CHAPTER - II

REVIEW OF LITERATURE ON THE INFORMATIONALLY EFFICIENT MARKET HYPOTHESIS

In neo-classical equilibrium theory, efficiency refers to Pareto efficiency. A system is Pareto efficient if it is impossible to make any one better off without making some one worse off. Productive efficiency is an implication of Pareto efficiency. An economy is productively efficient if it is impossible to produce more of any one good or service without lowering the output of some other. In finance, the word 'efficiency' has taken quite a different meaning.

A capital market is said to be (informationally) efficient if it utilizes all the available information in setting the prices of assets at levels reflecting the present value of expected future cash flow from the asset. The basic intuition of efficient markets is that individual traders process the information that is available to them and take positions in assets in response to their information as well as to their personal situations. The market price aggregates this diverse information and in that sense it 'reflects' the available information. Moreover, efficiency with respect to some information set, $I_t$, implies that it is impossible to make economic profit by trading on the basis of $I_t$. 

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The relation between the definitions of efficiency is not obvious, but it is not unreasonable to think of the efficient markets definition of finance as being a requirement for a competitive economy to be Pareto efficient. Presumably, if prices did not depend on the information available to the economy, then it would only be by accident that they could be set in such a way as to guarantee a Pareto efficient allocation (at least with respect to the commonly held information).

If the capital market is competitive and efficient, then neoclassical reasoning implies that the return that an investor expects to get on an investment in an asset will be equal to the opportunity cost of using the funds.

FORMS OF THE EFFICIENT MARKET HYPOTHESIS

It has been customary since Roberts (1967), to distinguish the three levels of market efficiency by considering three different types of information sets. But it was Fama (1970a) who has given a general framework. After that market efficiency is generally discussed within the framework presented in Fama's 1970b survey article. Fama defined efficient markets in terms of a "fair game" where security prices "fully reflect" the information available. That is, if markets are efficient, securities are priced to
provide a normal return for their level of risk.

Fama suggested that the efficient market hypothesis (EMH) can be divided into three categories - "weak form", "semi-strong" form, and the "strong" form. The distinctions among the weak, semi-strong, and strong forms of the EMH are determined by the level of information being considered.

**Weak Form EMH**

In the "weak form" EMH, the type of information being considered is restricted to only historical prices. It asserts that prices fully reflect the information contained in the historical sequence of prices. Thus, investors cannot devise an investment strategy to yield abnormal profits on the basis of an analysis of past price patterns (a technique known as technical analysis). It is this form of efficiency that is associated with the term 'Random Walk Hypothesis'.

**Semi-strong Form EMH**

The semi-strong form EMH asserts that security prices adjust rapidly and correctly to the release of all publicly available information. Thus, under the semi-strong form, current prices fully reflect not only all past price data but also such information as earnings reports, dividend
announcements, annual and quarterly reports, and news items in the financial press. If a market is efficient in this sense, then an analysis of balance sheets, income statements, announcements of dividend changes or stock splits or any other public information about a company (the technique of fundamental analysis) will not yield abnormal economic profits.

**Strong Form EMH**

The strong form EMH represents the most extreme case market efficiency possible. It asserts that all information that is known to any market participant about a company is fully reflected in market prices. Hence, not even those with privileged information can make use of it to secure superior investment results. There is perfect revelation of private information in market prices. These privileged information can be with corporate "insiders", stock exchange specialists, and mutual funds.

The rational expectations school of macro economics is influenced by the intuition of efficiency in finance. The original insight that prices reflect available information lies at the heart of the rational expectations macro-economics.
If markets are efficient in the weak form, the analysis of past price patterns to predict the future prices, known as technical analysis, will be useless because any information from such an analysis will already have been reflected in current market prices. If investors were confident that a scrip price would double instantaneously, the price will not adjust gradually. If it adjusts gradually a profitable arbitrage opportunity would exist which amounts to rejection of efficient market hypothesis. The genesis for the EMH was with the observation that stock price changes appeared to follow a random walk over time.

To say that a series of data follows a random walk over time means that each observation is independent of the preceding observations. If stock price changes follow a random walk, then the fact that yesterday's price was up, for example, provides no information as to what today's stock price change may be.

The earliest empirical work on the random walk hypothesis was performed by Bachelier (1900). He concluded that commodity prices followed a random walk, although he did not use that term. He developed an elaborate
mathematical theory of speculative prices and tested them against the French Government bond market. He presented convincing evidence that commodity speculation in France was a "fair game" and that current price of a commodity was an unbiased estimate of its future price. Little empirical justification is given for the model but a number of very important mathematical properties were proved.

The second discovery of the random walk model was attributed to Working (1934). He noted that series generated by summing random numbers look like some economic time series. He extensively analyzed commodity prices, noted that speculative price patterns might be shown to be random by demonstrating that even artificially generated series of price changes form apparent trends and patterns.

In another investigation of stock market prices, Alfred Cowles (1933) asked if stock market analysts could predict prices. He found little evidence that they could. He investigated the predictive performance of a group of financial services, advice by financial services, advice by newspaper columnists, the predictions by W.P. Hamilton who was the main exponent of the Dow Theory and the financial records of a group of fire insurance companies. He was interested in the findings of predictive ability of these professionals. A major part of his research focused on the
question of forecasting stock market prices from the past history of prices themselves.

By contrast, Cowles and Jones (1937) reported that stock prices moved with predictable trends. This gave rise to a common belief in the USA that they had put the random walk controversy to rest. In fact, their findings remained as damning evidence against the random walk hypothesis for more than five decades until they were withdrawn, after Working (1960) pointed out errors in their analysis. Cowles and Jones (1937) analysis was actually an investigation of the first-order serial correlations in the first differences of the stock price series. In their analysis, they have taken monthly averages of daily and weekly prices, this averaging have in effect produced a positive serial correlation. This effect of averaging may explain the particularly high apparent predictability of monthly changes despite virtual absence of predictability in changes over three-week intervals which was noted in Cowles and Jones (1937) article.

In 1953, Kendall made significant advances in the study of the random walk model on the U.K. Stock and Commodity prices. These studies generally found that the serial correlation between successive price changes was essentially zero. He analysed the behaviour of 22
price-series, ranging from 486 terms at weekly intervals to 2,387 terms at weekly intervals. He analysed the behaviour of weekly changes in 19 indices of British Share prices, and found that stock price changes behaved as if they had been generated by a suitably designed roulette wheel. The main feature of his analysis is that set of correlations is very small. There are traces of correlation in some instances but, however real, they are very slight. Not only is it impossible to predict a series from its own internal behaviour but it seems equally impossible to predict it from the behaviour of the other price series.

Further, Kendall also analysed two commodity prices. He concluded that wheat prices and cotton prices have behaved differently, as evidenced by a first-order serial correlation of first differences, \( r_1 = +0.313 \), for cotton prices, as against a corresponding coefficient, \( r_1 = -0.071 \), for wheat prices. Because, cotton-price series that Kendall used consisted of monthly averages of, for the most part, daily prices, a serial correlation of about \( r_1 = +0.25 \) in the cotton price series was to have been expected simply as a result of the averaging process. The wheat price series that Kendall used, on the other hand, was compiled without averaging. When this difference in constitution of the two series was taken into account there remained no clear evidence in systematic behaviour in wheat prices and cotton prices.
Roberts (1959) found that a time series generated from a sequence of random numbers had the same appearance as a time series of US stock prices. Roberts conducted simulation tests by comparing the levels of Dow Jones Industrial Average (DJIA) for 52 weeks during December 30, 1955 to December 28, 1956 with a series of numbers created by cumulative random numbers. He concluded that a time series generated from a sequence of random numbers had the same appearance as a time series of Dow Jones Industrial Average (DJIA). He also showed that the first difference of this artificially generated series looked very much like the first differences of DJIA series.

Osborne (1959) found that stock price movements of the New York Stock Exchange were very similar to the random Brownian motion of physical particles. He found that the logarithm of price changes were independent of each other.

Granger and Morgenstern (1963) applied spectral methods to a number of price series from the New York Stock Exchange. Their results confirm the random walk hypothesis as a broad description of the normal behaviour of price series over a wide range of frequencies. They applied spectral analysis on both weekly and monthly data for stock indices and individual stocks in their study. They also concluded that "...at least in the short term, and for the
normal day-to-day or week-to-week workings of the stock exchange the movements in the amount of stock sold are unconcerned with movements in price".

None of the authors (from Bachelier to Granger and Morgenstern) attempted to provide much economic rationale for the hypothesis, and indeed Kendall felt that economists would generally reject it.

The work of Samuelson (1965) and Mandelbrot (1966) provided economic rationale for the random walk hypothesis. It studied the relationship between the role of "fair game" expected return models in the theory of efficient markets and the theory of random walks and these papers came somewhat after the major empirical work on random walks. In the earlier work, "theoretical" discussion, though usually intuitively appealing, was always lacking in rigor and often either vague or ad-hoc. Both have provided a rigorous proof that properly anticipated prices vibrate randomly and that securities market will assuredly be efficient under certain assumptions. They are:

1. No transaction costs;
2. All market participants get free access to all available information, and
3. Identical time horizon and homogenous expectations of market participants regarding current and future prices
Basing their analyses on futures contracts in commodity markets, Mandelbrot and Samuelson show that if the price of such a contract at time $t$ is the expected value at $t$ (given information $I_t$) of the spot price at the termination of the contract, then the future price will follow a martingale with respect to the information sequence ($I_t$); that is, the expected price change from period to period will be zero, and the price changes will be a "fair game".

Fama (1965) not only looked at serial correlation coefficients but also corroborated his investigation by examining a series of lagged price changes as well as by performing a number of non-parametric 'runs' tests. He examined the daily proportionate price changes of thirty industrial stocks in the Dow Jones Industrial Average for five years, ending in 1962. He also studied whether lagged price changes show some dependence. His result was that the serial correlation coefficient did not differ substantially from zero. His estimated average serial correlation for intervals of one, four, nine and sixteen days were 0.03; 0.04; -0.04 and 0.01 respectively. Hence, he concluded that the evidence produced by the serial correlation model seems to indicate that dependence in successive price changes is either extremely slight or completely non-existent. But
before coming to any conclusion, one should remember that Fama's sample included only "blue chip" companies. He also used the various runs tests, for all the stocks the expected length turned out to be extremely similar. Impressive is the fact that there are very few long runs, that is, runs of length longer than seven or eight. There seems to be no tendency for the number of long runs to be higher than expected under the hypothesis of independence. Fama also used the Alexander's (1961) filter technique, it also did not over turn the independence observation of the random walk model.

Moore (1964) was one of the first to look at the serial correlation between successive price changes of individual stocks. He studied weekly changes in the prices of 30 randomly selected stocks for 1951-58 and found an average serial correlation coefficient of a -0.06. Hence he concluded that weekly changes were useless in predicting future price changes. A market index, based on the price changes of 25 of these stocks had a first order serial correlation coefficient of .153. This led Moore to conclude that individual price series behave differently from the market index at least on New York Stock Exchange for the time period covered.
Fama and Blume (1966) examined a variety of filter
techniques - trading techniques where buy (sell) signals are
generated by some upward (downward) price movements from
recent troughs (peaks) - and found that they could not
produce abnormal profits. They applied variety of filter
techniques on the individual stocks of the Dow-Jones
Industrial Average of the US stocks markets.

B.H. Solnik (1973) presented some summary evidence on
stock price formation in eight European countries. He
measured serial correlation coefficients for daily, weekly
and monthly price changes and concluded that profitable
investment strategies could not be formulated on the basis
of the extremely small dependencies found.

Levy (1967) considered a sample of 200 stocks, from New
York Stock Exchange covering a 260 week period from 1960 to
1965. His study shows that stock with relatively above (or
below) average performance in the past six months tends to
have above (or below) average performance in the next six
months. These rules, only seem to apply to the very best
and very worst performers in a random sample of stocks and
only over six-month periods. No similar pattern is seen
over the four-week period.

However, Jensen (1967) has shown that Levy was very
much overstating his case and in particular could be accused
of "data mining". Essentially, Levy has tested his technical rules on the same data that were used to select the model. This resulted in a bias in favour of the model. Jensen and Bennington (1970) applied two of Levy's trading rules to 29 different 21 - 200 security samples over five year periods. They found that "after allowance for transaction costs, the trading rules did not on the average earn significantly more than the buy-and-hold policy". On the basis these results they concluded that the behaviour of security prices is remarkably close to that predicted by the efficient market hypothesis.

Hagerman and Richmond (1973) considered the over-the-counter market in the USA. He found that monthly return of 263 stocks traded on the counter are seriously independent. Hence, they concluded that the over the counter (O.T.C.) market is a weakly efficient market.

Dryden (1970) investigated the formation of daily closing prices of 15 stocks traded on the London Stock Exchange. He reports some deviation from randomness. He considered three London daily indices for approximately 4 years, and found the first order serial correlation coefficient to be statistically significant for all the series. He reported that by using filter rule we can produce substantially higher rate return in comparison to a
buy-and-hold policy in particular for small and medium size filters when transaction costs were ignored. His study suggests that UK Share prices show more dependence than in those of US.

In view of this, he again in his later study (1970a) analysed daily closing prices of 15 individual U.K. shares. All the tests he considered confirmed the random walk theory. The serial correlation coefficients were numerically small and insignificant. Run tests and filter tests also confirmed the random walk theory. From above, we can conclude that the filter rules do not agree with the random walk when applied to London daily indices but a study of daily prices for 14 individual UK companies finds that random walk is supported by filter rules, runs tests and serial correlations.

Kemp and Reid (1971) concluded that infrequently traded shares may not obey a random walk. They concluded after studying daily price series of 51 stocks of the British Stock Market over a remarkably short period of 50 days. In this test they used non-parametric tests and their time period was very short. We straight-away cannot conclude that it disproves the random walk.

Jennergren and Korsvold (1975) investigated daily price series of 45 Norwegian and Swedish stocks. Out of the 30
Swedish stocks, 18 exhibit serial correlations for lag 1 larger than three standard errors in absolute value. Eight additional Swedish stocks have serial correlation coefficients for lag 1 larger than two standard errors in absolute value. Eight out of 15 Norwegian stocks have serial correlation coefficients for lag 1 larger than two standard errors in absolute value (out of those 8, 2 larger than three standard errors). The mean absolute serial correlation coefficient for lag 1 is 0.083 for Norway. It is 0.109 for Sweden. These results were corroborated by runs tests also. On the basis of these tests, they concluded that "random walk hypothesis" is probably not a very accurate description of Norwegian and Swedish stock prices. A logical question is then whether the deviations from randomness are so large that one can exploit them to make superior trading profits. It could well be that the deviations from randomness found here are insufficient to offset the fairly significant transaction costs that are often incurred through mechanical trading rules.

Jennergren (1975) conducted filter tests on the 30 stocks from the Swedish Stock Market during October 1967 - 1971. He reports that "the Swedish Stock Market exhibits larger deviation from randomness so that somewhat profitable filter rules may exist. However, he argues that the question whether the Swedish Stock Market is weakly
inefficient still remains an open one.

Wong and Kwong (1984) studied the daily closing prices of 28 Hong Kong stocks. The results of serial correlation coefficient showed that the successive stock price changes were dependent. Hence, they conclude that the market is not efficient in the weak form.

Random walk hypothesis implies that stock market is efficient in weak form. The stock prices may not follow a random pattern, still it may not be possible to earn abnormal profit due to transaction cost. Thus, while the random walk hypothesis is not strictly upheld, the departures from randomness that do exist are not large enough to leave unexploited investment opportunities. By and large empirical studies support the weak form of the efficient market hypothesis. The series $P_t$, $P_{t-1}$, $P_{t-2}$: ...(price data) does not offer investors any information that allows them to outperform a simple buy-and-hold investment strategy.

THE SEMI-STRONG FORM OF EFFICIENT MARKET HYPOTHESIS

The semi-strong form EMH, argues that all public information is fully reflected in security prices, public information not only includes historical prices and volume
data, but also data such as income statement, balance sheet, earnings and dividend announcements, and macro economic data such as changes in money supply, interest rate, tax rate, government expenditure etc. If market is efficient in this sense, then stock price should adjust instantaneously to new information. Clearly, if the adjustment is completed in very short time, then no one can make excess profits based on the information release.

One of the first studies to examine the semi-strong form EMH was performed by Fama, Fisher, Jensen, and Roll (1969) who analyzed the effect of stock splits on share prices. They examined 940 stock splits on the New York Stock Exchange from 1927 to 1959 for which the split ratio was 5:4 or more. While splits (Bonus shares) themselves provide no economic benefit, splits are usually accompanied by dividend increases that do convey important information to the market concerning management's assessment of the firm's long run earnings and dividend paying potential. The splits usually do result in high returns on splitting shares in the months immediately preceding a split, reflecting the market's anticipation of substantial increase in dividends which, in fact, usually occurs. Substantial returns can be earned prior to the split announcement, but there is no evidence of abnormal returns after the public announcement. Indeed, in cases where dividends were not raised following
split, firms suffered a loss in price, presumably because of the unexpected failure of the firm to increase its dividend. Thus their study lend considerable support to the conclusion that stock market is "efficient" in the sense that stock prices adjust very rapidly to new information.

Scholes (1972) analyzed the price effects of large secondary offerings and found that the stock price tended to decline before the offering. Market professionals believed that large secondary offerings would depress prices temporarily so as to facilitate a large distribution relative to normal trading volume. He found that the price decline was not due to selling pressure created by the large secondary offering but rather to an "information effect". This was because the largest price declines were associated with offerings made by corporate officers and smaller declines were associated with offerings made by groups which would not be considered "insiders". If such a large offer of secondary offering reduces the price level to induce various interested parties to buy the shares, such a price decline would be temporary. But Scholes found that the declines were permanent, especially when sales were by insiders, and thus inconsistent with the temporary price-pressure hypothesis. He also found that large holding of securities can be sold without the price pressure to induce traders to purchase the shares. His samples were also
from New York Stock Exchange. The period covered was from January 1947-December 1965.

Kraus and Stoll (1972) examined the price impacts of block trading on the New York Stock Exchange. They used intraday prices and did find some evidence of a price reversal and an arbitrage opportunity. But these reversals took place within a 15-minute period. It implies that the speed of adjustment is very high and the market is efficient.

Ball and Brown (1968) studied the effect of annual earnings announcements. They classified firms into two groups based on whether their earnings increased or decreased relative to the average corporate earnings. They found that positive abnormal return associated with increased earnings and negative abnormal return associated with decreased earnings happened before the earnings announcement. But after the earnings announcement both groups generated normal returns, thus providing support for the semi-strong form efficient market hypothesis.

Waud (1970) used the method residual analysis to examine the effects of announcement of discount rate changes by Federal Reserve Banks. In this case the residuals are essentially just the deviations of the daily return on the S&P's 500 Index from the average daily returns. He finds
evidence of a statistically significant "announcement effect" on the stock returns for the first trading day following an announcement, the magnitude of the announcement effect is small, never exceeding 0.5 per cent. Moreover, the market anticipates the announcement in advance.

Ball, R. (1972) and Beaver (1973) studied whether the alternative accounting procedures have any effect on the way investors price securities. Ball, R. (1972) finds that changes in accounting method have no significant effect in the aggregate on return, hence on price, though he concedes that it might affect individual investor's opinion of value. Beaver (1973) studied the price-earnings ratio of firms that use accelerated methods of depreciation both for tax and reporting purposes and those that use only for tax purposes, he finds that the average risks and average growth rates were the same for both depreciation groups. Both conclude that market looks beyond accounting methods. Hence evidence for semi-strong form EMH is very strong.

We have studies that do not support the semi strong version of EMH.

Ball (1978) in a survey article reviews over 20 different studies which reported abnormal returns, and agrees that "taken at face value studies of the market reaction to earnings announcements reveal post-announcement
excess returns". Abnormal risk-adjusted returns are systematically non-zero in the period following the announcement. However, he attributes this to inadequacies in the capital asset pricing model (CAPM) used to adjust for risk differentials and suggested several steps to reduce the estimation bias.

Sharpe and Walker (1975) studied the relationship between share prices and revaluation of assets of a sample of relatively large Australian Public companies which announced upward assets revaluation during 1960-70. They found that an announcement of revaluation of assets improved the cumulative average increase in returns by about 18 to 19 per cent above that expected from the general state of the stock markets. These shifts in stock prices were continued over the twelve post-announcement months. This result shows that profitable trading opportunity exists even after the announcement of revaluation of assets. Hence, the result of this study were biased in favour of rejecting the semi-strong form of EMH.

Watts (1978) examined the abnormal returns following quarterly earnings announcements in US stock markets for the period from 1950 to-1969. He found significant return after the earnings announcement. Hence the findings of earlier studies were confirmed. He then examined whether those
abnormal returns can be explained by deficiencies in capital asset pricing model and he finds that deficiencies in the capital asset-pricing model cannot be accepted as an explanation of the observed abnormal returns. The observed abnormal returns after quarterly earnings announcements imply that the market is inefficient, at least in the period 1962-65. However, the inefficiency is not substantial. Only those who can avoid some of the direct transaction costs (e.g. brokers) can make abnormal returns after quarterly earnings announcements.

Jones and Litzenberger (1970) hypothesized that quarterly earnings report significantly greater than anticipated by market professionals from historical earnings trends would cause gradual price adjustments over time (that means an intermediate stock price trend). They found that the performance of stocks whose earnings were 1.5 standard deviations below trend prediction was not significantly different from the performance of the standard and poor's Industrial Index. However, the group of stocks whose earnings were 1.5 standard deviations above trend predictions did consistently out perform those whose earnings were 1.5 standard deviations below trend predictions. Hence, they concluded that while earnings report significantly higher than expected cause gradual upward price revision, earnings reports significantly lower
than expected do not cause gradual downward price adjustments. Information available to the public in the form of quarterly earnings does not seem to be fully discounted by the market at the time it becomes available.

Rendleman, Jones and Latane (1982) also find a relationship between unexpected quarterly earnings and excess return for common shares subsequent to the announcement date.

Joy, Litzenberger, and McEnally (1977) examined prices and quarterly earnings over the period 1963-1968. The earnings for each quarter were compared with the earnings for the same quarter in the previous year. If the current quarter's earnings were 40% or more above the earnings of the same quarter in the previous year, the earnings were classified as substantially better than expected. If the current quarter's earnings were 40% below the previous year's quarterly earnings, the earnings were classified as substantially worse than expected. They noticed that stocks whose earnings were substantially greater than "expected" generated positive abnormal returns while those with earnings substantially below "expectations" generated negative abnormal returns. The earnings changes were not totally unexpected since a majority of the cumulative average abnormal returns occurred before the release of the
earnings announcement. However, after the announcement of the earnings, stock which reported earnings substantially above those of the previous year continued to generate positive abnormal returns. According to their study, investors could have earned positive abnormal returns of approximately 6.5% over the next 26 weeks after the announcement by simply buying stocks which reported earnings 40% above the previous year's quarterly earnings. This represents an evidence against the semi strong form EMH.

THE STRONG FORM OF EFFICIENT MARKET HYPOTHESIS

After studying the semi-strong form hypothesis, we can infer that markets anticipate the stock splits, dividends changes, merger, discount rate changes, and revaluation of assets announcements. These announcements produce abnormal return weeks before the announcements, sometime produce abnormal return even after the announcements. This gives an opportunity for insiders to trade on the basis of this information to make abnormal profit. Jaffe (1974) documented that insiders trading on such information can make profit prior to making announcement. While such trading is illegal generally, in USA, UK and other countries, such trading are also punishable. In India, Securities and Exchange Board of India (SEBI) got the power to regulate insider trading but SEBI has not yet made any
attempt to regulate it. It means that there is no one to regulate insider trading in Indian Stock Market. Even though such trading is not a "fair game", the fact that the market often at least partially anticipates the announcements suggests that it is certainly possible to profit on the basis of privileged information. Thus, the strongest form of the EMH is clearly refuted. Nevertheless, there is considerable evidence that the market comes reasonably close to strong form efficiency.

Who are these people who might have monopolistic information? Top Management of firms, specialists who make markets in the stocks listed on the exchanges. The specialists are the only persons who have access to the "book" of limit orders for a particular stock. Knowledge of the prices and quantities of the limit orders represent private information that would certainly be useful in devising trading strategies and another group is professional money managers. When the analysts for a large money management organization develop their estimates of future earnings and other estimates which are important in pricing securities, this information is frequently retained within the organization and not shared with the public. However, the private information generated by professional investors does not give them an advantage as strong as that afforded those who have true inside information, such as
corporate officers and exchange specialists.

Only the specialists and corporate insiders in real sense have true monopolistic information, on the other hand professional groups like money managers, investment advisors, mutual fund managers developed private estimates from public information. This information might help them to make excess return. Therefore, it would be better if we divide the strong form EMH in to two groups:

1. the "super strong" form, which includes insiders and exchange specialists;
2. the "near strong" form, which includes mutual fund managers, investment advisors.

It is not possible to test "super strong" form. Many studies have attempted the "near strong" form. In the following pages we consider the test conducted regarding "near strong" form.

Tests on the near strong form consist of analyses of the performance of portfolios managed by groups which might have special information. These tests consist of an examination of the performance of professionally managed portfolios. Consistent superiority would suggest that some people have superior access to relevant information not reflected in the prices of stocks.
Cowles (1933) investigated the performance of a group of financial services and professional investors. He failed to find evidence of performance superior to that which could be achieved by investing in the market as a whole. He considered the weekly recommendations of sixteen leading financial services from 1927 to 1932. For each service, the result of investing funds equally over all recommendations was considered in relation to the movement over the period of the whole market. Only six of the sixteen services achieved a higher profit than if one had invested on the whole market and operated a policy of buy and hold. The overall excess profit was -1.43% but there were considerable variation among the firms, one achieving a 20.8% excess profit while three others performed respectively 28%, 31.1%, 32% worse than market average. So he concluded that there was no evidence of superior performance of groups who might have special information.

The most visible of the professionally managed portfolios are the mutual funds. This group generates private information from public information. If this information remains private, it is possible to test the near strong form only indirectly. A number of studies have examined the performance of mutual fund managers.

Friend et. al. (1962) study was the first reasonable
comprehensive and serious study of mutual fund performance. The study covered 189 funds for the period December 1952 to September 1958. Its conclusion was that the performance of the mutual funds was insignificantly different from the performance of an unmanaged portfolio with similar asset composition. Rates of return on the latter were measured by the S & P'S Indices. About one half of the funds performed worse and one half better than the managed portfolios. There was no evidence of consistently superior performance by any of the funds.

William F. Sharpe (1966) studied the performance of 34 mutual funds for the period 1954-63. His performance evaluation considers both average return and risk, as measured by variability in rates of return of the individual fund. He found that, if the expenses of the funds were ignored, nineteen of thirty four funds did better than the Dow Jones Industrial Average, after taking risk into account. After the costs associated with the operation of funds have been deducted, only eleven funds outperformed the Dow Jones portfolio while twenty three did worse. Although another group of mutual funds would give different results, the odds are greater than 100 to 1 against the possibility that the average mutual funds did as well as the Dow Jones Portfolio from 1954 to 1963. So he concludes that mutual fund performance provides evidence that the market for
common stocks and other financial assets is highly efficient.

A more comprehensive study of mutual fund performance by Jensen (1968) covered the performance of 115 mutual funds for the period 1955-64. He measured the risk-adjusted performance of mutual funds utilizing the capital asset pricing model to measure the appropriate risk return tradeoff. Jensen found that while the mutual funds tended to earn gross positive abnormal returns, any relative advantage of the professional managers was lost in management fees.

Though Jensen's results indicate that mutual funds on the average did not outperform randomly selected portfolios of equal riskiness, there remains the possibility that some funds consistently outperform randomly selected portfolios.

Niederhoffer and Osborne (1966) examined the trading of specialists\(^1\) on major exchanges. They concluded that

\[^1\] (*Note: Two Main functions of the specialist are,\n
(a) acting as a broker for other Exchange Members who have taken limit orders at prices, significantly different from the current market price.

(b) acting as principal in attempting to bring about an "orderly" market for the stocks assigned to him.

In this latter function the specialist buys or sells for his own account when there is a shortage on one or both sides of the market.*)
information on unexecuted orders can be used profitably.

Reilly and Drzycimski (1975) considered a group of twelve non-random major world events occurring in the time span from 1955 through 1973. The prime criterion for inclusion was that the event was of major importance, and was largely unexpected by the investing public. The duty of specialists is to provide price continuity and liquidity for the stocks assigned to them. The specialist maintaining orderly market is especially burdensome, the specialist is often required to accept major financial losses, especially during periods of unexpected world crises, such as presidential illnesses, acts of war, or economic events of national or international importance. Their study examines major world events to find out what happens to the specialists when he risks his capital during periods of significant market activity. The evidence presented by them suggest that this responsibility is not that burdensome. Short-run price patterns following announcement of unexpected world events indicate that the major price changes occurs between the close before the announcement and the open on the day after the announcement. The price patterns following the open indicate that he would have consistently made profits on his short sales following favourable announcements and on his purchases following unfavourable announcements. Conversely, the investor
attempting to make short-run profits following the announcements of major world events consistently lost money even before taking into account brokerage commissions.

A Securities and Exchange Commission (1963) study found that over 80% of the time specialists either sell above their last purchase price or buy below their last sale price.

The results of all the studies seem quite consistent with the idea of specialists having monopolistic information. It is apparent that the super strong form of EMH is not valid.

Lorie and Niederhoffer (1968), Pratt and Devere (1978), Finnerty (1976) studies have utilized the information in the Securities Exchange Commission's Official Summary of Securities Transactions and Holdings to examine the profitability of insider trading. In general, all these studies have found that insiders utilize their monopolistic information to their advantage and earn positively abnormal returns by trading in their firm's securities. Even more interesting is that several studies found that non-insiders could earn positive abnormal profits by utilizing the information published in the official summary - this represents evidence against the semi-strong form EMH, since the official summaries is the publicly available
information. So we have evidence against strong form as well as against semi strong form EMH.

"Efficient Markets" theorists have claimed that at any time prices "fully reflect" all available information (See Fama 1970). If this were so then informed traders could not earn a return on their information. Grossman and Stiglitz have (1980) shown that when the efficient markets hypothesis is true and information is costly, competitive markets breakdown. When market is efficient in Fama's (1976) definition then price does reflect the all the information. When this happens, each informed trader feels that he could stop paying for information and do as well as a trader who pays nothing for information. But all informed traders feel this way. Hence having any positive fraction informed is not an equilibrium. Having no one informed is also not an equilibrium, because then each trader, taking the price as given, feels that there are profits to be made from becoming informed. What Grossman and Stiglitz are trying to say is that a sensible market equilibrium would leave some incentive for analysis. Those who acquire costly information would have superior gross returns but only average net returns. Because information is costly, prices cannot perfectly reflect the information which is available, since if it did, those who spent resources to obtain it would receive no compensation.
OTHER ANOMALIES

Generally the economists accepted the weak form of EMH, the semi strong form of EMH and near strong form of EMH. But studies by Basu (1977, 1983) and Banz (1981) found some anomalies. Basu (1977) made an attempt to determine empirically the relationship between investment performance of equity securities and their price-earnings ratios. He found during the period April 1957 - March 1971, the low P/E portfolio seem to have, on average, earned higher absolute and risk-adjusted rates of return than the high P/E securities. The result of his study support the view that P/E ratio information was not "fully reflected" in security prices in as rapid a manner as postulated by the semi strong form of the efficient market hypothesis, as a result, publicly available P/E ratios seem to possess "information content" and warrant an investor's attention at the time of portfolio selection.

Banz (1981) found that substantial abnormal (risk-adjusted) long-run rates of return could be earned by investing in portfolios of smaller firms. His results indicate that the larger the market value of the firm's common stock, the lower the rate of return generated by the stock. However, one should remember that these results suggest a violation of the joint hypothesis that (i) the
asset pricing models employed in these studies have
descriptive validity and (ii) security price behaviour is
consistent with the efficient market hypothesis. If (i)
above is assumed to be true, i.e. asset pricing models are
valid, then we have evidence against the semi strong form
EMH. If models are not true (i.e. misspecification of
model) then it is impossible to distinguish if the abnormal
returns are truly due to inefficiencies or result instead
because of inadequacies of the capital asset pricing model
as a method of measuring risk.

The risk of small firms was underestimated in the
earlier studies because the stocks of small firms do not
trade as frequently as those of large firms and Roll (1981)
has shown that this results in the betas of small firms
being systematically underestimated - which, in turn,
results in their risk-adjusted returns being overstated.

Shiller (1981) has shown that measures of stock price
volatility over the past century appear to be far too high -
five to thirteen times high - to be attributed to new
information about future real dividends if uncertainty about
future dividends is measured by the sample standard
deviations of real dividends around their long-run
exponential growth path. This apparent rejection of the EMH
for the entire stock market goes far beyond the narrow issue
of whether or not some investors or some trading schemes can
beat the market. Shiller's tests, however, are joint tests of market efficiency and the correctness of his model of dividend process.

Marsh and Merton (1983) and Kleidon (1986) conclude that Shiller's findings that stock prices are too volatile, is a result of his misspecification of the dividend process rather than a result of market inefficiency.

From this chapter we can come to the conclusion that by and large, market is efficient in weak form and semi strong form sense. Market inefficiency may well exist and even persist for periods of time. However, market participants will notice it and they will correct it. The strong form of efficiency, by and large, does not rule out above normal profit for specialists and insiders, but it rules out abnormal profit for investment professionals. We can say that market is efficient in near strong form but not in super strong form.