RANDOM WALK THEORY: EVIDENCE FROM INDIAN STOCK MARKET

Vanita and Neeta Tripathi***

ABSTRACT

This study tests the Random Walk Model in Indian stock market in recent time period over 50 most active scrips which account for about 91% of total market capitalisation on NSE. Using Serial Correlation and Runs Test the study concludes that the share price behaviour in the Indian stock market follows the random walk. Hence Indian stock market is weakly efficient.

INTRODUCTION

An efficient stock market is one in which (a) the security prices adjust rapidly to the infusion of new information, and (b) the current security prices fully reflect all available information. In an efficient market, competition among the many intelligent participants leads to a situation where, at any point of time, the actual prices of individual securities already reflect the effects of information based both on the events that have already occurred and on the events that are expected to take place in the future. In other words, in an efficient market, the actual price of a security will be a good estimate of its intrinsic value. The efficiency of market can be tested for three different forms, viz., Weak form, Semi-strong form, and Strong form.

The Weak form implies that the current prices of stocks already fully reflect all the information that is contained in the historical sequence of prices. As such the examination of historical sequence of prices in order to forecast future will yield no benefit.The Semi-strong form of efficient market hypothesis contends that the current prices of stocks not only reflect all informational content of historical prices but also reflects all publicly available information about the companies. As such the efforts by the analysts and investors to acquire and analyze public information will not yield consistently superior returns to them.The Strong form of Efficient Market Hypothesis maintains that not only the past price information and the publicly available information but all information is useless to predict the future. No information can be used to earn consistently superior investment returns.

Researchers have found out that the Stock Markets worldwide cannot be said to be efficient in the Strong form because over the past there have been many instances when the insider trading and also the mutual funds have outperformed the market. Tests of Semi strong form have yielded mixed results but there have been strong

**Lecturer in Commerce, Dyal Singh College, University of Delhi*
***Lecturer in Commerce, K.R. Post Graduate College, B.R. Ambedkar University*

evidences in favour of the Weak form of efficiency in the Indian Stock Markets. In this paper, we attempt to test Weak form of efficiency in the Indian Stock Market in recent time period, using Serial Correlation and Runs Test.

METHODOLOGY

For many years, economists, statisticians, and financial researchers have been interested in developing and testing the models of stock behaviour. One important model that has emerged from this research is the theory of "Random Walk". This theory casts serious doubts on many other methods that describe and predict stock price behaviour that have considerable popularity outside the academic world, especially the Technical Analysis.

The study undertaken in this paper embodies the analysis of 50 most active securities in 2001-02 on NSE. These 50 scrips account for 91.41% share of total turnover in the market and for 51.43% share in the total market capitalisation.

Data Collection :

The data on the daily stock prices of the 50 most active scripts were collected from the website of National Stock Exchange for a one and a half year period from 1st April 2001 to 30th September 2002. S&P CNX NIFTY prices were also collected for the same period. However, the data on three stocks, viz. Dr. Reddy, Visual Soft and Moser Baer were not available. Thus, the other 47 stocks have been considered for the analysis.

Tests :

For testing the hypothesis whether the Indian Stock markets are efficient in the Weak form, two kinds of tests are conducted. These are parametric tests for independence, i.e. the *Serial Correlation Test*, and a non-parametric test for randomness, i.e. the *Runs Test* :

Software/Computer Program :

- E-views 3.1 was used for finding out the autocorrelation of the individual scrips.
- Microsoft Excel was used to calculate the various parameters required for the Runs test.

RANDOM WALK MODEL

In order to test for the Weak form of efficiency, we need to test whether the successive changes in stock prices are linearly independent, i.e. the share prices follow the random walk approach. For this the 'Random – Walk' Model has been used. The Random Walk model states that successive returns are independent and that the returns are identically distributed over time.

The Model :

Suppose that Z_t is a discrete, purely random process with mean μ and variance σ^2. A process X_t is said to be a random walk if

$$X_t = X_{t-1} + Z_t$$

When t = 1,

$$X_1 = Z_1 \text{ and}$$

$$X_t = \Sigma Z_t$$

Then, we find that

$$E(X_t) = \mu \text{ and } Var(X_t) = \sigma^2$$

This would imply that the stock market has got no memory and the past price history of a share will not help predict today's price. The best estimate of today's price, given yesterday's price, is yesterday's price itself.

The empirical evidence in support of the

random – walk hypothesis rests primarily on statistical tests such as the Runs test and the Serial Correlation test. The results of these tests unanimously support the random walk hypothesis as will be seen in the later part of the paper.

SERIAL CORRELATION TEST

Correlation tests are appropriate to test the random walk hypotheses as these tests determine if the price changes or proportionate price changes in some future period are related.

Serial correlation coefficients provide a measure of relationship between the value of a random variable in time t and its value k periods later. The serial correlation of a time series is given by the autocorrelation function of lag k i.e. r_k.

$r_k = C_k / C_0$

where,

$C_k = 1/n[\Sigma(X_1\text{-}X)\ (X_{t-k}\text{-}X)]$ k=0,1,2...

$X\text{-}1/N \sum_{t=1}^{n} X_1$

C_0 = Variance of X_t

Statistical testing of the serial correlation coefficients requires the standard error of estimated coefficients, which is given by :

$S.E.\ r_k = 1/(n - k)^{1/2}$

For null hypothesis to be true, the observed serial correlation should not be statistically significant, i.e. it should not be greater than three times the standard error of the coefficients.

The Process :

- First of all we feed the stock prices data for the past one and a half years into the E-views workfile.
- The correlogram view of the leveled series of all shows that the series are non-stationary. As such, first order differencing is applied on all series to make them stationary.
- The correlogram view of the first differenced series for 10 lags is checked. It shows the respective value of the Autocorrelation function and the Partial Autocorrelation function and alongside also gives the values of Q-statistic and probability values.
- Q-statistic at lag k is a test statistic for the null hypothesis that there is no autocorrelation upto order k.
- The probability values represent the probability of not rejecting the null hypothesis. It can also be interpreted as the minimum level of significance needed to reject he null hypothesis. Thus, if p = 0.000, it implies that the null hypothesis can be rejected.
- If there is no serial correlation, the autocorrelations at all lags should be nearly zero, and all Q-statistic should be insignificant with large p-values.

Findings of the Study :

Annexure-I shows the autocorrelation coefficients, the Q-statistic and the p-values for the NIFTY and the 47 stock studied. It is evident that the first order coefficients are small in magnitude, with insignificant Q-statistic and considerable large p-values in most of the cases.

For lag 1, there are about 13 stocks which show significant AC (Autocorrelation) values low Q – statistic and low p-values. These stocks have been listed below :

AftekInfo	Hughes Software	Softsolint
Global Tele	IBP	Sqrdsfwre
HCL Tech	Pentasoftware	Sterlite optical
HDFC	Sawpipes	
Himachal Fut	Silverline Tech	

AftekInfo's AC value becomes insignificant

at lag 2 but the other 12 stocks mentioned above remain significant. Thus, there is correlation in these 12 stocks.

However, the remaining stocks show no autocorrelation. Thus, it can be inferred that, in general, there is randomness in the share prices.

RUNS TEST

The Correlation test has its limitation in that the correlation coefficients can be dominated by extreme values, thereby unduly influencing the results. To overcome this problem one can apply the Runs test.

Runs tests ignore the absolute values of the numbers in the series and observe only their sign. A run may be defined as a sequence of price changes of the same sign preceded and followed by the price changes of different signs.

In a given share price series, there can be either positive or negative changes represented by '+' and '-' respectively. [A '0' represents no change, but in this study it has been assumed that there are no two days when the prices remains same, which is a reasonably realistic assumption.]

The runs test makes use of the following calculations :

n = Total number of observations $(n_1 + n_2)$
n_1 = Number of + signs
n_2 = Number of – signs
k = Actual number of runs

Next we calculate the expected mean and the expected variance of the runs :

Mean : $M = [2n_1n_2/(n_1 + n_2)] + 1$

Variance : $\sigma_m^2 = [2n_1n_2(2n_1n_2 - n_1 - n_2)] / [(n_1 + n_2)^2 (n_1 + n_2 - 1)]$

The null hypothesis is that the successive returns are independent, that is there is no autocorrelation. For the null hypothesis to be true, the actual number of runs, k, should lie within $[M \pm 1.96\sigma_m]$ range with 95% confidence. Thus, if $M - 1.96\sigma_m < k < M + 1.96\sigma_m$, then we cannot reject the hypothesis of randomness at 5% level of significance.

Findings of the Study

Annexure-2 gives the results of the Runs Test. As can be seen from it, we cannot reject he null hypothesis of randomness for most of the securities since the actual runs fall within the range of $(M \pm 1.96\ \sigma_m)$. However, the expected mean for six securities viz. Silverline Technologies, After Info, Sterlite Optical, VSNL, Aptech and Tata Power falls outside the confidence interval. Thus, there is observed correlation in these six securities. However, on the whole the results of the Runs analysis suggest that, in general, successive price changes appear to occur at random in most of the shares anlaysed.

CONCLUSION

The above anlaysis indicates that the behaviour of the share prices over a short period in recent time does not display any apparent pattern. Thus, it would be difficult to predict share prices from their historical price movements. The results of serial correlation analysis indicate that, in general, the price change series do not show any dependence of any order. This is confirmed by the results of the Runs test. Therefore, we can infer that share price behaviour in the Indian stock market follows the Random Walk Model. Hence, Indian stock market is weakly efficient.

References:

1. Barua SK (1981) *The Short Run Price Behaviour of Securities: Some Evidence on Efficiency of Indian Capital market,* Vikalpa, 6, pp 93-100.

ANNEXURE – I : Serial Correlation Analysis

	Lags	1	2	3	4	5	6	7	8	9	10
NIFTY	AC	0.08	-0.026	0.036	0.027	-0.06	-0.025	0.03	0.019	-0.[illegible]	-0.027
	Prob	0.118	0.259	0.364	0.483	0.439	0.538	0.612	0.699	0.77	(90.817)
	Q-Stat	24406	27022	3.1836	3.4655	4.8174	5.0483	5.3967	5.5407	5.6925	69744
ACC	AC	-0.053	-0.065	0.027	0.03	-0.102	0.023	0.046	0.111	-0.035	-0.081
	Frob	0.306	0.264	0.402	0.514	0.201	0.28	0.309	0.112	0.142	0.099
	Q-Stat	1.0467	2664	29307	3.2661	7.2698	7.466	8.2698	13.003	13.473	6.007
Mtekinfo	AC	-0.116	0.022	-0.003	0.076	0.048	-0.011	-0.018	0.012	-0.042	0.012
	Prob	0.039	0.111	0.221	0.183	0.224	0.322	0.419	0.521	0.564	0.653
	Q-Stat	4.2494	4.397	4.3991	6.2231	6.9503	6.9923	7.0975	7.1456	7.7085	7.7568
Aptech	AC	0.065	-0.046	0.006	-0.027	-0.063	-0.049	-0.128	-0.106	-0.011	0.063
	Prob	0.353	0.52	0.726	0.832	0.805	0.831	0.502	0.365	0.46	0.476
	Q-Stat	0.862	1.3066	1.3149	1.4711	23065	28234	6.3273	8.7336	8.7612	9.608
Bajaj auto	AC	0.038	-0.046	0.004	0.029	0.083	0.011	0.037	-0.053	0.015	-'0.063
	Prob	0.457	(0.505	0.712	0.794	0.508	0.631	0.677	0.654	0.737	0.671
	Q-Stat	0.5544	1.3646	1.3715	1.6806	4.2923	4.3356	4.8578	5.9383	6.0246	7.5695
Balaji Telefilms	AC	0.035	.017	-0.027	0.003	0.037	-0.009	-0.012	-0.013	0	-0.009
	Prob	0.503	0.756	0.843	0.934	0.929	0.%7	0.984	0.993	0.997	0.999
	Q-Stat	0.4494	0.5584	0.8279	0.8319	1.3541	1.3872	1.4411	1.505	1.5051	1.5348
BHEL	AC	-0.074	-0.021	0.054	-0.017	-0.052	-0.046	0.043	0.082	-0.073	0.003
	Prob	0.149	0.324	0.339	0.483	0.478	0.502	0.536	0.376 -	0.3	0.384
	Q-Stat	20851	22527	3.3616	3.4664	4.5154	5.3306	6.0297	8.6135	10.658	10.662
BPCL	AC	-0.003	0.033	0.035	-0.075	0.084	0.038	0.032	-0.043	0.03	-0.05
	Prob	0.956	0.814	0.832	0.555	0.337	0.397	0.467	0.498	0.564	0.563
	Q-Stat	0.003	0.4109	0.8741	3.0184	5.6984	6.2413	6.6403	7.3595	7.7085	8.6725
Castrol	AC	-0.008	-0.01	0.101	-0.022	-0.063	-0.057	0.004	-0.016	0.09	0.057
	Prob	0.882	0.971	0.271	0.392	0.346	0.335	0.444	0.541	0.344	0.331
	Q-Stat	0.0222	0.0584	3.9125	4.1039	5.6106	6.8504	6.8564	6.9552	10.076	11.353
Cipla	AC	0.008	0.028	-0.084	-0.097	-0.076	-0.07	0.026	-0.03	0.022	0.092
	Prob	0.875	0.854	0.389	0.16	0.119	0.101	0.144	0.19	0.25	0.145
	Q-Stat	0.0246	0.3155	3.0166	6.5735	8.7509	10.605	10.871	11.207	11.389	14.661
Digital Global	AC	-0.004	-0.041	0.13	0.045	-0.017	-0.086	0.034	0.063	-0.028	0.06
	Prob	0.933	0.722	0.07	0.099	0.161	0.097	0.132	0.124	0.164	0.158
	Q-Stat	0.007	0.6503	7.046	7.807	7.9111	10.726	11.159	12.669	12961	14.341
Geometric	AC	-0.043	-0.156	0.04	0.139	-0.01	-0.043	-0.049	0.062	0.056	-0.066
	Prob	0.411	0.008	0.016	0.002	0.004	0.006	0.008	0.008	0.01	0.009
	Q-Stat	0.6759	9.725	10.324	17.487	17.527	18.221	19.136	20.561	21.764	23.433
Global Tele	AC	0.22	0.019	0.05	-0.026	-0.126	-0.156	-0.149	-0.058	-0.037	0.024
	Prob	0	0	0	0.001	0	0	0	0	0	0
	Q-Stat	18.327	18.457	19.421	19.675	25.76	35.07	43.567	44.882	45.418	45.64
Grasim	AC	-0.025	-0.099	0.054	0.022	-0.107	0.099	0.043	0.019	0.004	-0.049
	Prob	0.63	0.142	0.17	0.266	0.088	0.038	0.051	0.078	0.117	0.128
	Q-Stat	0.2324	3.9091	5.031	5.2106	9.5851	13.313	14.021	14.154	14.159	15.1
HCL Tech	AC	0.174	0.006	-0.026	-0.112	-0.247	-0.166	0.118	0.048	0.031	0.063
	Prob	0.001	0.003	0.009	0.003	0	0	0	0	0	0
	Q-Stat	11.377	11.393	11.65	16.3%	39.608	50.193	55.516	56.407	56.772	58.327
HDFC	AC	-0.169	0.057	-0.185	0.042	-0.134	0.082	-0.114	0.141	-0.017	-0.03
	Prob	0.001	0.003	0	0	0	0	0	0	0	0
	Q-Stat	10.728	11.96	24.986	25.655	32466	35.015	40.004	47.614	47.727	48.069
Hero Honda	AC	0.098	-0.15	-0.095	-0.027	0.041	-0.009	0.032	0.021	0.079	-0.029
	Prob	0.057	0.002	0.001	0.003	0.006	0.011	0.018	0.029	0.022	0.032
	Q-Stat	3.619	412117	15.549	15.824	16.48	16.51	16.904	17.069	19.448	19.764

	Lags	1	2	3	4	5	6	7	8	9	10
	AC	0.28	-0.01	0.076	0.024	-0.11	-0.119	-0.046	-0.083	-0.089	-0.021
Himachal Fut	Prob	0	0	0	0	0	0	0	0	0	0
	Q-Stat	29.478	29.513	31.695	31.911	36.537	41.98	142781	45.432	48.515	4.685
	AC	0.01	-0.074	-0.109	0.015	-0.086	0.003	0.075	0.034	0.036	-0.019
HLL	Prob	0.849	0.352	0.085	0.153	0.09	0.145	0.111	0.145	0.179	0.236
	Q-Stat	0.036	120862	6.619	6.6999	9.5351	9.5392	11.6971	2141	12649	112789
	AC	0.057	-0.009	0.047	-0.031	0.093	0.053	0.04	-0.021	0.018	-0.069
HPCL	Prob	0.273	0.54	0.56	0.656	0.332	0.338	0.385	0.473	0.56	0.48
	Q-Stat	1.2037	1.2321	2060	224345	5.7407	6.818	7.4385	7.6093	7.7411	9.5641
	AC	0.153	-0.027	0.108	0.059	-0.133	-0.022	0.028	0.049	0.033	0.064
Hughes Soft	Prob	0.003	0.01	0.004	0.005	0.001	0.001	0.002	0.003	0.005	0.005
	Q-Stat	8.8531	9.1274	13.54	14.881	21.605	21.783	22076	23.006	23.433	25.036
	AC	0.439	0.253	0.17	0.088	0.095	0.009	-0.006	0.124	0.046	'0.029
IBP	Prob	0	0	0	0	0	0	0	0	0	0
	Q-Stat	72556	96.833	107.75	110.72	114.13	114.16	114.17	120.06	120.89	121.21
	AC	0.073	-0.101	-0.006	-0.001	-0.07	-0.11	0.016	0.047	'-0.042	0.03
Infosys	Prob	0.159	0.054	0.12	0.211	0.175	0.055	0.088	0.103	0.125	0.161
	Q-Stat	1.9835	5.8253	5.8401	5.8406	7.6817	12323	12419	13.261	13. 931	14.274
	AC	0.007	-0.107	0.007	0.13	0.039	—0.034	-0.048	0.049	0.019	0.059
Infotec Ent	Prob	0.893	0.114	0.226	0.029	0.044	0.066	0.08	0.092	0.131	0.128
	Q-Stat	0.0182	4.3384	4.3544	10.814	11.382	11.819	12703	13.62	13.765	15.123
	AC	-0.018	0.029	-0.008	0.014	0.032	0.021	-0.023	0.002	0.002	0.009
ITC	Prob	0.741	0.818	0.935	0.974	0.973	0.985	0.991	0.997	0.999	1
	Q-Stat	0.1089	0.4012	0.4233	0.4915	0.8548	1.0036	1.1799	1.1817	1.1836	1.2089
	AC	0.05	-0.076	0.105	0.007	-0.037	0.051	0.045	0	-0.063	-0.057
L&T	Prob	0.334	0.21	0.063	0.12	0.164	0.182	0.211	0.292	0.267	0.261
	Q-Stat	0.9335	3.1205	7.3093	7.3268	7.8611	8.8523	9.626	9.626	11.133	12377
	AC	-0.034	-0.123	-0.016	0.029	0.051	-0.049	-0.03	-0.02	0.06	-0.132
Mastek	Prob	0.514	0.046	0.1	0.159	0.18	0.204	0.265	0.343	0.321	0.072
	Q-Stat	0.4252	6.1612	6.26	6.5865	7.5893	8.501	8.8377	8.9883	10.379	17.103
	AC	0.099	-0.202	-0.038	0.112	-0.056	-0.009	0.11	0.017	-0.072	-0.032
MTNL	Prob	0.054	0	0	0	0	0	0	0	0	0
	Q-Stat	3.7171	19.088	19.644	24.434	25.626'	25.653	30.257	30.364	32365	32771
	AC	0.033	-0.19	0.021	0.044	0.105	0.019	-0.13	0.002	0.216	-0.004
NIIT	Prob	0.516	0.001	0.003	0.005	0.002	0.004	0.001	0.001	0	0
	Q-Stat	0.4218	14.058	14.219	14.94	19.153	19.286	25.775	25.777	43.734	43.74
	AC	0.175	-0.153	-0.003	0.063	0.063	-0.113	-0.127	-0.031	-0.021	0.06
Penta Soft	Prob	0.001	0	0	0	0	0	0	0	0	0
	Q-Stat	11.594	20.466	20.468	21.97	23.485	28.357	34.52	34.887	35.063	36.444
	AC	0.055	0.023	0.031	0.049	-0.046	-0.096	-0.035	0.035	-0.14	0.124
Polaris	Prob	0.281	0.509	0.635	0.625	0.635	0.324	0.386	0.444	0.08	0.019
	Q-Stat	1.1599	1.3516	1.707	126112	3.4204	6.%19	7.4292	7.8928	15.429	21.323
	AC	0.022	-0.117	-0.101	-0.003	-0.021	0.014	-0.04	-0.013	0.028	-0.047
Ranbaxy	Prob	0.669	0.068	0.026	0.055	0.093	0.146	0.181	0.251	0.312	0.331
	Q-Stat	0.1833	5.3888	9.272	9.2746	9.447	9.5245	10.136	10.197	10.492	11.35
	AC	0.052	0.096	0.015	-0.106	0.003	-0.141	-0.046	-0.024	-0.013	-0.033
Reliance	Prob	0.313	0.106	0.206	0.065	0.115	0.012	0.016	0.026	0.041	0.056
	Q-Stat	1.0168	4.4905	4.5766	8.8547	8.8574	16.422	17.234'	17.464	17.526	17.959
	AC	0.068	-0.019	0.029	-0.075	0.047	-0.028	0.101	0.071	'-0.028	-0.042
Relaince Petro	Prob	0.188	0.393	0.535	0.361	0.395	0.483	0.225	0.184	0..235	0.264
	Q-Stat	1.7302	1.868	921852	4.3483	5.1782	5.4836	9.3985	11.316	11.629	12.317

I	Lags	1	2	3	4	5	6	7	8	9	10
	AC	0.079	-0.029	-0.016	-0.041	0.044	-0.03	-0.138	0.041	-0.086	-.001
Rolta	Prob	0.124	0.263	0.427	0.491	0.528	0.609	0.106	0.131	0.083	*0.12*
	Q-Stat	2.3626	2.675	*2.777*	3.4113	4.151	4.5033	11.841	12.48	15.316	15.354
	AC	0.047	-0.053	0.031	-0.037	-0.083	-0.099	-0.02	0.06	-0.111	. 0.061
Satyam	Prob	0.365	0.386	0.52	0.597	0.371	0.166	0.232	0.221	0.08	10.078
	Q-Stat	0.8209	1.90172	2614	27721	5.3839	9.1364	9.2953	10.677	15.405	16.853
	AC	0.295	0.138	0.024	0.075	0.097	-0.05	0.014	0.076	0.096	0.026
Saw Pipes	Prob	0	0	0	0	0	0	0	0	0	0
	Q-Stat	32.815	40.012	40.229	42362	45.958	46.923	46.997	49.197	52733	53.003
	AC	0	-0.081	0.041	0.01	-0.015	-0.062	0.072	0.121	-0.005	-0.039
SBI	Prob	0.995	0.287	0.371	0.53	0.661	0.578	0.46	0.138	0.1%	0.229
	Q-Stat	4.00E-05	2.4978	3.134	3.1696	3.2564	4.7333	6.7093	12.299	12.309	'12.902
	AC	0.177	-0.18	0.033	0.126	0.047	-0.081	-0.126	-0.05	-0.004	0.048
Silverline Tech	Prob	0.001	0	0	0	0	0	0	0	0	0
	Q-Stat	11.786	24.022	24.439	30.457	31.306	33.792	39.921	40.884	40.89	41.792
	AC	0.356	0.106	0.039	-0.182	-0.29	-0.352	-0.177	-0.081	· 0.017	0.166
Softsolint	Prob	0	0	0	0	0	0	0	0	0	0
	Q-Stat	47.652	51.909	52497	65.055	97.014	144.23	156.24	158.79	158.91	169.53
	AC	0.243	-0.084	-0.103	-0.02	-0.056	-0.095	-0.093	-0.139	-0.036	0.04
Sqrd sfware	Prob	0	0	0	0	0	0	0	0	0	0
	Q-Stat	21.562	24.152	28.071	28.226	29.383	2721	35.%2	43.126	43.599	44.203
	AC	0.198	-0.033	0.037	0.088	0.054	-0.111	-0.183	-0.029	0.046	0.111
Sterlite Optical	Prob	0.002	0.009	0.02	0.02	0.029	0.017	0.001	0.002	0.004	0.002
	Q-Stat	9.2557	9.5206	9.8547	11.725	12435	15.438	23.615	23.822	24.347	27.363
	AC	0.074	-0.128	0.037	0.02	-0.046	0.027	0.008	-0.072	0.042	0
Tara power	Prob	0.152	0.016	0.033	0.063	0.084	0.125	0.188	0.152	0.179	0.244
	Q-Stat	20546	8.2468	8.7593	8.9061	9.7017	9.9865	10.013	11.981	12649	12.649
	AC	0.024	-0.035	0.044	0.039	0.056	-0.05	-0.052	-0.011	0.018	-0.086
TELCO	Prob	0.647	0.713	0.7	0.737	0.671	0.654	0.634	0.729	0.799	0.608
	Q-Stat	0.2093	0.6772	1.4222	1.9933	3.191	4.1647	5.2122	5.2612	5.389	8.2163
	AC	0.034	-0.067	-0.036	0.006	0.083	0.038	-0.008	0.016	0.043	0.074
TISCO	Prob	0.503	0.344	0.452	0.619	0.381	0.442	0.556	0.652	0.673	0.553
	Q-Stat	0.4487	21335	2.62%	26434	5.2922	5.8358	5.8607	5.9577	6.6585	8.7824
	A•	0.088	-0.021	-0.037	-0.043	-0.021	0.005	0.051	0.024	-0.042	-0.135
VSNL	Prob	0.089	0.218	0.312	0.372	0.489	0.617	0.607	0.686	0.707	0.205
	Q-Stat	28.865	3.0474	3.5716	4.2616	4.4312	4.4392	5.4322	5.6569	6.3209	13.345
	AC	0.026	-0.007	-0.031	-0.013	-0.069	-0.032	-0.021	-0.057	0.004	0.118
Wipro	Prob	0.612	0.872	0.888	0.951	0.773	0.819	0.877	0.827	0.888	0.463
	Q-Stat	0.2566	0.2747	0.6358	0.6994	2526	29226	3.0861	4.3219	4.32%	9.7476
	AC	0.085	-0.026	0.049	-0.108	-0.06	-0.053	-0.077	0.044	0.053	0.034
Zee telefilms	Prob	0.099	0.227	0.276	0.081	0.085	0.096	0.072	0.088	0.095	0.122
	Q-Stat	27159	29657	3.866	8.3051-	9.6743	10.754	13.021	13.779	14.859	15.297

2. Elton E, Gruber M (1996) *Modern Portfolio Theory and Investment Analysis* 5th Ed. John Wiley and Sons.
3. Fama EF (1970) *Efficient Capital Market: A Review of Theory and Empirical Work* Journal of Finance, May, pp 383-417.
4. Gupta OP (1989) *Behaviour of Share Prices in India: A Test of Market Efficiency* National Publishing House, New Delhi.
5. Sharma JL (1983) *Efficient Capital Market and Random Character of Stock Prices and Behaviour in a Developing Economy,* The Indian Economic Journal,31,pp 53-70.
6. Laurence MM (1986) *Weak Form Efficiency in Kuala Lumpur and Singapore Stock Markets,* Journal of Business Finance,10, pp431-445.

Annexure-II : **RUNS TEST ANALYSIS**

company		n1	expected n2	std runs	E(k) + dev	E(k) - 1.96sd	actual 1.96sd	Randomness runs
SA1YAMCOMP	172	202	186.80	9.59	205.60	167.99	182	Yes
INFOSYSTCH	188	186	187.99	9.66	206.92	169.07	179	Yes
DIGITAIEQP	183	191	187.91	9.65	206.83	169.00	190	Yes
WIPRO	179	195	187.66	9.64	206.55	168.77	188	Yes
GLOBAL1EIE	172	202	186.80	9.59	205.60	167.99	188	Yes
RELIANCE	187	187	188.00	9.66	206.93	169.07	190	Yes
ZEETEIE	182	192	187.87	9.65	206.78	168.95	176	Yes
HIMACHLFUT	168	206	186.07	9.56	204.80	167.34	168	Yes
HCLTECH	189	185	187.98	9.66	206.90	169.05	176	Yes
NIIT	189	185	187.98	9.66	206.90	169.05	184	Yes
RANBAXY	189	185	187.98	9.66	206.90	169.05	179	Yes
SOFTSOLINT	165	209	185.41	9.52	204.08	166.75	188	Yes
L&T	181	193	187.81	9.65	206.71	168.90	169	Yes
ITC	158	216	183.50	9.42	201.97	165.03	174	Yes
ACC	173	201	186.95	9.60	205.77	168.13	176	Yes
POLARIS	178	196	187.57	9.63	206.45	168.68	199	Yes
PENTASOFT	162	212	184.66	9.48	203.25	166.07	158	Yes
HINDLEVER	173	201	186.95	9.60	205.77	1.68.13	180	Yes
SILVERIINE	161	213	184.39	9.47	202.95	165.83	158	No
SQRDSFWARE	156	218	182.86	9.39	201.27	164.46	166	Yes
AFTECKINFO	159	215	183.81	9.44	202.31	165.31	151	*No*
REL PETRO	152	222	181.45	9.32	199.71	163.19	170	Yes
MASTEK	190	184	187.95	9.65	206.87	169.03	192	Yes
SBIN	182	192	187.87	9.65	206.78	168.95	190	Yes
BALAJITELE	177	197	187.47	9.63	206.34	168.59	176	Yes
HUGHESSOFT	173	201	186.95	9.60	205.77	168.13	178	Yes
STROPTICAL	111	263	157.11	8.06	172.90	141.32	.112	*No*
TISCO	172	202	186.80	9.59	205.60	167.99	170	Yes
VSNL	188	186	187.99	9.66	206.92	169.07	167	*No*
HINDPETRO	175	199	187.23	9.62	206.08	168.38	178	Yes
ROLTA	175	199	187.23	9.62	206.08	168.38	184	Yes
MTNL	171	203	186.63	9.59	205.42	167.84	180	Yes
CIPLA	179	195	187.66	9.64	206.55	168.77	192	Yes
TELCO	197	177	187.47	9.63	206.34	168.59	185	Yes
BHEL	182	192	187.87	9.65	206.78	168.95	192	Yes
BPCL	188	186	187.99	9.66	206.92	169.07	196	Yes
GRASIM	187	187	188.00	9.66	206.93	169.07	184	Yes
GEOMETRIC	191	183	187.91	9.65	206.83	169.00	196	Yes
HDFC	177	197	187.47	9.63	206.34	168.59	184	Yes
HEROHONDA	190	184	187.95	9.65	206.87	169.03	187	Yes
IBP	163	211	184.92	9.50	203.53	166.31	170	Yes
INFOTECENT	184	190	187.95	9.65	206.87	169.03	188	Yes
APTECH	91	283	138.72	7.10	152.64	124.79	84	*No*
SAWPIPES	167	207	185.86	9.55	204.57	167.15	170	Yes
TATAPOWER	171	203	186.63	9.59	205.42	167.84	175	*No*
CASTROL	171	203	186.63	9.59	205.42	167.84'	187	Yes
BAJAJAUTO	179	195	187.66'	9.64	206.55	168.77	180	Yes