adjust portfolios profitably. Such rewards are captured by institutional investors, who have the capacity to process large amounts of data quickly and efficiently.

Competition of information, which ensures market efficiency, limits the opportunity to earn above average return. The legitimate function of security analysis is to discover information before competitors get it. Security analysis is critical to the investment process even in the case of instantaneous price response. Correct pricing of assets in an efficient market (but less than perfect) does not imply investors' indifference to the choice of assets held in a portfolio. As price of security responds to new information, reflecting change in risk and returns, portfolio adjustment takes place. Security analysis and portfolio management are complimentary to an efficient capital market.

9.8 IMPLICATIONS OF EMH FOR PORTFOLIO MANAGEMENT

Since you are now a lot familiar with the subject could I pose the question "Is it possible to outperform the market?" This is one of the most important questions any investor should ask. This question is relevant for you as an investor and also for the fund managers, who invest in securities promising the naive investors to pay a handsome return on their investment. This they could do only by outperforming the market. If your answer is no and if you believe the market is efficient, then passive investing or indexing - buying diversified portfolios of all the securities in an asset class - is probably the way to go. The arguments for such an approach include reduced costs, tax efficiency and the fact that, historically, passive funds have outperformed the majority of active funds

But if your answer is yes, it is possible to beat the market, then you should pursue active portfolio management. Among the arguments for this approach are the possibility that there are a variety of anomalies in securities markets (that we have discussed in the earlier sections) that can be exploited to outperform passive investments the likelihood that some companies can be pressured by investors to improve their performance and the fact that many investors and managers have outperformed passive investing for long periods of time.

But the active investor must still face the challenge of outperforming a passive strategy. Essentially, there are two sets of decisions. The first is asset allocation, where you carve up your portfolio into different proportions of equities, bonds and other instruments decisions, often referred to as market timing as investors try to reallocate between equities and bonds

in response to their expectations of better relative returns in the two markets, tend to require macro forecasts of broad-based market movements. The second set of decisions includes security selection - picking particular stocks or bonds. These decisions require micro forecasts of individual securities underpriced by the market and hence offering the opportunity for better than average returns.

Active investing involves being 'overweight' in securities and sectors that you believe to be undervalued and 'underweight' in assets you believe to be overvalued. Buying a stock, for example, is effectively an active investment that can be measured against the performance of the overall market. Compared to passive investing in a stock index, buying an individual stock combines an asset allocation to stocks and an active investment in that stock in the belief that it will outperform the stock index. In both market timing and security selection decisions, investors may use either technical or fundamental analysis and growth investing. And you can be right in your asset allocation and wrong in your active security selection and vice versa.

There could be two important implications of EMH for portfolio selection. These are:

1. Even simple random selection leads to portfolio, which approximates the market very closely when 15-20 stocks are held.
2. Index Funds are an outgrowth of the increasing awareness and acknowledgement of market efficiency.

Nobel Laureate William Sharpe makes a simple yet powerful case against active management in his article 'The Arithmetic of Active Management': "If active and passive management styles are defined in sensible ways, it must be the case that: (1) before costs, the return on the average actively managed dollar will equal the return on the average passively managed dollar; and (2) after costs, the return on the average actively managed dollar will be less than the return on the average passively managed dollar These assertions will hold for any time period".

Ambitious investors and investment managers almost all want to beat the market, but it is worth asking why should they want to beat it for you. Why should precious insights into the nature of the market be available for sale to the general public, either directly through a fund or indirectly, perhaps through a book advocating a particular investment technique as the route to out-performance? If an investment technique is so good, it would seem to make more sense to keep its secrets to yourself.

Activity-2

- a) Distinguish between active and passive management of portfolio? Briefly explain the process involved in the active management of the portfolios.

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- b) List out the implications of EMH for security analysis and portfolio management in India.

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9.9 SUMMARY

In this Unit, we have discussed various dimensions of the hypothesis that the stock markets are efficient. We have highlighted the concept and forms of market efficiently viz., weak form, semi-strong form. and strong form. We have also described various empirical tests of EMH. Indian studies on market efficiency are briefly indicated and the anomalies in EMH



are pointed out. The Unit closes by highlighting the implications of EMH for security analysis and portfolio management, "Investing by dart" can still not be recommended as superior equity investment strategy in the context of most of the stock markets of the world. Most of the world stock markets are still less than efficient and hold scope for abnormal returns by following active security analysis and portfolio management strategies.

9.10 SELF-ASSESSMENT QUESTIONS/EXERCISES

1. What do you mean by capital markets are efficient? And why capital market should be efficient?
2. Define market efficiency?
3. Describe the differences in various forms of market efficiency.
4. Describe the different tests of the weak form of EMH.
5. What are the implications of EMH for technical analysis?
6. What factors can act as signaling devices for stock price movements? Explain, how these factors would affect market efficiency?
7. Distinguish between active and passive portfolio management strategies. Why did Index funds become popular in USA?
8. What are some of the anomalies in efficient market hypothesis?
9. What are the implications of EMH for security analysis and portfolio management?

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