A STUDY ON RANDOMNESS IN THE NATIONAL STOCK EXCHANGE

Silky Vigg
Ph.D., Associate Professor, Institute of Information Technology and Management, GGSIP University, New Delhi, Email : drsilkyviggkushwah@gmail.com

Deepika Arora
Ph.D., Assistant Professor, Institute of Information Technology and Management, GGSIP University, New Delhi, Email : deep2581@yahoo.com

ABSTRACT

During the past decades, the efficient market hypothesis (EMH) has been at the heart of the debate in the financial literature because of its crucial implications. Fama (1970) defined a market as being efficient if prices fully reflect all available information, and suggested three models for testing market efficiency: the Fair Game model, the Submartingale model, and the Random Walk model. Also, according to Fama (1970), the market is said to be efficient at three levels-weak form, semi strong form and strong form. In emerging stock markets, most empirical studies have focused on the weak form, the lowest level of EMH because if the evidence fails to support the weak-form of market efficiency, it is not necessary to examine the EMH at the stricter levels of semi-strong and strong form (Wong and Kwong, 1984).This paper examines the weak form market efficiency of Indian stock market i.e. National Stock Exchange (NSE) from April 1, 1996 to March 31, 2016 with EMH. The study has tested weak form of efficiency using Runs test and Autocorrelation test based on the secondary data i.e. the daily stock prices of companies involved in the formation of NIFTY. The evidences from these tests support the weak form of efficiency of NSE. The findings reveal that the stock market has turned efficient to the extent that the stock prices fully reflect all information of the past.

Keywords: Efficient Market Hypothesis (EMH), Random Walk Model, Runs

Test, Autocorrelation Test, Jaque-Bera test

INTRODUCTION

Financial markets have been always in news because of its volatile nature. Investors like and try to reduce this volatility in the prices of the financial assets in these financial markets by contacting the forecasters of these prices. There are technical forecasters and fundamental forecasters and both work in different ways. Technical forecasters try to predict the current and future prices of financial assets on the basis of past prices of them. Prices will no more be a function of the prices in the past as the day-to-day forces move in an independent and random manner. In simpler words, we can say that the price of a stock already stands adjusted to all the historical information available about it. This is known as weak form of efficiency in Efficient Market Hypothesis (EMH). The Efficient Market Hypothesis (EMH) is a backbreaker for forecasters. In its crudest form it effectively says that the returns from speculative assets are unforecastable.

According to Efficient Market Hypothesis, an efficient market is the one in which prices reflect all available information (Fama, 1970). If the stock market is efficient, share prices must reflect all available information which is relevant for the evaluation of a company's future performance, and therefore the market price of share must be equal to its intrinsic value. It says that when any new information regarding a company, sector or economy which can affect the returns of a company or companies is released, it is readily adjusted in the share prices so that no investor can make abnormal profits from that information. The way news are random, same the movement in the stock prices are random.

According to Fama (1970) there are three forms of market efficiency- weak form, semi strong form and strong form of efficiency. In these three forms, weak form of efficiency is the lowest form which says that the current and future prices of stocks are not dependent on the past prices. This form is laso popularly known as Random Walk Theory. This form implies that past prices cannot be used as a predictive tool for future stock price movements. Therefore, it is not possible for a trader to make abnormal returns by using only the past history of prices. It contradicts the Chartist and Technical School which believes that the present prices are the result of the past trends and that averages discount all fluctuations and that the average trends move in a predictable manner as the history of trends repeats itself. The Random Walk model can be stated in the following equation:

$P_{t+1}=P_t+e_{t+1}$ Equation 1

Where:

P_{t+1}: price of share at time t+1;

P_t : price of share at time t;

e_{t+1}: random error with zero mean and finite variance.

Equation 1 indicates that the price of a share at time t+1 is equal to the price of a share at time t plus given value that depends on the new information (unpredictable) arriving between time t and t+1. In other word, the change of price, $e_{t+1} = P_{t+1} - P_t$, is independent of past price changes.

LITERATURE REVIEW

The aim of this section is to draw a broad picture of empirical literature on the weak form efficiency in emerging stock markets. As previously mentioned, the weak form of EMH implies that current market prices of stocks are independent on their past prices. In other words, a market is efficient in the weak form if stock prices follow a random walk process.

Bachelier (1900) was the first one to research and write about market efficiency. He analysed that "past, present and future information is reflected in market price, but it shows no relation with price changes. This recognition of the informational efficiency of the market led Bachelier to continue, in his opening paragraphs, that "if the market, in effect, does not predict its fluctuations, it does assess them as being more or less likely, and this likelihood can be evaluated mathematically". His work was not given importance. It was in late 1950s when it was noticed. Studies by Cootner (1964), Working (1934) and Cowles and Jones (1937) showed that US stock prices and other economic series also share these characteristics. Cowles (1933) in his study found that it was not possible to outguess the share prices.

Although there were continuous acceptance of weak form of efficiency among various stock markets in the world, still there were incidence where this form of efficiency failed to be supported and some dependency was seen in the past stock price series and future prices. Some of the researchers like Working (1934), Cowles and Jones (1937) and Kendall (1953) showed in their research work anomalous price behavior.

Literature related to different countries

Empirical findings derived from the studies in emerging stock markets have been mixed. Indeed, some studies provide empirical results to reject the null hypothesis of weak form market efficient while the others show evidence to support the weak form of EMH. Regarding emerging European stock markets, for instance, the empirical evidence obtained from Wheeler et al. (2002) fails to support the weak form efficient hypothesis for the Warsaw Stock Exchange (Poland). Studies conducted by Karemera et al. (1999) and Buguk and Brorsen (2003) on Turkish stock market also supported random walk theory and supported the null hypothesis of weak form efficiency. Weak form of efficiency was also supported in Budapest Stock Exchange in a research by Dockery and Vergari (1997) and also in Nairobi and Nigerian stock exchanges respectively (Africa), Dickinson and Muragu (1994), and

Olowe (1999).

Turning to stock markets in the Latin American region, Urrutia (1995) provides mixed evidence on the weak form efficiency for the stock markets in Argentina, Brazil, Chile, and Mexico. Specifically, results of the variance ratio test reject the random walk hypothesis for all markets while findings from the run tests indicate that these markets are weak form efficient. Consistent with the results reported by Urrutia (1995), Grieb and Reyes (1999) show empirical findings, which are obtained from the variance ratio tests, to reject the hypothesis of random walk for all stock market indexes and most individuals stock in Brazil and Mexico. Moreover, Karemera et al. (1999) find that stock return series in Brazil, Chile, and Mexico do not follow the random walk, based on the results of single variance ratio tests, but Argentina does. However, when the multiple variance ratio test is applied, the market index returns in Brazil is observed to follow the random walk process.

Empirical studies on weak form efficiency in Asian stock markets have been extensively conducted in recent years. Indeed, in the Chinese stock markets, Mookerjee and Yu (1999) and Groenewold et al. (2003) consistently document that these markets (Shanghai and Shenzhen stock exchanges) are not weak form efficient. In addition, Lima and Tabak (2004) find that the B shares index for both Shanghai and Shenzhen Stock Exchange do not follow the random walk.

However, they also report that the hypothesis of weak form efficiency can not be rejected for A shares indexes of the two exchanges. Moreover, Seddighi and Nian (2004) document that the Shanghai Stock Exchange is weak form efficiency for the period from Jan. 4th 2000 to Dec. 31st 2000. Regarding the Taiwanese stock market, it is proved that the market is efficient in the weak form (Fawson et al., 1996; Alam et al., 1999; and Chang and Ting, 2000). Similarly, the null hypothesis of random walk cannot be rejected for the Hong Kong stock market (Karemera et al., 1999; Alam et al., 1999; Cheung and Coutts, 2001; and Lima and Tabak, 2004). Similar research were also conducted in countries like Indonesia, Malaysia, Thailand and Singapore and most of them supported weak form of efficiency in their stock market (Barnes, 1986; Karemera et al., 1999; Alam et al., 1999).Studies conducted on Bombay Stock Exchange and Dhaka Stock Exchange showed the existence of weak form of efficiency (Sharma and Kennedy (1977) and Alam et al. (1999). Although, stock markets of Sri Lanka, Kuwait, Saudi Arabia and Bahrain didn't support random walk theory.

The Indian literature

The Indian literature on this issue throws light on the fact that most of the researches have failed to prove the efficiency of Indian stock markets. That is, the results of most of the studies have been negative in regard to weak form efficiency level. In one of the similar efforts, Gupta (2000) investigates the price discovery and hedging

efficiency of NIFTY and all those stock futures whose trading started on 9th November 2001 and are continuously traded till 30th June 2006. Presence of information asymmetry and co integration implies the market is inefficient in weak form. Research was conducted on some of the most important stock markets of India by Pandey (2003) and result supported weak form of efficiency for all the stock markets. Pant and Bishnoi (2002) conducted a research on testing Random Walk Hypothesis for Indian Stock Market Indices. While analyzing the behavior of daily & weekly returns of 5 Indian market indices for random walk during April 1996-June 2001, it came out that the Indian stock market indices do not follow random walk. Similar study was conducted by Ramasastri (1999, 2001) in India and accepted the null hypothesis of weak form of efficiency. However, Parameswaran (2000) results showed that eight out of ten size sorted portfolios do not follow a random walk.

Study of stock market efficiency in emerging markets has acquired great interest among research community during recent years, particularly in context to the continuous process of financial disintermediation in these markets and their integration with other world market. It is believed that with increasing trading activities of both Indian and foreign investors, these markets must be more efficient to safeguard the interest of the investors. However, empirical evidences are mixed in regards to this hypothesis.

In view of the above backdrop, this study makes an attempt to investigate whether stock market in India has turned weak form efficient i.e. it fully reflects all the information contained in past price movements. Most of the studies conducted on Indian stock market show the inefficiency of stock market. The present study aims to use an extended sample period and check the current status of efficiency of Indian stock market. The main objective of the study is to analyze whether so many reforms and developments taking place in our stock market have increased the efficient of stock market to the extent that the stock prices fully reflect the past price movements or still investors are dependent on technical analysts to predict the future prices of the shares by seeing the past price movements.

HYPOTHESES FORMED

The random walk hypothesis otherwise called the weak form of the efficient market hypothesis which we are concerned with, states that current market prices reflect all the information contained in the record of past prices. The hypotheses formed are:

H1: National Stock Market is efficient in weak form i.e., autocorrelations are not present.

H2: The price movement in the share prices of National Stock Exchange is

random.

RESEARCH DESIGN AND METHODS

Data description

The data used in the study primarily consist of daily price series of the stocks of 24 companies involved in the formation of NIFTY, index of National Stock Exchange, India. All data are obtained over the period from 1st April 1997 to 31st March 2016 from NSE website www.nseindia.com . Then, a natural logarithmic transformation is performed for the data. To generate a time series of continuously compounded returns, daily returns are computed as follows:

$R_t = \log(P_t) - \log(P_{t-1}) = \log(P_t / P_{t-1})$

Where, P_t and P_{t-1} are the stock prices at time t and t-1.

Descriptive statistics of daily returns of stocks of all the companies involved in the formation of NIFTY are presented in table 1.

Methods

According to Fama (1970), market efficiency under the Random Walk model implies that successive price changes of a stock are independently and identically distributed so that the past movement or trend of a stock price or market cannot be used to predict its future movement. As reviewed in the literature, in order to test the weak form of EMH many techniques have been applied in empirical studies. Following these studies, a set of complementary tests are used to detect the random walk in the observed series of Indian stock market. First, the parametric autocorrelation test is used to examine whether the consecutive stocks returns are independent of each other. Moreover, the results of the Jaque-Bera test (presented in Table 1), indicate that the stocks returns are not normally distributed, so a non-parametric test is likely to be more appropriate in testing for the random walk. Consequently, the runs test is also applied to check the randomness of the series of share prices.

Autocorrelation test

The first approach to detect the random walk of the stock returns summarized here is the autocorrelation test. Autocorrelation (serial correlation coefficient) measures the relationship between the stock return at current period and its value in the previous period. Insignificant autocorrelations between all such lags will suggest price independence, and validate the random walk theory, and the research hypothesis (H1). Whereas significant autocorrelations will suggest price dependence, and will refute both the random walk theory and the research

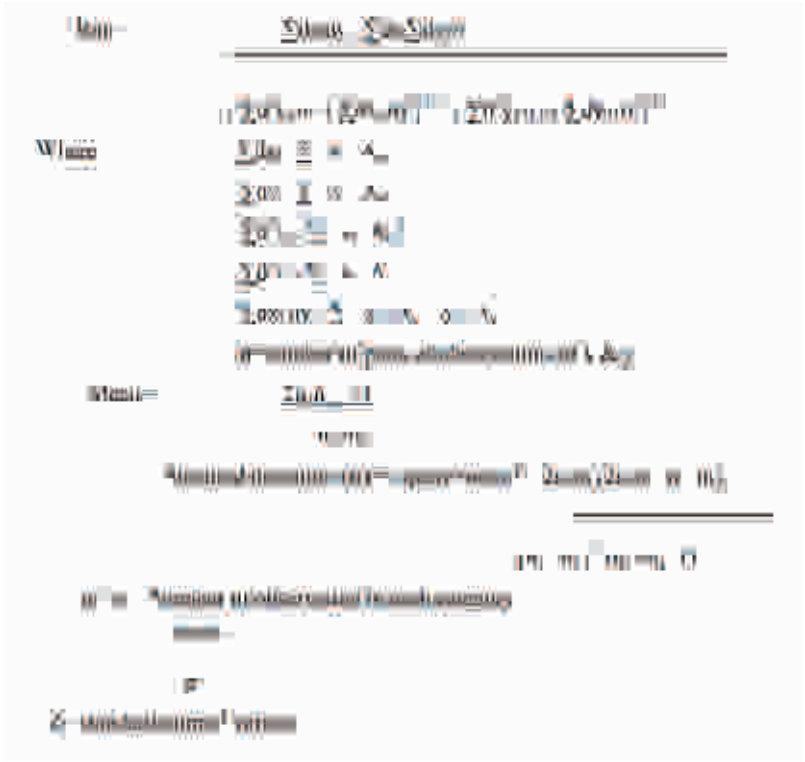
hypothesis (H1).

Runs test

The runs test checks the randomness of a series by examining a series of price changes, and designates each change as a (+), (-) or (0). The runs test was performed using the daily price data.

Runs test shows the number of positives, the number of negatives, the number of blanks, the number of runs, and the test statistics Z with its observed significance level.

To check the randomness of the share prices using runs test, hypothesis (H2) formed is that the price movement in the share prices of National Stock Exchange is random. The significant Z values indicate non-randomness of the series. Runs test



RESULTS AND DISCUSSION

Auto correlation test

To test the weak form of EMH for the National stock market, first the autocorrelation tests with 100 lags was performed for daily returns of 24 companies involved in the formation of NIFTY. The results of these tests are summarized in Table 2 for the lags 1, 10, 50 and 100. When the observed returns of all 24 companies were used, it is found that the null hypothesis (H1) of random walk is accepted for almost all studied series. It is worth to note here that the autocorrelation coefficients of almost all lags for all 24 companies indicates that consecutive daily return tend to have different sign ,so that a positive (negative) return in the current day tends to be followed by an decreased (increase) of return in the next day. Especially, the results of the Liung-Box Q-test reveal that the autocorrelation coefficients of all 100 lags for almost all the companies used are insignificant at 5% level except 3 companies namely ABB Ltd., Siemens Ltd. and SAIL Ltd.

Therefore, the null hypothesis that there are no autocorrelations present in the series is not rejected. The results therefore support the random walk theory in the National Stock Exchange. As implied by the results it is reasonable to assume security returns data are independent. This implies that the National Stock Exchange appears to be efficient in the weak form, suggesting that the opportunity to make excess return does not exist in National Stock Exchange. Consistently, Kendall (1953) examined 22 UK stocks. He concluded that "in series of prices which are observed at fairly close intervals the random changes from one term to the next are so large as to swamp any systematic effect which may be present. The data behave almost like wandering series. Nevertheless, these empirical observations came to be labelled the "random walk model" or even the "random walk theory". Dockery and Vergari (1997) also document that the Budapest Stock Exchange is efficient in the weak form. In addition, Karemera et al. (1999) and Buguk and Brorsen (2003) also show empirical evidence to support the null hypothesis of weak form market efficiency for the stock market in Turkey. Surprisingly, in the perspective of Africa, Dickinson and Muragu (1994), and Olowe (1999) find that the Nairobi and Nigerian stock exchanges respectively are again efficient in the weak form.

Runs Test

Weak form efficiency of the National stock market was checked through the nonparametric runs test. The runs test is considered more appropriate than the parametric autocorrelation test since all observed series do not follow the normal distribution. Results of the runs tests for all 24 stocks involved in the formation of nifty are reported in Table 3. Test statistic Z value is calculated for all the stocks. For

large samples the Z statistics gives the probability of difference between the actual and expected number of runs. The Z value is greater than or equal to+ _ 1.96, reject the null hypothesis at 5% level of significance (Sharma and Kennedy, 1977). The calculated value of Z is compared with the critical value of +-1.96 at 5% level of significance. Out of the 24 companies, the value of test statistic Z of 19 companies is less than +-1.96 at 5% level of significance so the null hypothesis is not rejected in these cases and the value of test statistic Z for 6 companies is more than +-1.96 at 5% level of significance (Refer Table 3). With regard to the data, roughly 75% of the securities tested have calculated Z values below 1.96, which would not reject the hypothesis (H2) and support an efficient National Stock Market. The result shows that the price movements in share prices of National Stock Exchange are random in behavior. We can't use the historical data for predicting the future prices. The results therefore support the fact that the successive price (return) changes are independent thereby lending credence to the assertion that the National stock market follows a random walk process and is therefore weak - form efficient. This work, irrespective of its difference in time scope, volume of data or population coverage and analytical approach, the result lends support to the work of Samuels and Yacout (1981), Ayadi (1984), and Olowe(1999).

Many papers on market efficiency have employed run tests in a similar framework for verification of the weak-form efficiency of the U.S. and other countries' stock markets, such as the studies by Fama (1965), Sharma and Kennedy (1977), Cooper (1982), Chiat and Finn (1983), Wong and Kwong (1984), Yalawar (1988), Ko and Lee (1991), Butler and Malaikah (1992), and Thomas (1995). These studies typically find that in most markets (except Hong Kong, India, Kuwait and Saudi Arabia), the hypothesis is not rejected and supports efficiency of these stock markets.

CONCLUSION

The theoretical and empirical studies of the efficiency of stock market have made an important contribution to the understanding of the stock market, although the present state of understanding of the issue, especially in the emerging financial markets like India, is far from being conclusive. Following the theoretical literature, empirical studies on the weak form of efficiency in emerging stock markets have been extensively conducted, especially in recent years. The empirical evidence obtained from these studies is mixed. Indeed, while some studies show empirical results that reject the null hypothesis of weak form of efficiency, the others report non rejection of the null hypothesis and support the weak form of efficiency.

On the basis of the theoretical and empirical literature that is reviewed in this paper, the weak form of market efficiency for National Stock Exchange was checked using statistical tests like autocorrelation and runs test. The results of autocorrelation and runs test support the existence of weak form of efficiency in the National Stock

Exchange. That means the stock prices are random and the future prices of the stock cannot be predicted by the past prices. The results are similar to the results of various old studies carried out by researchers on different stock exchanges. It will be useless to select stocks based on information about recent trends in stock prices. Thus, technical analysts and chartists who follow the price trend in order to forecast price or determine when to buy and sell the stock are wasting their time.

The efficiency of National stock market follows from the compliance of the necessary conditions for an efficient market with a developed financial system and also implies financial and institutional perfections. This leads to the conclusion that Indian financial policies and regulations such as those concerning liberalisation, deregulation and privatisation have generated a perceived consistency, and a tendency to produce stability. The implication is that the benefits of a well functioning stock market are being realized in the economy. Indeed, the weak-form efficiency of the stock market demonstrated in this study is most likely caused by a combination of the glut of its development and the implication of policy choices. The beneficiaries of such efficiency in the Indian stock market are the stock market investors specially the retail investors who will now don't spend their valuable time and money running behind Technical analysts to forecast the future prices of the stock by using information of the past prices.

REFERENCES

- Abeysekera, S.P. (2001) Efficient markets hypothesis and the emerging capital market in Sri Lanka: Evidence from the Colombo Stock Exchange – A note, *Journal of Business Finance and Accounting* 28, 249-261.
- Abraham, A., F.J. Seyyed and S.A. Alsakran (2002) Testing the random walk behaviour and efficiency of the Gulf stock markets, *The Financial Review* 37, 469- 480.
- Alam, M.I., T. Hasan and P.R. Kadapakkam (1999) An application of variance-ratio test of five Asian stock markets, *Review of Pacific Basin Financial Markets and Policies* 2, 301-315.
- Ayadi, O. (1984) The Random Walk Hypothesis and the Behaviour of Share Prices in Nigeria. Nigeria J*ournal Economic Social Studies 26*(1), 160-169.
- Barnes, P. (1986) Thin trading and stock market efficiency: The case of the Kuala Lumpur Stock Exchange, *Journal of Business Finance and Accounting* 13, 609-617.
- Buguk, C. and B.W. Brorsen (2003) Testing weak-form efficiency: Evidence from the Istanbul Stock Exchange, *International Review of Financial Analysis* 12, 579-590.
- Butler, K.C. and S.J. Malaikah (1992) Efficiency and inefficiency in thinly traded stock markets: Kuwait and Saudi Arabia, *Journal of Banking and Finance* 16, 97–201.
- Chang, K.P. and K.S. Ting (2000) A variance ratio test of the random walk hypothesis for Taiwan's stock market, *Applied Financial Economics* 10, 525-532.
- Cheung, K.C. and J.A. Coutts (2001) A note on weak form market efficiency in security prices: Evidence from the Hong Kong Stock Exchange, *Applied Economics Letters* 8, 407-410.
- Chiat, H.S. and F.J. Finn (1983) Random walks on the stock exchange of Singapore, *Accounting and Finance* 23, 81–87.

- Cooper, J.C.B. (1982) World stock markets: some random walk tests, *Applied Economics* 14, 515–531.
- Dickinson, J.P. and K. Muragu (1994) Market efficiency in developing countries: A case study of the Nairobi Stock Exchange, *Journal of Business Finance and Accounting* 21, 133-150.
- Dockery, E. and F. Vergari (1997) Testing the random walk hypothesis: Evidence for the Budapest Stock Exchange, *Applied Economics Letters* 4, 627-629.
- Fama, E.F. (1970) Efficient capital markets: A review of theory and empirical work, *The Journal of Finance* 25, 383-417.
- Fawson, C., T.F. Glover, W. Fang and T. Chang (1996) The weak-form efficiency of the Taiwan Share Market, *Applied Economics Letters* 3, 663-667.
- Grieb, T. and M.G. Reyes (1999) Random walk tests for Latin American equity indexes and individual firms, *The Journal of Financial Research* 22, 371-383.
- Groenewold, N., S.H.K. Tang and Y. Wu (2003), The efficiency of the Chinese stock market and the role of the banks, *Journal of Asian Economics* 14, 593-609.
- Huber, P. (1997) Stock market returns in thin markets: Evidence from the Vienna Stock Exchange, *Applied Financial Economics* 7, 493-498.
- Karemera, D., K. Ojah and J.A. Cole (1999) Random walks and market efficiency tests: Evidence from emerging equity markets, *Review of Quantitative Finance and Accounting* 13, 171-188.
- Ko K.S. and S.B. Lee (1991) A comparative analysis of the daily behavior of stock returns: Japan, the US and the Asian NICs, *Journal of Business Finance and Accounting* 18, 219–234.
- Lima, E.J.A. and B.M. Tabak (2004) Tests of the random walk hypothesis for equity markets: Evidence from China, Hong Kong and Singapore, *Applied Economics Letters* 11, 255-258.
- Mookerjee, R. and Q. Yu (1999) An empirical analysis of the equity markets in China, *Review of Financial Economics* 8, 41-60.
- Olowe, R.A. (1999) Weak form efficiency of the Nigerian stock market: Further evidence, *African Development Review* 11, 54-68.
- Samuels, J.M. and N. Yavout (1981) Stock Exchange in Developing Countries, *Savings and Development* 4, 217-320.
- Seddighi, H.R. and W. Nian (2004) The Chinese stock exchange market: Operations and efficiency, *Applied Financial Economics* 14, 785-797.
- Sharma, J. L. and R.E. Kennedy (1977) A comparative analysis of stock price behaviour on the Bombay, London, and New York stock exchanges, *Journal of Financial and Quantitative Analysis* 12, 391-413.
- Thomas, S. (1995) An empirical characterisation of the Bombay stock exchange, Center for Monitoring Indian Economy, *University of Southern California, California.*
- Wheeler, F.P., B. Neale, T. Kowalski and S.R. Letza (2002) The efficiency of the Warsaw Stock Exchange: the first few years 1991-1996, *The Poznan University of Economics Review 2, 37-56.*
- Wong, K.A. and K.S. Kwong (1984) The behaviour of Hong Kong stock prices, *Applied Economics* 16, 905-917.
- Yalawar, Y.B. (1988) Bombay stock exchange: rates of return and efficiency, *Indian Economic Journal* 35, 68–121.

ANNEXURE

Table 1: Descriptive statistics of daily returns of stocks of 29 the companies involved in the formation of NIFTY

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis		Jaqua-Bera
Companies	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error	
A B B Ltd.	4501	-.6628	.0562	.00003	.017128	-18.845	.036	624.045	.073	15297[a]
A C C Ltd.	4501	-.3114	.0805	.00021	.013184	-4.355	.036	88.789	.073	15852[a]
AmbujaCmt.Ltd	4501	-.2669	.0668	.00018	.012352	-4.725	.036	95.287	.073	19761[a]
BHEL	4501	-.4650	.0721	.00026	.015137	-8.460	.036	227.148	.073	95761[a]
BPCL	4501	-.3024	.1138	.00009	.013571	-2.353	.036	58.138	.073	15762[a]
Cipla Ltd.	4501	-.1645	.1006	.00029	.011054	-1.801	.036	30.352	.073	17589[a]
G A I L Ltd.	4501	-.5653	.1206	.00013	.015111	-12.071	.036	444.828	.073	18432[a]
HDFC Bk. Ltd.	4501	-.2288	.0997	.00036	.011831	-2.870	.036	56.282	.073	74409[a]
HeroHonda Ltd	4501	-.2340	.0854	.00039	.011766	-2.150	.036	44.079	.073	35228[a]
Hindalco I.Ltd.	4501	-.3808	.0728	.00007	.012675	-6.197	.036	183.258	.073	13868[a]
Hindtn L.Ltd.	4501	-.1350	.1713	.00008	.009896	.690	.036	30.927	.073	19927[a]
HDFC Ltd.	4501	-.2582	.0880	.00028	.012041	-3.306	.036	68.969	.073	15052[a]
I T C Ltd.	4501	-.2104	.0460	.00023	.010740	-3.036	.036	54.198	.073	10755[a]
InfosysTech.Ltd	4501	-.1775	.0645	.00049	.013140	-1.912	.036	24.403	.073	60545[a]
L & T Ltd.	4501	-.3963	.0953	.00020	.015163	-8.535	.036	183.168	.073	12453[a]
M & M Ltd.	4501	-.5360	.0934	.00011	.016574	-10.596	.036	291.974	.073	13674[a]
ONGC Ltd.	4501	-.4092	.0792	.00019	.014107	-9.185	.036	252.245	.073	19654[a]
RanbaxyLb.Ltd.	4501	-.2612	.2356	.00015	.012234	-.917	.036	81.907	.073	20231[a]
Reliance E. Ltd.	4501	-.3614	.0909	.00015	.014182	-3.959	.036	100.587	.073	52443[a]
RIL	4501	-.3145	.0841	.00020	.013074	-7.072	.036	148.546	.073	251121[a]
Siemens Ltd.	4501	-.5407	.0645	.00024	.017233	-12.767	.036	344.819	.073	16244[a]
SBI	4501	-.2763	.0793	.00020	.012275	-4.055	.036	78.042	.073	15779[a]
SAIL	4501	-.7020	.1268	.00025	.020828	-9.319	.036	304.549	.073	27081[a]
SterliteInd.Ltd	4501	-1.0057	.4807	.00019	.025427	-14.876	.036	688.653	.073	17653[a]
SunPharmaLtd	4501	-.2987	.0866	.00042	.013134	-4.893	.036	105.638	.073	18435[a]
TataMotors Ltd.	4501	-.4442	.0749	.00007	.015002	-6.662	.036	181.345	.073	80791[a]
TataPower.Ltd.	4501	-.4489	.0907	.00023	.013716	-8.085	.036	259.220	.073	14564[a]
Tata Steel Ltd.	4501	-.4663	.0682	.00017	.015134	-7.745	.036	217.498	.073	13965[a]
Wipro Ltd.	4501	-.1180	.0928	.00049	.014469	-.339	.036	6.521	.073	7652.765[a]

Table 2: Autocorrelation Test applied on companies of NIFTY

Company	Lag 1		Lag 10		Lag 50		Lag 100	
	Autocorrelation	Sig.[b]	Autocorrelation	Sig.[b]	Autocorrelation	Sig.[b]	Autocorrelation	Sig.[b]
A B B Ltd.	0.012	0.426	-0.005	0.875	0.003	0.999	-0.022	1
A C C Ltd.	0.009	0.568	-0.011	0.119	-0.005	0.238	-0.003	0.131
Ambuja Cements Ltd.	-0.005	0.754	0.012	0.038	-0.025	0.128	0.018	0.066
BHEL	0.028	0.062	0.013	0.021	-0.005	0.254	-0.009	0.256
BPCL	0.045	0.002	0.005	0.002	-0.017	0.021	-0.023	0.022
Cipla Ltd.	0.057	0	0.015	0.004	0.001	0.007	0.013	0
G A I L Ltd.	0.013	0.385	0.037	0.001	-0.01	0.005	-0.001	0.086
H D F C Bank Ltd.	-0.005	0.735	0.014	0.067	0.01	0.074	0.005	0.362
Hero Honda M. Ltd.	0.044	0.003	0.006	0	-0.013	0	-0.007	0.006
Hindalco Ind. Ltd.	0.072	0	0.015	0	0.02	0.008	-0.02	0.003
Hindustan Lever Ltd.	0.026	0.077	-0.006	0.01	0.002	0.042	0.008	0.016
HDFC Ltd.	0.025	0.091	0.022	0	0.018	0	0.006	0
I T C Ltd.	-0.023	0.117	0.001	0.441	-0.006	0.019	0.014	0.019
Infosys Tech. Ltd.	0.071	0	0.009	0	0	0	0.001	0
L & T Ltd.	0.037	0.013	-0.004	0.008	-0.012	0.018	-0.005	0.112
M & M Ltd.	0.061	0	0.01	0.007	0.006	0.099	-0.005	0.361
ONGC Ltd.	0.044	0.003	-0.006	0.02	0.027	0.001	-0.005	0.002
Ranbaxy Lab. Ltd.	0.06	0	-0.015	0.027	-0.024	0.037	-0.006	0.177
Reliance Energy Ltd.	0.028	0.059	-0.014	0.004	0.011	0	-0.01	0
RIL	0.026	0.084	0.01	0.309	0.008	0.572	-0.02	0.616
Siemens Ltd.	0.034	0.023	0.029	0.151	0.009	0.253	-0.001	0.866
State Bank Of India	0.036	0.014	0.015	0	-0.006	0	0.006	0
SAIL	0.03	0.043	0.017	0.229	0.007	0.575	-0.035	0.008
Sterlite Ind. Ltd.	0.054	0	0.002	0.057	0.002	0.531	0.007	0.966
SunPharma. Ind. Ltd.	0.033	0.028	0.009	0.012	0	0.074	-0.035	0.052
Tata Motors Ltd.	0.06	0	0.034	0	0.009	0.029	0.013	0.011
Tata Power Co. Ltd.	0.045	0.003	0.024	0	0.012	0.001	0.007	0.001
Tata Steel Ltd.	0.033	0.027	0.028	0.018	0.013	0.116	-0.017	0.032
Wipro Ltd.	0.07	0	0.047	0	0.005	0	-0.004	0

Table 3: Run test on 29 companies involved in the formation of NIFTY

Companies	No. Of Positive (N1)	No. of Negatives (N2)	No. Of Blanks	No. Of Runs	Mean	S.D.	Z
A B B Ltd.	2294	2194	14	2168	2242.886	33.4759	-2.23702
A C C Ltd.	2308	2168	26	2246	2235.811	33.41499	0.30493
Ambuja Cements Ltd.	2277	2167	58	2251	2220.639	33.30749	0.911542
BHEL	2296	2189	17	2202	2241.224	33.46228	-1.17218
BPCL	2231	2251	20	2184	2240.956	33.46947	-1.70172
Cipla Ltd.	2285	2187	30	2201	2234.926	33.41671	-1.01525
G A I L Ltd.	2251	2190	61	2328	2220.081	33.31037	3.239793
H D F C Bank Ltd.	2247	2201	54	2254	2223.762	33.33935	0.906965
Hero Honda M. Ltd.	2283	2199	20	2285	2240.213	33.45838	1.338586
Hindalco Ind. Ltd.	2277	2205	20	2121	2240.422	33.4615	-3.56894
Hindustan Lever Ltd.	2204	2256	42	2272	2229.697	33.38333	1.267187
HDFC Ltd.	2227	2255	20	2257	2240.913	33.46883	0.480663
I T C Ltd.	2243	2234	25	2327	2238.491	33.45132	2.645899
Infosys Tech. Ltd.	2291	2205	6	2200	2247.178	33.51011	-1.40787
L & T Ltd.	2287	2156	59	2160	2219.569	33.29519	-1.78912
M & M Ltd.	2310	2170	22	2076	2237.813	33.42998	-4.84035
ONGC Ltd.	2277	2205	20	2269	2240.422	33.4615	0.854059
Ranbaxy Lab. Ltd.	2278	2211	13	2192	2244	33.4888	-1.55276
Reliance Energy Ltd.	2204	2286	12	2239	2244.251	33.48882	-0.15681
RIL	2368	2122	12	2232	2238.261	33.39942	-0.18747
Siemens Ltd.	2224	2254	24	2200	2238.9	33.45369	-1.16279
State Bank Of India	2307	2176	19	2307	2239.586	33.44528	2.015644
SAIL	2080	2132	290	2395	2105.679	32.44116	8.918323
Sterlite Ind. Ltd.	1749	1698	1055	1731	1723.123	29.34489	0.268428
Sun Pharma. Ind. Ltd.	2249	2218	35	2261	2233.393	33.41246	0.826259
Tata Motors Ltd.	2291	2201	10	2248	2245.099	33.49401	0.086624
Tata Power Co. Ltd.	2283	2198	21	2157	2239.694	33.45436	-2.47185
Tata Steel Ltd.	2299	2186	17	2178	2241.077	33.46008	-1.88513
Wipro Ltd.	2251	2215	36	2252	2232.855	33.40816	0.57306