The study of share price behaviour in the stock market is both a well-cultivated and much confused area of research in financial economics and financial management. The mechanisms of the stock market, pricing of securities and various factors affecting the price of shares have intrigued many scholars, economic theorists and skilled statisticians to probe into the phenomenon of pricing of securities. The behaviour of share price has been depicted by different researchers in different manners to explain such behaviour from different angles. The studies of share price behaviour undertaken so far are analogous to the perceptions of the shape of the proverbial elephant by some blind men. The ensuing paragraphs reveal the efforts made by various researchers and their findings to examine the market efficiency in share pricing.

Efficiency of Market in weak Form

Testing of efficiency of market in weak form is equivalent to random walk hypothesis testing. Here the answer for the question, 'How well do past returns predict future return?' is enquired into.

The concept of random walk originated in the work of Louise Bachelier (1900)\(^1\). However the work was related to commodity prices, and not stock prices. Bachelier developed a theory for the behaviour of commodity prices. His work provided convincing evidence that commodity speculation in France was a 'fair game'. Neither buyers nor sellers could expect to make profits.

Random walk concept did not receive much attention until 1934 when

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Working\textsuperscript{2} studied the commodity price and 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.

Some corroborative evidence was also found in the study of Cowles (1933)\textsuperscript{3} who investigated if stock market analysts could predict prices. There was little evidence that stock prices were predictable.

Kendall (1953)\textsuperscript{4} conducted one of the earliest studies to analyse the behaviour of stock prices. The study was one of the earliest to use the serial correlation technique. Kendall analysed the Actuaries Index of Industrial Share Prices for the London Stock Market for the period 1928-38. He considered the weekly series for each of the eighteen industrial groupings, with one additional aggregate grouping. Serial correlation coefficients were computed using lags from one to twenty-nine weeks. Coefficients were insignificant for all the industrial groups, thus supported the hypothesis of randomness.

Roberts (1959)\textsuperscript{5} in a paper, indicated that a series of numbers generated by cumulating random numbers had a striking resemblance with a time series of stock prices—the Dow Jones Industrial Averages. The study examined the values of the stock for the year 1956. Familiar patterns like the head and shoulders formations and other patterns could be detected both in the stock price series and in series of random numbers.


\textsuperscript{3} Cowles, A., Can Stock Market Forecasters Forecast ?" \textit{Econometrica}, Vol. 1, No. 3, 1933


Osborne (1959)\textsuperscript{6}, examined stock prices to see whether these numbers confirmed to certain laws governing the motion of physical objects. In particular his study examined whether price movements were similar.

Moore (1964)\textsuperscript{7} studied weekly changes in prices of 30 randomly selected stocks for 1951-58 and found an average serial correlation coefficient of -0.06. This was surely an extremely low value indicating that data on weekly changes were valueless in predicting future price changes. Moore was one of the first to look at the serial correlation between successive price changes of individual stocks.

King (1966)\textsuperscript{8} investigated the monthly changes of 63 selected stocks between 1927 and 1960 and found them to obey random walk model.

Cootner (1962)\textsuperscript{9} considered weekly prices of 45 stocks listed on the New York Stock Exchange. A mean-square successive differences test (Von Neuman ratio) was used to examine the properties of security prices. He found that stock prices followed a random walk when examined at weekly intervals but produced some trends when examined at longer differencing intervals.

In one study Granger and Morgenstern (1963)\textsuperscript{10} applied spectral methods


\textsuperscript{7} Moore, A. B., “Some characteristics of changes in common Stock Prices”, in Cootner, P. H. The random character of Stock Market Prices, Cambridge, The MIT Press, 1964


to a number of price series from New York Stock Exchange. In general they found that short-run movements in stock prices followed a simple random walk model. However, they found that "the long run movements are not adequately explained by this model".

Broadly, the finding of Godfrey, Granger and Morgenstern (1964)\textsuperscript{11} study were also on the same lines. They suggested that "the random walk hypothesis appears to provide a reasonable model for the logairthmic series for both New York and London —".

One of the most definitive and widely quoted studies to test the random walk hypothesis was conducted by Fama (1965)\textsuperscript{12}. He investigated the daily proportionate price changes of the 30 industrial stocks in the Dow Jones Industrial Average for approximately five years, ending in 1962. The serial correlation coefficients for the daily changes were insignificant. The average correlation coefficient was found to be 0.03. Fama also computed the correlation coefficient for different lags and for price changes across longer differencing intervals of four, nine and sixteen days. The coefficients were found not to differ significantly from zero. The evidence, thus, supported the random walk hypothesis. Fama employed a non-parametric runs test also. The departure from randomness was negligible. Fama's study thus, produced impressive evidence in favour of random walk hypothesis.

Fama and Blume (1966)\textsuperscript{13} showed that filter schemes cannot, in general,

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provide larger returns in comparison to a buy and hold policy when dividends and transaction costs are taken into account. They concluded that "there appears to be both positive and negative dependence in price changes. The order of magnitude of dependence is so small however, that our results add further to the evidence that for practical purposes the random walk model is an adequate description of price behaviour."

Levy (1967)\textsuperscript{14} tested the random walk hypothesis using several different strategies essentially based on relative strength. His sample consisted of weekly closing prices of 200 stocks from New York Stock Exchange covering a 200-week period from 1960 to 1965. He found that stocks with relatively above (or below) average performance in the past six months tended to have above (or below) average performance in the next six months. He claimed better than a buy- and hold policy. This led Levy to conclude that "stock prices follow discernible trends and patterns which have predictive significance and the theory of random walk has been refuted."

Jenson (1967)\textsuperscript{15} pointed out that due to several errors, the results reported by Levy overstated the excess returns earned by the profitable trading rules over the returns earned by the buy-and hold policy.

Jenson and Bernington (1970)\textsuperscript{16} studied the two of Levy's trading rules to 29 different out of 200-security samples over five-year periods and found that after allowance for transaction costs the trading rules did not, on the


average, earn significantly more than the buy and hold policy.

Brealy (1970)\textsuperscript{17} and Cunningham (1973)\textsuperscript{18} found a certain degree of
dependence in stock price behaviour of U.K. But their study was based on
the stock market indices rather than individual company shares.

Kemp & Reid (1971)\textsuperscript{19} however, considered individual share price
movements in U.K. They noticed non-random price changes in 80% of their
sample. This percentage declined to 50% after excluding no change data from
the price series. An elimination of the thinly traded shares from the sample,
thus, led to a different conclusion.

In one study of a relatively smaller stock market, Niarchos (1972)\textsuperscript{20}
using prices of 15 individual stocks and two indices from the Athens Stock
Exchange (Greece) during January 1957 to December 1968, found an average
value of 0.036 for the first order serial correlation coefficient for the individual
stock price series. The first order serial correlations of individual stocks were
all close to zero, thus suggesting that those series were random walks.
Additionally runs tests also supported the serial correlation results. So, the
results of the study indicated that the Greece stock market was efficient in
the weak sense.

Hagerman and Richmond (1973)\textsuperscript{21} examined monthly returns of 253

\textsuperscript{17} Brealy, R., "The distribution and independence of successive rates of return

\textsuperscript{18} Cunningham, S., The predictability of British stock market Prices", \textit{Applied
statistics}, vol. 22, 1973

\textsuperscript{19} Kemp, A. and Reid, G., "Random walk Hypothesis and the Recent Behaviour
of Equity Prices of Britain", \textit{Economica}, vol. 38, 1971

\textsuperscript{20} Niarchos, N. A., "The stock Market in Greece, A statistical. Analysis", Greece :
Athens Stock Exchange, 1972

\textsuperscript{21} Hagerman, R and Richmond, R., "Random walks. Martingales and the OTC",
securities traded in Over the Counter Market in U. S. A. They reported that "—the evidence indicated that monthly returns of stocks traded in Over the Counter are serially independent." Thus, they concluded that "The OTC is a weakly efficient market".

Conard and Juttner (1973)22, who investigated the behaviour of daily prices of 54 German stocks during January 1968 to April 1971 by means of both parametric and non-parametric tests, found greater degree of dependence in German stock price behaviour. They found significant divergence between the observed and expected number of runs in respect of all but six stocks. Thus, they concluded that German stock market cannot be said an efficient one.

Benjamin & Girmes (1975)23 considered a large sample of 543 securities and found that only 30% of them moved like a genuine random walk. About 20 percent of them fluctuated in a non-random manner. The remainder were inconclusive. However, the above contradiction of the random walk hypothesis apparently occurs, because a large number of small and non marketable securities were included in the sample. The randomness was observed in case of the large and actively traded securities.

Solnik (1973)24 studied 234 daily common stock prices and divided data for eight European countries for March, 1966 to April, 1971 and found that the deviation from random walk hypothesis was slightly more in those


countries than that in United States, though serial correlation coefficient was still very small.

A study was conducted by Bradford Cornell (1985)\textsuperscript{25} which was based on the daily observations of the opening and closing price for SP 500 Index and the most actively traded futures contract, from 1982-1984 to find out if the weekly pattern in stock returns continues when futures trading is introduced and whether this pattern is carried over to the futures market. The study concluded that, "there is no evidence that futures prices deviate from the predictions of the efficient market hypothesis"

Using a non-parametric distribution-free test procedure Ashly & Petterson (1986)\textsuperscript{26} established the serial independence of stock returns.

Using modified Hurt-Mandelbrot rescaled range for dependence Lo (1991)\textsuperscript{27} found little evidence of long term memory in historical US stock prices.

Using autoregression and rescaled range statistics Goetzmann (1993)\textsuperscript{28} studied the London stock exchange share price data for almost three centuries. He found evidence of persistence in raw returns greater than five years and of mean reversion in deviations from rolling 20 year averages. Similar patterns were also observed for New York exchange in the same study.

The study conducted by Peters (1991)\textsuperscript{29} on capital markets, however,

\begin{itemize}
\item \textsuperscript{27} Lo, Andrew, W., "long-term Memory in stock Market Prices", \textit{Econometrica}, vol. 59, No. 5, September 1991
\item \textsuperscript{28} Goetzmann, William, N., "Patterns in three centuries of stock market Prices," \textit{Journal of Business}, vol. 66, No. 22, April, PP. 249-70, 1993
\item \textsuperscript{29} Peters, Edgar, E., "Fractal structures in capital markets", \textit{Financial Analysts Journal}, July-August 1991
\end{itemize}
went in favour of a biased random walk and came to the conclusion that the capital market prices did not reflect prices immediately as assumed by the EMH.

The random walk hypothesis again got support from a study jointly conducted by Ambrose, Ancel and Griffiths (1993).\(^\text{30}\)

In a recent attempt, Clare, Thomas and Wickens (1994)\(^\text{31}\) conducted an econometric study on the usefulness of the Gilt-Equity Yield Ratio (GEYR) in predicting the stock returns in United Kingdom. The GEYR emerged as a useful predictor of stock returns and the evidence went against the weak form of EMH. However, the results may be partly tinted due to the fact that pension funds have a large hold on UK security market whereas the EMH testing requires the existence of a large number of individual investors with little or no market power.

Rao and Mukherjee (1971)\(^\text{32}\) used spectral analysis to test the random walk model. They used the weekly average prices of only one company over a 16 years period (1955 to 1971). They found no evidence contrary to the random walk hypothesis. Their study shows that R. W. hypothesis is valid for the Indian Aluminium's weekly average share prices.

Ray (1976)\(^\text{33}\) studied seven daily index series and conducted runs test,

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serial correlation test and spectral analysis. He studied the period from January 1966 to July 1972. He found that the random walk model held good only for iron & steel and cement industries.

In 1977 Sharma and Kennedy\textsuperscript{34} undertook a study to test the applicability to random walk hypothesis to the stock market in India and to compare this behaviour to that of stock markets in United States and England. For this purpose they examined monthly indices of Bombay, New York and London Stock Exchanges during 1963-73 by means of runs test and spectral analysis and concluded that "... Stocks on Bombay Stock Exchange obey a random walk and are equivalent in this sense to the behaviour of stock prices in the markets of advanced industrialised countries...".

In another study Kulkarni (1978)\textsuperscript{35} reported that share price behaviour in India did not obey the random walk model. He examined the RBI weekly series of indices of share prices from 1953-54 to 1965-66 to 1972-73 and monthly series from 1946-47 to 1972-73. It is worth noting that this was the first study to indicate that RWH did not apply to Indian Stock Market.

Barua (1981)\textsuperscript{36} examined the serial independecne of short-term changes in security prices and stock market index in India. The study was based on two data sets, viz. (a) daily closing price quotations of 20 securities, 18 from BSE, one each from Ahmedabad and Delhi and (b) market index for 2 years. The study period covered July 1977 through June 1979. The run test and


serial correlation were employed to test the efficiency of market. The result showed that individual security prices support the randomness, while market index favours dependence of share prices.

Bhalla (1983)\textsuperscript{37} tested market efficiency by assessing the behaviour of 33 individual stocks during the period December 17, 1980 to March 15, 1981. The results of these studies have shown evidences of efficiency of the Indian Capital Market.

O. P. Gupta (1985)\textsuperscript{38} conducted a study, "Behaviour of share prices in India - A test of Market Efficiency" with the primary objective to examine the price behaviour of equity shares in India during the period January 1971 to March 1976 and to test with empirical evidence, the applicability of random walk hypothesis in Indian conditions. Further, it was sought to find out whether there exists a relationship between different share price series, so as to know whether certain share price movements 'lead' the other share price movements. The study concluded that ".............share price movements over the short periods do not display any systematic or recognizable pattern and that share prices are not predictable either from their own historical price behaviour or from the behaviour of the prices of other shares in the market".

Barua and Raghunathan (1986)\textsuperscript{39} in a case study of Reliance Industry Ltd. based on actual returns by following different strategies varified that Indian capital market is inefficient in pricing its securities.

\textsuperscript{37} Bhalla, V. K., \textit{Investment Management and Security Analysis}, New Delhi, S. Chand & Co.


Srinivasan, Mahapatra and Sahu (1988)\textsuperscript{40} studied the daily prices of 30 active shares during April 1987 to May 1988 using serial correlation and runs test. They found no evidence of statistical dependence. The results do not seem to support the weak form of efficiency.

A comprehensive study was conducted by Yalawar (1988)\textsuperscript{41} to investigate the rate of return available on equity investment in the stock market during 1963-83. He also tested the weak form of efficiency of the Bombay Stock Exchange (BSE) in pricing the equities. For these purposes, he utilised the monthly closing prices of a sample of 122 stocks listed on the BSE. The Independence hypothesis was tested by means of the Spearman Rank Coefficients. The randomness in price changes was tested in terms of runs test performed on stock to stock basis and the equally weighted index on sample common stocks and found “niether substantial evidence of linear dependence nor predictable directional price changes. The significant correlations reported by him were so small that it was unlikely to profit from trading rule based on this linear dependence. Hence, his results supported the random walk hypothesis and that the BSE is efficient in the weak form at least in pricing the actively traded common stock.”

Jandhyala L. Sharma (1988)\textsuperscript{42} studied the capital market efficiency by taking the data from 1973-78 from the Bombay Stock Exchange Directory by taking 23 actively traded stocks listed on the BSE. He concluded that

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share prices do not have any "memory" and thus the weak form of efficient market hypothesis was validated. However, it raised an important question as to whether the random walk of shares is a sufficient condition for market efficiency.

Rao (1988) studied the weak form efficiency of the Indian stock market on week-end prices of a sample of ten shares of blue-chip companies during a five year period from July 1982 to June 1987 by means of serial correlation analysis, runs test and 'filter rules' of 2 percent, 5 percent and 10 percent. He reported that eighty out of hundred serial correlation coefficients were within twice their corresponding standard errors. So, he argues that "........the null hypothesis that successive price changes are random cannot be rejected". The runs tests corroborated the findings reached by serial correlation analysis. The filter techniques analysis also lent support to the applicability of the RWH in as much as the rate of return under a buy and hold strategy was found to be higher than the rate of return available under the filter techniques. Thus he concluded "In view of the overwhelming evidence provided by the three types of analysis used for the sample data in support of Random walk hypothesis it may be concluded that the efficient market hypothesis (in its weak form) holds good."

In a study by Pandey and Bhat (1988), the attitudes and perceptions of market participants about the efficiency of stock market were examined. The 160 participants included preparer and users (i.e. chief financial exec-


utives, academicians, chartered accountants, investors and brokers) of accounting information and survey was conducted through the structured questionnaire. The respondents did not believe that Indian stock market had been efficient in any of its three forms. The majority of them considered technical and fundamental analysis and audited accounting information sources to be useful in investment management. On the basis of survey, Pandey and Bhat doubted the efficiency of the Indian stock market.

Anandh and Barua (1989) applying mechanical trading rules to a sample of 47 blue chip companies succeeded in formulating trading rules which outperformed the market and hence concluded that Indian stock market is not weak form efficient.

Maheshwari and Vanjara (1989) too, questioned the efficiency of the Indian stock market. They utilised a sample of 142 securities selected on the basis of their performance and assets during the year 1986. The study spanned over seven years from January 1, 1980 to December 31, 1986. Primarily they were interested in estimating the direction and degree of various relationship during the year 1986. They reported that “............In a bearish market, systematic risk and actual returns are negatively related”. Thus, they concluded that “.............the Indian Stock market is not efficient enough to price its securities according to their risk return characteristics.”

Obaidullah (1990) studied the weekly stock returns of 36 actively


traded scrips for the period January 1985 to December 1988 with the help of serial correlation and runs tests. Serial correlation coefficients for lags 1 to 20 have been computed. It is observed that out of the total 720 coefficients only 56 are more than twice their standard errors. These are corroborated by runs test results. Thus, no contradictory evidence is found against the random walk hypothesis and weak form EMH for Indian stock markets.

Another significant study was conducted by Gupta (1990) for testing the appropriateness of the random walk model for the period April 1979 to December 1987, using data of prices for 5 indices of shares traded on Bombay Stock Exchange during this period. The random walk model was tested by using serial correlation and runs test. On the basis of these tests, Gupta found that random walk model is an appropriate model to describe equity price behaviour in India.

Gupta and Gupta (1991) tested the applicability of random walk hypothesis in the Indian Stock Exchange during the period April 1984 to March 1987 by using daily closing prices of twenty equity shares listed on Bombay Stock Exchange. By using serial correlation and runs tests he found some serial dependence among the day to day price changes in respect of some shares. In terms of runs tests too, he did found some shares which did not obey the hypothesis of randomness. However, in terms of both these tests, majority of sample shares are a good example of random walk. He, thus, concludes that ".........a majority of share prices tested here are adequately described by the random walk model.


Chaudhary (1991)\textsuperscript{50} also tested the log random walk model but reached different conclusions. He used daily price quotations of 93 actively traded shares for the period January 1988 to April 1990. 70 shares were found to have significant auto correlation for one day lag. 17 shares were significant for a lag of 2 days or more. The results do not seem to support the weak form of efficiency. However, the correlation coefficients are of small magnitude. The difference of the findings from that of earlier research findings was attributed to the shift in market's pricing efficiency with respect of individual shares.

Rao and Jayarajan (1991)\textsuperscript{51} also tested the efficiency of Indian stock market under weak form of EMH by examining the equity share price behaviour during three year period ending December 1989. This study has used share price indices instead of individual prices. It includes Economic Times ordinary share index (comprising 13 industry-wise indices), 6 regional indices and an All India Index. The serial correlation analysis strongly supports the weak-form of market efficiency in Indian stock market. The runs test is supporting the existence of randomness in most of cases of industry-wise indices and in 3 out of 6 cases of regional indices. However, similar observations do not hold good in respect of All India Index.

A study to examine the behaviour of share prices in Indian stock market was conducted by Dhankar (1991).\textsuperscript{52} Efficient market hypothesis was tested:

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by using serial correlation and runs tests. Two sets of week-end data of 43 companies listed on the major stock exchanges like Bombay, Calcutta, Madras and Ahmedabad covering period from July 1, 1989 to June 30, 1990 were employed. First set consists of the Economic times All India Index of ordinary shares prices with the base year 1984-85. The second set includes individual shares prices series of 43 selected companies. By analysing the data he concludes that Indian stock market is efficient in the weak form. The results of both tests are also confirmed by market participants including brokers, investors, chartered accountants and finance analysts.

Broca (1992)\textsuperscript{53} examined the randomness assumption for the Indian share returns. Using daily data, the study discovers that share returns exhibit statistically significant difference across days of the week. The lowest mean returns occur on wednesday in contrast to developed markets where monday exhibits the lowest return. Multiple comparison procedure are employed to delineate those pairs of daily means whose difference cannot be attributed to chance. Trading strategies designed exploit these empirical day of the week patterns, however, do not outperform the naive buy and hold strategy.

Barman and Madusoodanan(1993)\textsuperscript{54} assessed market efficiency by using the variance ratio as suggested by Cochrane (1988). The study was based on RBI ordinary share price Index as well as share prices of 35 companies during 1984-1992. Initially they specified two models for assessing market efficiency. For selecting an appropriate model from these two, unit root test was applied to distinguish a model with randomness from one with stationary


component. But the efficiency of unit root test fails when a series is a mixture of temporary and permanent components. In such case variance ratio can be used to decompose the series into stationary and random components. By examining selected data on price series by employing unit root test and varialce test, they concluded that market was not efficient. In other words, this study rejects RWH.

Ranganathan and Subramanian (1993) applied Rescaled Range (R/s) analysis with a view to find evidence of random walk and long term non-periodic dependence. Using the Economic Times (All Industry/All India) index on daily observation for the period of 1984-90, they observed that price series followed a random walk and hence any attempt to predict the future prices would be a futile exercise. They further showed that the results refute long term dependence also.

By using their data, Ranganathan and Subramanian (1993a) again empirically tested further the weak form of efficient market hypothesis using spectral analysis. They reported that spectral evidence exhibited presence of hidden periodic cycles in share price movement. Thus the findings of this study are also in perfect agreement with their earlier study i. e. the results refute the weak form of efficiency.

Vaidyanathan and Kanti Kumar Gali (1994) tested for the weak form of Efficiency of the Indian capital market using runs test, serial correlation


and filter rule tests based on the daily closing prices of ten shares actively traded on Bombay Stock Exchange. The evidence from all the three tests supports weak form of EMH. However, with an unrealistic assumption of zero transaction cost, it may be possible to identify profitable opportunities for using filter rules provided the patterns are stable over time.

By applying the multiple regression approach, Murthy (1994)\textsuperscript{58} examined the relationship between stock prices and monetary variables. He found a strong lagged relation between stock prices and monetary variables like RBI credit to government, index of industrial production, money stock at time t-1, Government expenditure at time t-1 and bank advances at time t+1. This outcome evidenced that the Indian market was not efficient in weak form.

Dhankar, R. S. (1994)\textsuperscript{59} analyzed the week-end prices of 30 non-specified group of companies representing all the major industries, covering the period from September 1990 to August 1993. Empirical results of both parametric and non-parametric tests shows that share price movements in non-specified groups over the short periods do display systematic or recognizable pattern and that share prices are predictable from their own historical price behaviour. There is a definite pattern in successive price changes. Hence, random walk theory does not seem to hold good in non-specified group of scrips.

In a study Belgaumi (1995)\textsuperscript{60} tested market efficiency by using Eco-


nomic Times All India Index and 70 individual weekly 'A' list share prices of selected companies that are traded in the stock exchanges of Bombay, Calcutta, Madras and Ahmedabad during the period April 1, 1991 to March 31, 1992. Results from serial correlation and runs analysis showed that Indian stock exchanges are efficient in weak form.

Mittal (1995)\textsuperscript{61} examined the weak form of efficient market hypothesis by employing serial correlation and runs tests on monthly, weekly and daily share prices of two years 1991 and 1992. He tested weak form of efficiency in case of Bombay, Calcutta, Madras, Ahmeadabad and Delhi Stock Exchange. Again by incorporating industry-wise differences, the weak form of efficient market hypothesis was tested and concluded that share prices are random in character and favoured the weak form of efficiency.

Mahapatra (1995)\textsuperscript{62} attempted to examine the relative strength in performance of 26 major stocks at different time in the Indian stock market during January 1989 to December 1992. Rank correlation analysis has extensively been used in the study to discover whether the performance of a stock in one period relates to its performance in the following period. To some extent the findings of the study support the relative strength theory and disclose that Indian stock market is less efficient in the short run, but more efficient in the longer run.

A latest study was undertaken by Gupta and Gupta (1997)\textsuperscript{63} to re-

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emamine the applicability of the random walk model or weak variant of the EMH in explaining the share price behaviour in India during the recent period July 1988 to January 1996. The results of auto correlation analysis as well as run analysis carried out in respect of each of the 50 shares both from specified and non-specified groups included in the sample were not supportive of the random walk hypothesis. Some of the observed coefficients were larger than those obtained in other studies. Thus, the results obtained here do not lend support to the view that the Indian stock market is weak form efficient in pricing shares where market efficiency is understood as generating security prices which fully reflect information contained in their historical records. It appears that the Indian stock market does not incorporate all of the information contained in past prices into current prices.

A significant study was conducted by Basu and Morey (1998) for examining if and how economic reforms initiated in the mid 1980s have affected the behaviour of Indian stock prices. To address this issue a recently developed non-parametric variance ratio tests spanning a sample period of July 1957 to October 1996 has been employed. The study shows that from the mid 1980s, aggregate equity prices in India behaved like a random walk suggesting that Indian stock prices obeyed Fama's efficient market hypothesis after the beginning of the economic reforms. It was also found that, to some extent, this progress towards efficiency was thwarted after the infamous scam of September 1991 - May 1992.

It can be discerned from the forgoing discussion that the weak form of EMH or the random walk implies that the short runs changes in prices

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i. e. the daily or weekly changes deny well defined patterns. However, it is pertinent to put on record the observations made by Fisher and Jordan (1992) that it is the day-to-day, week-to-week price changes and consequently return changes that are random and not the price levels themselves. Consequently it is entirely possible while believing in random walk to believe also in the existence of an upward or downward drift in prices of individual securities over a longer period of time. In other words, random walk says nothing about trends in the long runs or how price levels are determined, it speaks only of the phenomenon of short run price change independence.

Efficiency of Market in Semi-strong Form

The tests conducted under this postulated form of efficiency of market is called 'event studies' or 'studies of information effect'. Tests of event studies' are performed by examining the speed with which the share price adjust to the new information implied by dividend and earning announcement as well as new issue of shares, mergers and acquisitions, block trading and changes in accounting rules and reporting methods. If price adjusts not later than the date of announcement, then the market is informationally efficient with respect to that type of information.

Ball and Brown (1968)\(^{65}\) conducted the study to investigate the relationship between stock prices and accounting income numbers. A sample of 261 firms listed on the New York Stock Exchange were classified into good or bad earnings groups. The earnings of a firm was classified as good or bad in relation to the earnings that was expected. Market Model was used to measure the unexpected change in the value of the firms stock. The findings

overwhelmingly rejected the null hypothesis. However, one aspect of the results relevant from the standpoint of market efficiency was that more than 85 per cent of the total stock price changes associated with unexpected earnings of stocks placed before the month of announcement.

Fama, Fisher, Jensen and Roll (1969)\textsuperscript{66} studied the U. S. stock markets to examine the effect of stock splits on stock prices. They found that the average abnormal returns or residuals are positive prior to the split, but hovered around zero during the post-split period. The post-split stock price behaviour was, as a whole, normal. The evidence offered strong support for the Efficient Market Hypothesis.

Empirical studies in US market by Brown & Kennelly (1972)\textsuperscript{67} for the period from 1951 to 1967 of 64 companies revealed that information content in quarterly earnings per share, reports is useful i.e. it can be used to predict the aggregate abnormal rate of return.

Using the US data O'Donnell (1965)\textsuperscript{68} and Kaplan & Roll (1972)\textsuperscript{69} studied the information effect for disclosure of manipulated earnings due to accounting method changes. They found no significant durable effect for such manipulation.


Pettit (1972)\textsuperscript{70} found that most of the information implicit in the announcement of dividend is reflected in the security prices as of the end of the announcement period. This lent support to the proportion that the market is reasonably efficient on both monthly and daily basis.

Basu (1977)\textsuperscript{71} tested the predictive content of price-earnings (P/E) multiples and provided that the result was a direct contradiction of semi-strong form. It means that past sequence of P/E multiples has capacity to forecast future price.

Ohlson (1979)\textsuperscript{72} showed that disclosure leads to increased variability in stock price and risk and return parameters are essentially independent of changes in disclosure environment.

Cornett & Travlos (1989)\textsuperscript{73} studied the debt-for-equity and equity-for-debt offers. They found significant positive abnormal returns for the firm’s stock holders in the former event and significant negative abnormal returns in the latter event.

The results of Sarma’s (1992)\textsuperscript{74} study in general, indicated that after bonus issue the prices do not increase significantly in relation to no-bonus issue.


Results from the USA data of Gaver et al. (1992)\textsuperscript{75} implied that shareholder's meeting and not the performance plan adoption showed reaction in stock market prices. However, Kumar and Sopariwala (1992)\textsuperscript{76} found significant positive excess return around the announcement of performance plan adoption.

Aggarwal & Schirm (1992)\textsuperscript{77} found that asset prices (including stock prices) were sensitive to news in trade balance announcement. This sensitivity was felt to have increased significantly in recent years with important implications for asset pricing models and economic policy.

Gemmill (1992)\textsuperscript{78} observed that though in the last week of the UK general election the option prices showed a gross inefficiency, there was a close relation between opinion poll for the said election and FTSE 100 share price Index - the tests indicated a speculative bubble present in the options.

Haque & Hamhirun (1993)\textsuperscript{79} found that there was significant positive relation between stock prices and merger.


Ramachandran (1985)\textsuperscript{80} so tested the semi-strong form of efficiency by assessing information content of issue of rights and bonus shares and confirmed that market was efficient in semi-strong form.

Ramachandram G. (1989)\textsuperscript{81} attempted to examine the semi-strong form of market efficiency by analysing the impact of the announcement of bonus issues on equity share prices. The study considers forty bonus shares declared during the six year period. The methodology based on shewhart control chart theory was used. The findings indicates the existance of two distinct clusters. The first cluster includes shares whose adjustment times to new information are short. The second cluster consists of shares with long adjustment times. The findings thus indicate mixed evidence for the semi-strong form efficiency of Indian stock markets.

Subramanian (1989)\textsuperscript{82} examines the impact of political and economic kind of public information. The data for the study are the daily closing prices of forty-five securities and the Financial Express Equity Index for the period 1979-86. Fifteen major political events and release of macro-economic information, such as credit policy, announcements of $M_1$, $M_2$, WP, are identified for analysis. The findings regarding the political events provide mixed evidence of semi-strong form market efficiency. Similarly, findings regarding economic events idicate that it has no information value.

\begin{itemize}
\item \textsuperscript{81} Ramachandram, G., "Behaviour of Stock Market Prices, Information Assimilation and Market Efficiency, FPM Thesis, 11 M Ahmedabad (1989)
\end{itemize}
Abaidullah (1992) studies market-adjusted returns around the announcement date or the date of release of information to the market. The sample for this study comprises 75 bonus issues announced during 1987-89. The study is attempted by examining CAAR around the period of announcement. A significant upward drift is noticed much before the announcement period. This implies that the market is able to anticipate the event. This highlights the efficiency of the market. The drift in periods subsequent to the announcement period are insignificant. On the basis of empirical evidence, therefore, several conclusions have been arrived at. No evidence is found supporting the contention that learning exist. The dissemination of information occurs before the announcement. This evidence supports the semistrong form EMH for Indian stock markets.

In another study, Srinivasan (1993) tested semi-strong of efficiency by analyzing right issue and concluded that the market was efficient in semi-strong form.

Rao (1997) examines the response of stock prices quoted on the Bombay Stock Exchange (BSE) to fiscal and monetary policy pronouncements, change in industrial policy, change in exchange rate policy, amendments to Foreign Exchange Regulation Act (FERA) and regulatory action by Monopolies and Restrictive Trade Practices Commission (MRTPC). These events will effect the entire economy and hence the market as a whole and/or profitability of a particular industry or a group of firms and hence the returns

on the securities of the firms which constitute the same. Of all the events, changes in administered prices seem to have the maximum impact on the market.

**Efficiency of Market in Strong Form**

The strong-form EMH is an extreme hypothesis. If the market is efficient in strong form, individual with monopolistic access to information of share price also cannot exploit the trading strategy to earn abnormal profits. This is because the strong form of market efficiency assumes that even monopolistic information is reflected in price series, so that all market participants, both outside and inside, have only equal access in assessing price behaviour of stock market. To test the strong form empirically, data relating to monopolistic information possessed by corporate insiders and stock exchange specialists is essential. Due to the very nature of the problem of information availability, research on empirical validity of the strong-form has not been extensive in the past.

An alternative test of strong-form of market efficiency is to examine the performance of professionally managed institutional portfolios such as Mutual Fund operations. Professional portfolio managers should be able to obtain and earn from valuable information before it is fully reflected in the market.

Treynor (1965)\textsuperscript{86}, Sharpe (1966)\textsuperscript{87} and Jensen (1987)\textsuperscript{88} had made attempts in this direction. The results, however, strengthened the random walk

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\textsuperscript{86} Treynor, J. I., "How to rate management of Investment Funds", *Harvard Business Review*, 1965


theory.

Kraft & Kraft (1977) failed to identify any casual relation between Standard & Poor's Common stock price indices on the one hand and some macro-economic variables (i.e. money supply etc.) on the other. They concluded that their results were consistent with the hypothesis that capital markets are efficient in the sense that prices fully reflect all available information, implying, both public and private information.

Fishman & Hagerty (1992) dealt with the insider trading and its effects on stock prices. By mathematical deductions they showed that rather requiring insiders to disclose their private information than banning them from trading leads to more efficient prices of stocks.

Studies to examine the performance of Mutual funds in developed stock markets have generally concluded that these do not provide abnormal returns.

The first close ended mutual fund was floated in the Indian capital market in September 1986. Today, private sector has also been allowed to enter in this industry. Given the brief history, it is hardly surprising that there is paucity of research on mutual funds. One of the earliest empirical research in the area is by Barua and Varma.

Barua and Varma (1990) examined the performance of Mastershare, 


the first close-end mutual fund, both in terms of NAV and market prices. They found that though in terms of NAV the risk adjusted performance of Mastershare is superior to the market, in terms of market price the performance is inferior to the market.

-and -(1991)\(^92\) refined the initial work in the subsequent paper. They concluded that the performance of Mastershares from the point of view of a small investor (whose equity investment would primarily be in terms of holding of Mastershares) is poor while from the point of view of a large investor (for whom Mastershare would be one of the securities in the portfolio), the performance is excellent. This research raised an interesting issue about the purpose of mutual funds; If they are meant primarily for small investors, then Mastershare has failed to serve the purpose. In this sense, it rejected EMH of strong-form.

-and -(1993)\(^93\), in another paper, have examined the relationship between the NAV and the market price on Mastershares. They conclude that market prices are more volatile than what can be justified by volatility of NAVs. The prices also show a mean reverting behaviour, thus perhaps providing an opportunity for discovering a trading rule to make abnormal profits in market. Such a rule would basically imply buying Mastershares whenever the discount from NAV is quite high and selling Mastershares whenever the discount is low.

All the studies in India conclude that mutual funds provide abnormal returns which contradicts the near strong form EMH.

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