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Testing weak form market efficiency of Indian capital market: A case of national stock exchange (NSE) and Bombay stock exchange (BSE)

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Testing the efficiency of the market is an important concept for the investors, stock brokers, financial institutions, government etc. In order to develop an understanding of the stock behaviour various models are employed. The opening up of our economy has integrated our stock market with the world economy. The study is more important in the present era of globalised economies. This paper tests the market efficiency of Indian Capital Market in its weak form based on the indices of two major stock exchanges of India viz; National Stock Exchange (NSE) and Bombay Stock Exchange (BSE). The efficiency of the Indian capital market is tested using the daily closing values of the indices of NSE and BSE over the period OF 1st April 2000 to 31st March 2010 by employing Runs Test, which is a non-parametric test. Based on the result of runs test alternate hypothesis is rejected and it is proved that Indian Capital market neither follow random walk model nor is a weak form efficient.

Key words: Market efficiency, efficient market hypothesis (EMH), Bombay stock exchange (BSE), national stock exchange (NSE), runs test.

INTRODUCTION

Capital market is an institutional arrangement, which facilitates long-term borrowing and lending of funds. An efficient capital market is one where the security prices reflect all the, relevant information. Capital Market efficiency is very important for the investors from the investment point of view. In an efficient market, no investor is able to earn abnormal profit, as all the information is absorbed and disseminated in the market and is quickly and accurately reflected by the security prices. Hence, there is no chance of under-valued and over-valued assets offering higher or lower expected return. It implies that with the availability of the information the assets reflect the true prices and the investors, brokers, financial institutions etc. cannot be kept in the

dark.

The present era is marked by globalization where economies and markets worldwide are integrated. An event in one country has repercussions on the market of others. The understanding of efficiency of the emerging market is becoming more important as a consequence of integration with more developed markets and free movement of investments across national boundaries. The recent financial recession which erupted due to the liquidity crisis in USA in 2007 is the biggest testimony of the integrated economies. The liquidity crisis spread to economies worldwide which was reflected in the falling stock index and fluctuations in the values of the currency. In India investor wealth of about Rs 250000 crore was wiped out in the course of a single day on 10 October as the result of the recessionary impact (Khan and Mehtab, 2010).

In the past it has been observed that the developed

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Western Equity Markets are more efficient. In the case of developing countries contribution of equity markets in the process of development is less and that resulted in weak markets with restrictions and control (Gupta and Basu 2007). Fama (1965) described efficient market as a fair game model where the value of expected return was zero.

The present paper makes an earnest attempt to analyze the weak form market efficiency based on the theory of Efficient Market Hypothesis (EMH) (Fama 1965). The Efficient Market Hypothesis (EMH) provides that the stocks always trade at their fair value on stock exchanges, making it impossible for investors to either purchase undervalued stocks or sell stocks for inflated prices

<http://www.investopedia.com/terms/e/efficientmarkethypothesis.asp>. As such, it should be impossible to outperform the overall market through expert stock selection or market timing as the information is disseminated to all. The assets price is reflective of all the available information available and anticipated risk. The only way an investor can possibly obtain higher returns is by purchasing riskier investments. The Random Walk Model asserts that all price changes are serially independent, which implies that future price changes are independent of past price changes. Samuelson (1965) and Fama (1970) indicates that the EMH supposes that share price adjust rapidly to the appearance of new information, and thus, current prices fully reflect all available information and should follow a random walk process (Awad and Daraghma, 2009). The levels of market efficiency was provided by Fama (1971), who argued that markets could be efficient at three levels, based upon what information was reflected in prices-

The weak form EMH implies that the information relating to past price and volume are reflected in the current price of the asset or security. In the present times information is easily available at the click of the mouse. The prices of the security are accessible to the public which is the reason behind this form being termed as weak form. It implies that no one should be able to outperform the market using something that "everybody else knows".

The semi strong form EMH states that all publicly available information is already incorporated into the price of the assets. The public information includes not only the past prices but also the data reported in a company's financial statements, company's announcement, economic factors and others. It also implies that no one should be able to outperform the market using something that "everybody else knows". This indicates that a company's financial statements are of no help in forecasting future price movements and securing high investment returns as these are already reflected in the prices of the securities.

The strong form EMH stipulates that private information or insider information too, is quickly incorporated by market prices and therefore cannot be used to reap abnormal

trading profits. Thus, all information, whether public or private, is fully reflected in a security's current market price in an objective and informative manner. It implies that even the company's management (insider) is not able to make gains from the inside information they hold.

Statement of problems and issues

In the present times, the concept of the efficiency of stock market is an issue gaining ground and importance both in academics and business world. Investment practices and government policies have a detrimental effect on the security markets. Some of the researchers believe that capital markets in emerging countries are not efficient because of their operating characteristics and the nature of the investors. Various studies have been made on testing weak form market efficiency but the results are mixed. While some support the Efficient Market Hypothesis, some do not. Hence, present study is an attempt to test the efficiency of Indian Capital market in its weak form by employing Runs Test on the indices of Bombay Stock Exchange and National Stock Exchange for the period 1st April 2000 to 31st March 2010.

The present study entails both domestic and international issues. It is observed that economic, political and social issues have an impact on the study undertaken. During the period of the study the change of the government at the centre along with political instabilities have an impact on the movement of the indices. Also global factors such as the financial recession of 2007 which gripped the worldwide economies have a cascading effect on the movement of the index as well. Also various other micro and macro factors apart from the information related to the stocks itself have an impact on the movement of the index which cannot be overlooked.

Research gap

Many studies have been done on Weak form market efficiency by using different models ranging from traditional models to advance models as well, but these provide mixed results. Some studies resulted that Indian capital market is weak form market efficient while others reject this. Sharma and Kennedy (1977), Ramachandran (1986), Poshakwale (1996) and Sharma et al. (2009) found the Indian stock market to be weak form efficient while according to Pradhan et al. (2009), the Indian stock market was not weak form efficient. However data for two years was only considered for the same.

Hence, the present study focuses on examining the efficiency of Indian capital market in order to test whether the Indian Equity market encompassing both NSE (National Stock Exchange) and BSE (Bombay Stock Exchange) is weak form efficient or not. The researchers takes into account data for ten years to understand the behaviour of the market over the past decade that is 1 April,

2000 to 31, March 2010.

Scope and objectives

The movement of the stock market provides an insight to investors who buys and sells shares and securities with the aim of making profits. Various models are employed for the purpose of understanding the movement of the stock market and also anticipating future changes in price or volume. The present study tests the market efficiency of the Indian Capital Market in its weak form of Efficient Market Hypothesis (EMH). The index of two major stock exchanges that is, National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) are undertaken for the purpose of the study. The present study entails data of one decade that is since 1st April 2000 to 31st March 2010. Monthly index of each exchange are scrutinized for the purpose of the analysis and the behaviour and movement of the index are tested for efficiency.

The objectives of the study are:

1. To develop an understanding of the various forms of efficiency of the stock market
2. To study relevant literature relating to efficiency of stock market in India and other developing countries
3. To trace the trend of the movement of the stock market index over the last decade
4. Take into account the impact of the micro and macro factors pertaining to both domestic and international aspects on the movement of the stock prices.
5. To examine the pattern of the movement of share prices in the Indian Stock market, that is, whether they move in an independent manner or not.
6. To test whether the Indian Equity markets, especially NSE and BSE are weak form efficient or not.
7. To test whether the Indian Capital market follow random walk model or not.

LITERATURE REVIEW

Conceptual review

The concept of market efficiency came into existence with the submission of Ph.D thesis by Bachelier in 1900, "The Theory of Speculation" to the Sorbonne. His work was largely ignored until the 1950s but with the beginning of 1930's other researchers supported his work.

In the mid-1960s, the concept of Efficient Market Hypothesis got special recognition as a prominent theory and the work of Bachelier was circulated by Paul Samuelson. In 1964 Bachelier's dissertation along with the empirical studies mentioned above were published in an anthology edited by Paul (1964). In 1965, Eugene published his dissertation arguing that stock market prices follow a random walk, and Samuelson's publication focused on the concept of martingale rather than

a random walk. He concluded that properly anticipated prices fluctuate randomly (Eugene, 1965). Fama (1970) published a review of both the theory and the evidence for the hypothesis. The paper extended and refined the theory, included the definitions for three forms of financial market efficiency: weak, semi-strong and strong. He was the first to consider the 'Joint Hypothesis Problem'.

Granger and Morgenstern published a book 'Publicity of Stock Market Prices' in 1970. In 1972 Scholes, studied the price effect of secondary offerings and found that the market is efficient. Studies by Firth (1976, 1979, and 1980) in the United Kingdom have compared the share prices existing after a takeover announcement with the bid offer. Firth found that the share prices fully and instantaneously adjusted to their correct levels, thus concluding that the UK stock market was semi-strong-form efficient.

However, the market's ability and efficiency to respond to a short-term, widely publicized event such as a takeover announcement does not necessarily prove that market efficiency was related to other more long term, amorphous factors. David (1994) has criticized the evidence provided by this instant "efficient" response, pointing out that an immediate response is not necessarily efficient, and that the long-term performances of the stock in response to certain movements are better indications (http://en.wikipedia.org/wiki/Efficient-market_hypothesis#cite_note-13).

Subjective review

Several studies has been conducted on testing the weak-form efficiency of Indian stock market and some of them are as follows-

Sharma and Kennedy (1977) compared the behavior of stock indices of the Bombay, London and New York stock exchanges during 1963-73 using run test and spectral analysis. Both runs test and spectral analysis confirmed the random movement of stock indices for all the three stock exchanges. They concluded that stocks on the BSE (Bombay Stock Exchange) follow random walk and are weak-form efficient.

Ramachandran (1986) tested for the weak - form of Efficient Market Hypothesis using weekend prices of 60 scrips over the period 1976-81. He used filter rule tests in addition to runs test and serial correlation tests and found support for the weak - form of EMH.

Yalawar (1988) conducted an intensive study on the efficiency of BSE (Bombay Stock Exchange). He studied the month end closing prices of 122 stocks listed on the BSE during the period 1963-82. He used only the non-parametric tests, Spearman's rank correlation test and found the behaviour of stock prices to be random. Rao and Bhole (1991) questioned his study, as it was restricted to only those companies, which performed well during that period. Poshakwale (1996) focused on the accelerating trend of investment in the stock market. He analyzed the weak

form efficiency and day of the week effect on the Bombay Stock Exchange (BSE) using daily BSE National Index Data for the period 1987 to 1994. The study reveals that BSE supports the validity of day of the week effect and the Indian stock market is weak - form inefficient.

Seiler and Walter (1997) examined the degree of random walk by analyzing the historical returns of all the stocks listed on the New York Stock Exchange (NYSE) from February 1885 to July 1962. The study concludes that changes in historical prices are completely random and this conclusion is consistent with modern efficient market studies.

Keasey and Mobarek (2000), in their paper investigated the weak-form efficiency of an emerging market by taking evidence from Dhaka Stock Market of Bangladesh over the period 1988 to 1997 by employing both parametric and non-parametric tests. The study includes the sample of daily price indices of all the listed securities on the Dhaka Stock Exchange. The study reveals that Dhaka Stock Market of Bangladesh is weak - form inefficient.

Pandey (2003) analysed the efficiency of the Indian stock markets by using three Indian stock indices to test the efficiency level in Indian stock market and the random walk nature of the stock market by using the runs test and the Auto Correlation Function ACF (K) for the period from January 1996 to June 2002. The study found that the series of stock indices in the Indian stock market biased the random time series and do not confirming the Random Walk Theory.

Sharma et al. (2009) examined the weak-form efficiency of eleven (11) securities listed on the BSE using weekly data from July 2007 to October 2007 by employing runs test and auto-correlation tests. The study concludes that the BSE is weak-form efficient and the stock prices are having very scrimpy effect on future prices which implies that an investor cannot reap out abnormal profits as the current share prices already reflect the effect of past share prices.

Pradhan et al. (2009) in their paper tried to examine the Efficient Market Hypothesis (EMH) in its weak - form by employing the unit root test on the sample of daily stock returns of National Stock Exchange (NSE) and Bombay Stock Exchange (BSE). The sample period lies between Jan.2007 to Jul.2009. The study reveals that Indian Stock market is not weak - form efficient.

Chigozie and Okpara (2009) examined the efficiency of Nigerian Stock Market over the period 1984 to 2006 by employing an advance test viz; GARCH (Generalized Autoregressive Conditional Heteroscedasticity) Model. The study reveals that Nigerian Stock market is weak form efficient. The result agrees with the findings of Samuels and Yacout (1981), Ayadi (1984), Olowe (1999) and Kukah (2007).

Hypotheses

$H_{0\alpha}$: Indian Capital Market does not follow Random Walk Model.

$H_{a\alpha}$: Indian Capital market is not weak form efficient.

Ko and Lee (1991) in their dissertation observed, "If the random walk hypothesis holds, the weak form of the efficient market hypothesis must hold, but not vice versa. Thus, evidence supporting the random walk model is the evidence of market efficiency. But violation of the random walk model need not be evidence of market inefficiency in the weak form".

Data

The data analyzed in this paper has been collected from a wide range of reliable sources. The database maintained by the National Stock Exchange and Bombay Stock Exchange relating to their monthly index has been accessed for the purpose of the study. The Data consists of daily closing prices of two major stock indices of India which is the BSE Sensex and S&P CNX Nifty from 1st April 2000 to 31st March 2010.

Data has also been retrieved from the publications of the Reserve Bank of India (RBI) that is the Monthly Bulletin and the Handbook of Statistics for the purpose of the study.

METHODOLOGY

The study seeks to test the weak form market efficiency test of Indian Capital market especially BSE Sensex and S&P CNX Nifty, by employing Runs Test. Runs Test is a non-parametric test, which is used to test the randomness of the series which auto correlation fails to do. Runs Test is a traditional method used in the random walk model and ignores the properties of distribution. It has been used to judge the randomness in the behaviour of Indian Stock market. It determines whether successive price changes are independent. It ignores the absolute value in a time series and takes into consideration the price changes of the same sign. In this test actual number of runs is being compared with the expected number of runs. If the actual number of runs is not significantly different from the expected number of runs, then the price changes are considered independent, and if this difference is significant then the price changes are considered dependent. The expected number of runs can be obtained by applying the following formula-

$$E(r) = \frac{2(n_1 n_2)}{n_1 + n_2 + 1}$$

Where, $E(r)$ = Expected number of runs. n_1 = number of positive runs. n_2 = number of negative runs.

The standard error of the expected number of runs of all signs may be obtained as-

$$S.E = \sqrt{\frac{2n_1 n_2 (2n_1 n_2 - n_1 - n_2)}{(n_1 + n_2)^2 (n_1 + n_2 - 1)}}$$

Where, S.E = Standard Error

The expected number of runs is now compared with the actual

Table 1. Statistical description – BSE and NSE (From 1st April 2000 to 31st March 2010).

Index	Mean	S.D	Var.	Max.	Min.	Skewness	Kurtosis
NSE	7.692421	0.588271	0.346062	8.746374	6.750165	0.101389	-1.45125
BSE	8.883224	0.668552	0.446962	13.77962	6.650256	0.838019	3.566902

Source: Compiled and Calculated from Appendices 1 and 2.

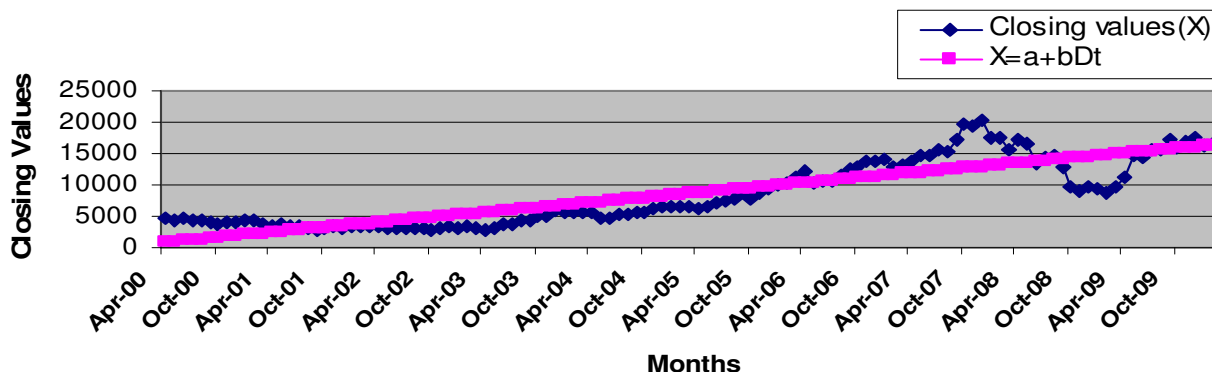


Figure 1. Graph showing trend of BSE Sensex (from April 2000 to 31st March 2010). Source: Appendix 1.

number of runs. The difference between actual number of runs and expected number of runs can be expressed by a standardized value 'Z' as under-

$$Z = \frac{R + 0.5 - E(r)}{S.E}$$

Where, R = Actual number of runs. 0.5 = Continuity adjustment.

In order to test the significant difference between the actual number of runs and expected number of runs the test statistics employed will be 'Z'. The null hypothesis for this test is that the observed series are random. The null hypothesis is rejected if the calculated number of runs falls outside the 95% confidence interval ($\mu - 1.96\sigma \leq k \leq \mu + 1.96\sigma$) and is accepted if the value lies in between ± 1.96 . The z-value is tested at 5% significant level, that is, one cannot reject the null hypothesis with 95% confidence level. In other words there is a probability of rejecting a null hypothesis when it is true five out of 100 times.

Descriptive statistics

Before employing any test it is very important to find out the normality of the data which can be found out by statistical description of the data. Table-1 presents statistical description of two major stock indices of India, that is, national stock exchange (NSE) and Bombay stock exchange (BSE).

Under this mean, standard deviation, variance, minimum, maximum, skewness and kurtosis have been calculated. Statistical description is made in order to find out whether the data shows normality or not. The reason to find out normality is that until and unless the data is normal, parametric test such as serial correlation test cannot be applied. Runs test is applied in this case which ignores time series normality assumptions. Statistical description is being calculated on the basis of the daily closing prices of NSE and BSE indices. The mean of NSE is ranging from 6.750 to 8.75 and of BSE is from 6.65 to 13.779. It is observed by the researchers that the mean return of NSE is lower as compared to BSE and similarly

the variance of NSE is lower than that of BSE showing that BSE index is highly volatile and risky in nature in comparison to S&P CNX Nifty. The values of skewness and kurtosis determine the normality of the data. The critical values for skewness and kurtosis are 0 and 3 which represents that the observed data is perfectly normally distributed. The calculated values of skewness for NSE and BSE are at 0.1014 and 0.8380 and values of kurtosis for NSE and BSE are at -1.45125 and 3.5669 respectively. The values from the table show that neither the skewness nor the kurtosis of both the indices shows normality of the data. The skewness of NSE and BSE is greater than 0 and kurtosis of NSE is less than 3 and that of BSE is greater than 3 which imply that data does not show normality. In this case it is better to employ runs test which ignores the assumptions of normal distribution.

Graphical analysis

Figure 1 displays the graph of the BSE Sensex and its trend for the period from 1st April 2000 to 31st March 2010. The months are plotted on the X-axis and the closing values are plotted on the Y-axis. The trends of monthly returns have been calculated by taking the log of closing values and the trend has been fitted by least square. The trend as calculated in Appendix 1 is plotted accordingly.

In Figure 2 it is observed that the trend line is linear which shows the stationary feature in the time series. Monthly return is shown on Y-axis and Months are shown on X-axis. Monthly Return has been calculated in Appendix 1 by taking natural log in order to bring out uniformity. In Figure 2, trend line is linear; this shows that the time series is uniform in nature.

Figure 3 highlights the graph of the NSE Sensex and its trend for the period starting from 1st April 2000 to 31st March 2010. It is plotted on the basis of Appendix 2. The

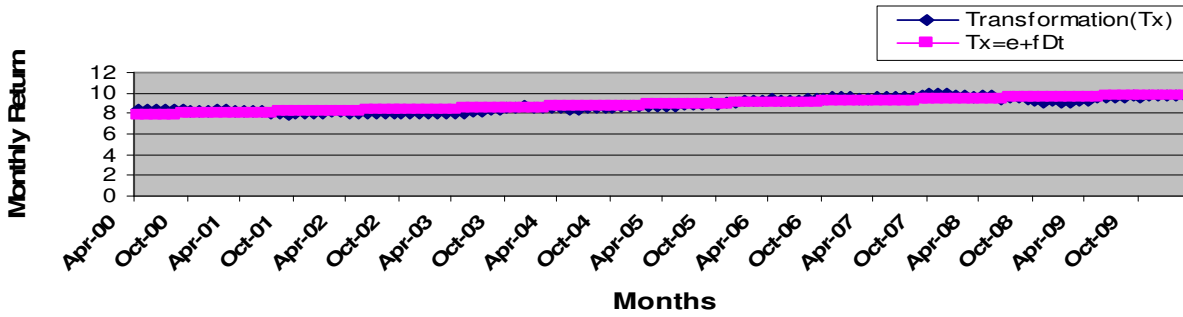


Figure 2. Graph showing trend of BSE Sensex after transformation (from April 2000 to 31st March 2010) Source: Appendix 1.

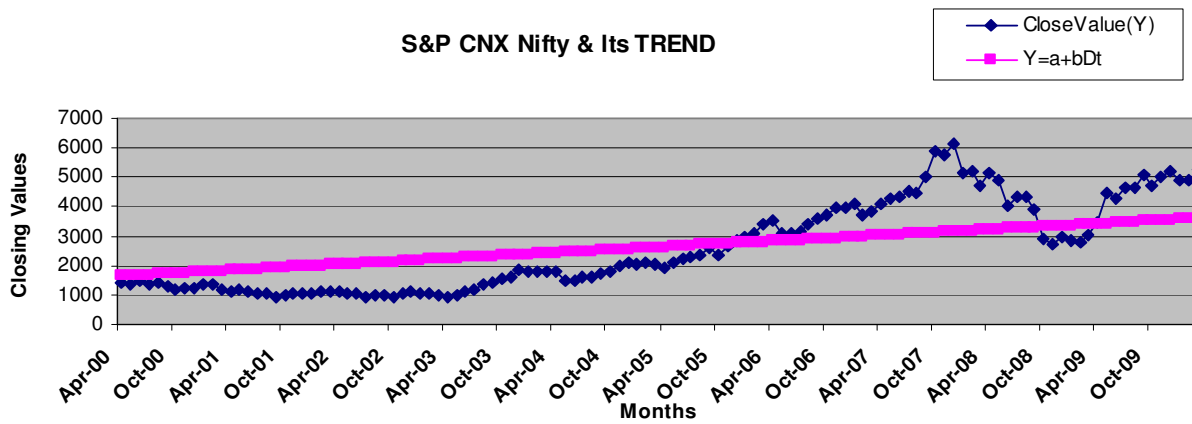


Figure 3. Graph showing trend of S&P CNX Nifty (from April 2000 to 31st March 2010). Source: Appendix 2.

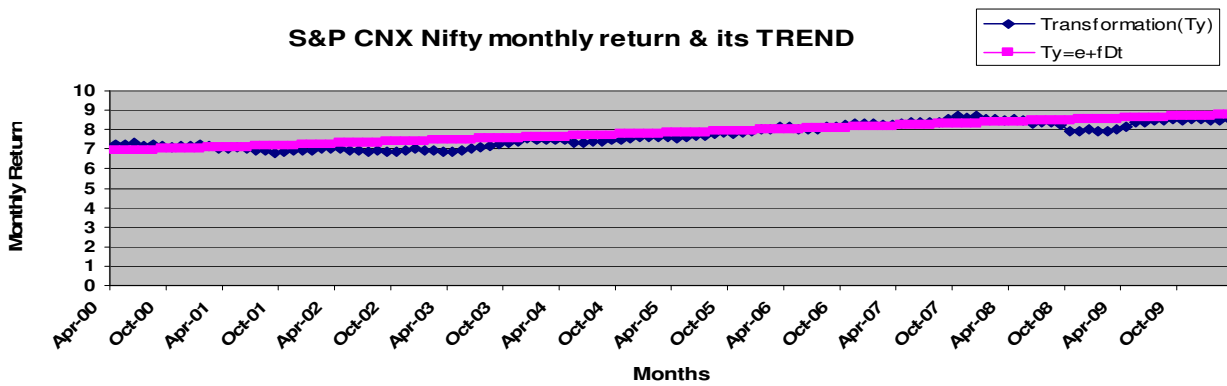


Figure 4. Graph showing trend of S&P CNX Nifty after Transformation (from April 2000 to 31st March 2010)Source: Appendix 2.

monthly return is shown on Y-axis and months are shown on X-axis. In this graph it can be noticed that the time trend is not linear. Nifty shows high fluctuations from 2005 to 2008 as in case of BSE Sensex. It is very difficult to get any idea about the stationary aspect from this graph. In the middle of 2007 Sensex reaches at its peak and thereafter it started decreasing. The reason behind it

was the financial recession starting from the end of 2007 till the end of 2008. As there are high fluctuations in the S&P CNX Nifty, monthly return has been calculated by taking natural log of closing prices of NSE which is termed as transformation as can be seen in Appendix 2. In Figure 4 monthly return of NSE has been calculated by taking natural log of closing prices of NSE in order to

Table 2. Result of Runs Test of BSE Sensex and S&P CNX Nifty.

Exchange	Actual runs (R)	Expected number of runs (r)	Number of positive runs (n_1)	Number of negative runs (n_2)	Standard error (S.E)	Z-value
a) BSE	1120	1231	1370	1119	24.69	-4.48
b) NSE	1168	1240	1377	1126	24.76	-2.88

remove fluctuations from the data and to get the uniformity in graph and trend line. In this graph Months are shown on X-axis and Monthly Return is shown on Y-axis. It is observed that the trend line is linear which shows uniformity in data. This graph shows that the CNX Nifty is showing an upward trend from 1st April 2000 to 31st March 2010.

Analysis and interpretation

This study conducts a Runs Test in order to test the weak form market efficiency of Indian Capital market, especially NSE and BSE. Table 2 shows the result of Runs Test of BSE Sensex and S&P CNX Nifty. It presents the result of random walk test. Actual number of runs, expected number of runs and standard error has been calculated in this table for BSE Sensex and S&P CNX Nifty from the closing price values of both the indices for the years 2000 to 2010. Further Z-values are calculated so that they can be compared with the critical value ± 1.96 in order to find out whether the difference between the actual number of runs and expected number of runs is significant or insignificant.

a) BSE: In case of BSE it is noted that the z-value is computed as -4.48. The value falls outside the 95% confidence interval and so we cannot accept the null hypothesis. This implies that the succeeding price changes do not move in an independent manner and so Indian Capital Market does not follow the random walk model. Secondly, the Indian Capital Market is not weak form efficient.

B) NSE: In case of NSE it is observed that the Z-value comes out as -2.28 which again fall outside the 95% confidence interval and so we cannot accept the null hypothesis. This implies that the succeeding price changes do not move in an independent manner. Hence in the case of NSE as well it is seen that the Indian Capital Market does not follow the random walk model and also the Indian Capital Market is not weak form efficient.

Compare results with other studies

Various other studies also tested the efficiency of the market by using runs test like Sharma and Kennedy (1977) compared the behaviour of London, New York and Bombay stock exchange by employing the runs test.

The study concludes that the Bombay Stock Exchange follow random walk and is weak form efficient but this study is very old. Panday (2003) analysed the efficiency of the Indian stock markets by using three Indian stock indices to test the efficiency level in Indian stock market by using runs test and found that the series of stock indices in the Indian stock market biased the random time series and do not confirming the Random Walk Theory. And now our study also confirming that both the NSE and BSE do not follow the random walk and the Indian Capital Market is not weak form efficient.

Conclusion

This study examines the weak form efficiency of Indian Capital market based on the two major stock exchanges of India, that is, NSE and BSE. The study concludes that both NSE and BSE does not follow random walk model. Runs Test is being employed in this study, which rejects the presence of random walk and supports that Indian Capital Market is not weak form market efficient. It implies that the movement of the stock market index cannot be determined by the Random Walk Model. The investors cannot determine the movement of the present stock prices or anticipate future movements in price and volume based on this. The investors cannot make profit relying on this model.

However it is observed that the earlier literatures related to the Indian Stock Market was a weak form market. Hence, it can be concluded that the market has evolved and developed and there are other micro and macro factors both at the domestic and inter-national level accountable for this. The Indian economy as a whole has grown by leaps and bounds over the past decade. Economies worldwide are integrated with each other more than ever before. An event in a certain country has immediate and long lasting repercussions elsewhere. Hence it is imperative to study the movement of the Indian Capital Market in the light of the changed circumstances to understand, introspect and anticipate.

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APPENDICES

Appendix 1. Daily closing values of BSE(X) showing monthly trend fitted by least square.

Months	Closing values(X)	Transformation (Monthly Return) TX	T	Dt	Dt*Dt	XDt	TDt	X=a+bDt	Tx=e+fDt
Apr-00	4657.55	8.446244838	1	-59	3481	-274795.45	-498.3284454	873.06	7.8936
May00	4433.61	8.39696943	2	-58	3364	-257149.38	-487.0242269	1004.12	7.91
Jun-00	4748.77	8.465640916	3	-57	3249	-270679.89	-482.5415322	1135.18	7.9264
Jul-00	4279.86	8.361675578	4	-56	3136	-239672.16	-468.2538324	1266.24	7.9428
Aug-00	4477.31	8.406777699	5	-55	3025	-246252.05	-462.3727734	1397.3	7.9592
Sep-00	4090.38	8.316393154	6	-54	2916	-220880.52	-449.0852303	1528.36	7.9756
Oct-00	3711.02	8.21906205	7	-53	2809	-196684.06	-435.6102887	1659.42	7.992
Nov-00	3997.99	8.293547014	8	-52	2704	-207895.48	-431.2644447	1790.48	8.0084
Dec-00	3972.12	8.287055236	9	-51	2601	-202578.12	-422.639817	1921.54	8.0248
Jan-01	4326.72	8.372565028	10	-50	2500	-216336	-418.6282514	2052.6	8.0412
Feb-01	4247.04	8.353977549	11	-49	2401	-208104.96	-409.3448999	2183.66	8.0576
Mar-01	3604.38	8.189905052	12	-48	2304	-173010.24	-393.1154425	2314.72	8.074
Apr-01	3519.16	8.165977604	13	-47	2209	-165400.52	-383.8009474	2445.78	8.0904
May01	3631.91	8.19751396	14	-46	2116	-167067.86	-377.0856421	2576.84	8.1068
Jun-01	3456.78	8.148092799	15	-45	2025	-155555.1	-366.664176	2707.9	8.1232
Jul-01	3329.28	8.110511343	16	-44	1936	-146488.32	-356.8624991	2838.96	8.1396
Aug-01	3244.95	8.084855221	17	-43	1849	-139532.85	-347.6487745	2970.02	8.156
Sep-01	2811.6	7.941508995	18	-42	1764	-118087.2	-333.5433778	3101.08	8.1724
Oct-01	2989.35	8.002811251	19	-41	1681	-122563.35	-328.1152613	3232.14	8.1888
Nov-01	3287.56	8.097900927	20	-40	1600	-131502.4	-323.9160371	3363.2	8.2052
Dec-01	3262.33	8.090196943	21	-39	1521	-127230.87	-315.5176808	3494.26	8.2216
Jan-02	3311.03	8.105014598	22	-38	1444	-125819.14	-307.9905547	3625.32	8.238
Feb-02	3562.31	8.17816449	23	-37	1369	-131805.47	-302.5920861	3756.38	8.2544
Mar-02	3469.35	8.151722536	24	-36	1296	-124896.6	-293.4620113	3887.44	8.2708
Apr-02	3338.16	8.113175036	25	-35	1225	-116835.6	-283.9611263	4018.5	8.2872
May02	3125.73	8.047423135	26	-34	1156	-106274.82	-273.6123866	4149.56	8.3036
Jun-02	3244.7	8.084778175	27	-33	1089	-107075.1	-266.7976798	4280.62	8.32
Jul-02	2987.65	8.002242404	28	-32	1024	-95604.8	-256.0717569	4411.68	8.3364
Aug-02	3181.23	8.065023193	29	-31	961	-98618.13	-250.015719	4542.74	8.3528
Sep-02	2991.36	8.003483412	30	-30	900	-89740.8	-240.1045024	4673.8	8.3692
Oct-02	2949.32	7.989329914	31	-29	841	-85530.28	-231.6905675	4804.86	8.3856
Nov-02	3228.82	8.079872024	32	-28	784	-90406.96	-226.2364167	4935.92	8.402
Dec-02	3377.28	8.124825931	33	-27	729	-91186.56	-219.3703001	5066.98	8.4184
Jan-03	3250.38	8.086527192	34	-26	676	-84509.88	-210.249707	5198.04	8.4348
Feb-03	3283.66	8.096713933	35	-25	625	-82091.5	-202.4178483	5329.1	8.4512
Mar-03	3048.72	8.022477109	36	-24	576	-73169.28	-192.5394506	5460.16	8.4676
Apr-03	2959.79	7.992873599	37	-23	529	-68075.17	-183.8360928	5591.22	8.484
May03	3180.75	8.064872297	38	-22	484	-69976.5	-177.4271905	5722.28	8.5004
Jun-03	3607.13	8.190667721	39	-21	441	-75749.73	-172.0040221	5853.34	8.5168
Jul-03	3792.67	8.240825536	40	-20	400	-75853.4	-164.8165107	5984.4	8.5332
Aug-03	4244.73	8.353433492	41	-19	361	-80649.87	-158.7152364	6115.46	8.5496
Sep-03	4453.24	8.4013872	42	-18	324	-80158.32	-151.2249696	6246.52	8.566
Oct-03	4906.87	8.498391543	43	-17	289	-83416.79	-144.4726562	6377.58	8.5824
Nov-03	5044.82	8.526117253	44	-16	256	-80717.12	-136.4178761	6508.64	8.5988
Dec-03	5838.96	8.672307978	45	-15	225	-87584.4	-130.0846197	6639.7	8.6152
Jan-04	5695.67	8.647461516	46	-14	196	-79739.38	-121.0644612	6770.76	8.6316
Feb-04	5667.51	8.642505147	47	-13	169	-73677.63	-112.3525669	6901.82	8.648
Mar-04	5590.6	8.628841895	48	-12	144	-67087.2	-103.5461027	7032.88	8.6644
Apr-04	5655.09	8.640311304	49	-11	121	-62205.99	-95.04342434	7163.94	8.6808
May04	4759.63	8.467925213	50	-10	100	-47596.3	-84.67925213	7295	8.6972
Jun-04	4795.46	8.475424916	51	-9	81	-43159.14	-76.27882424	7426.06	8.7136
Jul-04	5170.32	8.550689861	52	-8	64	-41362.56	-68.40551889	7557.12	8.73
Aug-04	5192.08	8.554889667	53	-7	49	-36344.56	-59.88422767	7688.18	8.7464
Sep-04	5583.61	8.6275908	54	-6	36	-33501.66	-51.7655448	7819.24	8.7628
Oct-04	5672.27	8.643344669	55	-5	25	-28361.35	-43.21672335	7950.3	8.7792
Nov-04	6234.29	8.737819978	56	-4	16	-24937.16	-34.95127991	8081.36	8.7956

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Dec-04	6602.69	8.795232421	57	-3	9	-19808.07	-26.38569726	8212.42	8.812
Jan-05	6555.94	8.788126788	58	-2	4	-13111.88	-17.57625358	8343.48	8.8284
Feb-05	6713.86	8.811929325	59	-1	1	-6713.86	-8.811929325	8474.54	8.8448
Mar-05	6492.82	8.77845223	60	0	0	0	0	8605.6	8.8612
Apr-05	6154.44	8.724929052	61	1	1	6154.44	8.724929052	8736.66	8.8776
May05	6715.11	8.81211549	62	2	4	13430.22	17.62423098	8867.72	8.894
Jun-05	7193.85	8.880981773	63	3	9	21581.55	26.64294532	8998.78	8.9104
Jul-05	7635.42	8.940553226	64	4	16	30541.68	35.7622129	9129.84	8.9268
Aug-05	7805.43	8.962574924	65	5	25	39027.15	44.81287462	9260.9	8.9432
Sep-05	8634.48	9.063518769	66	6	36	51806.88	54.38111261	9391.96	8.9596
Oct-05	7892.32	8.973645414	67	7	49	55246.24	62.8155179	9523.02	8.976
Nov-05	8788.81	9.0812346	68	8	64	70310.48	72.6498768	9654.08	8.9924
Dec-05	9397.93	9.148244731	69	9	81	84581.37	82.33420258	9785.14	9.0088
Jan-06	9919.89	9.202297112	70	10	100	99198.9	92.02297112	9916.2	9.0252
Feb-06	10370.24	9.246695445	71	11	121	114072.64	101.7136499	10047.26	9.0416
Mar-06	11297.96	9.332377457	72	12	144	135575.52	111.9885295	10178.32	9.058
Apr-06	12042.56	9.396202321	73	13	169	156553.28	122.1506302	10309.38	9.0744
May06	10398.61	9.249427422	74	14	196	145580.54	129.4919839	10440.44	9.0908
Jun-06	10609.25	9.269481541	75	15	225	159138.75	139.0422231	10571.5	9.1072
Jul-06	10743.88	9.282091569	76	16	256	171902.08	148.5134651	10702.56	9.1236
Aug-06	11699.05	9.367262921	77	17	289	198883.85	159.2434697	10833.62	9.14
Sep-06	12454.42	9.429830859	78	18	324	224179.56	169.7369555	10964.68	9.1564
Oct-06	12961.9	9.469769564	79	19	361	246276.1	179.9256217	11095.74	9.1728
Nov-06	13696.31	9.524881732	80	20	400	273926.2	190.4976346	11226.8	9.1892
Dec-06	13786.91	9.53147487	81	21	441	289525.11	200.1609723	11357.86	9.2056
Jan-07	14090.92	9.553285897	82	22	484	310000.24	210.1722897	11488.92	9.222
Feb-07	12938.09	9.467930953	83	23	529	297576.07	217.7624119	11619.98	9.2384
Mar-07	13072.1	9.478235467	84	24	576	313730.4	227.4776512	11751.04	9.2548
Apr-07	13872.37	9.537654371	85	25	625	346809.25	238.4413593	11882.1	9.2712
May07	14544.46	9.584965444	86	26	676	378155.96	249.2091015	12013.16	9.2876
Jun-07	14650.51	9.592230426	87	27	729	395563.77	258.9902215	12144.22	9.304
Jul-07	15550.99	9.651879581	88	28	784	435427.72	270.2526283	12275.28	9.3204
Aug-07	15318.6	9.636823055	89	29	841	444239.4	279.4678686	12406.34	9.3368
Sep-07	17291.1	9.757947197	90	30	900	518733	292.7384159	12537.4	9.3532
Oct-07	19837.99	9.895354065	91	31	961	614977.69	306.755976	12668.46	9.3696
Nov-07	19363.19	9.87112912	92	32	1024	619622.08	315.8761318	12799.52	9.386
Dec-07	20286.99	9.917735073	93	33	1089	669470.67	327.2852574	12930.58	9.4024
Jan-08	17648.71	9.778417972	94	34	1156	600056.14	332.466211	13061.64	9.4188
Feb-08	17578.72	9.774444359	95	35	1225	615255.2	342.1055526	13192.7	9.4352
Mar-08	15644.44	9.657870861	96	36	1296	563199.84	347.683351	13323.76	9.4516
Apr-08	17287.31	9.757727985	97	37	1369	639630.47	361.0359355	13454.82	9.468
May08	16415.57	9.705985554	98	38	1444	623791.66	368.827451	13585.88	9.4844
Jun-08	13461.6	9.507596467	99	39	1521	525002.4	370.7962622	13716.94	9.5008
Jul-08	14355.75	9.571905838	100	40	1600	574230	382.8762335	13848	9.5172
Aug-08	14564.53	9.5863444	101	41	1681	597145.73	393.0401204	13979.06	9.5336
Sep-08	12860.43	9.461910434	102	42	1764	540138.06	397.4002382	14110.12	9.55
Oct-08	9788.06	9.188918554	103	43	1849	420886.58	395.1234978	14241.18	9.5664
Nov-08	9092.72	9.115229372	104	44	1936	400079.68	401.0700924	14372.24	9.5828
Dec-08	9647.31	9.174434399	105	45	2025	434128.95	412.849548	14503.3	9.5992
Jan-09	9424.24	9.151040372	106	46	2116	433515.04	420.9478571	14634.36	9.6156
Feb-09	8891.61	9.092863414	107	47	2209	417905.67	427.3645805	14765.42	9.632
Mar-09	9708.5	9.180757069	108	48	2304	466008	440.6763393	14896.48	9.6484
Apr-09	11403.25	9.341653681	109	49	2401	558759.25	457.7410304	15027.54	9.6648
May09	14625.25	9.590504766	110	50	2500	731262.5	479.5252383	15158.6	9.6812
Jun-09	14493.84	9.581479011	111	51	2601	739185.84	488.6554295	15289.66	9.6976
Jul-09	15670.31	9.659523118	112	52	2704	814856.12	502.2952021	15420.72	9.714
Aug-09	15666.64	9.65928889	113	53	2809	830331.92	511.9423112	15551.78	9.7304
Sep-09	17126.84	9.748402103	114	54	2916	924849.36	526.4137135	15682.84	9.7468
Oct-09	15896.28	9.673840399	115	55	3025	874295.4	532.0612219	15813.9	9.7632
Nov-09	16926.22	9.736619178	116	56	3136	947868.32	545.250674	15944.96	9.7796
Dec-09	17464.81	9.767943278	117	57	3249	995494.17	556.7727669	16076.02	9.796
Jan-10	16357.96	9.702469908	118	58	3364	948761.68	562.7432547	16207.08	9.8124

Appendix 1. Contd

Feb-10	16429.55	9.706836822	119	59	3481	969343.45	572.7033725	16338.14	9.8288
Mar-10	17410.57	9.764832772	120	60	3600	1044634.2	585.8899663	16469.2	9.8452
Total	1039697.27	1065.30498		60	144020	19391595	2889.4861		

$$X = a + bDt;$$

$$1039697.27 = 120a + 60b; \quad 19391595 = 60a + 144020b; \quad a = 8605.6 \Rightarrow b = 131.06$$

$$Tx = e + fDt;$$

$$1065.30498 = 120e + 60f; \quad 2889.5 = 60e + 144020f \Rightarrow e = 8.8612 \Rightarrow f = 0.0164$$

Appendix 2. Daily Closing values of NSE(Y) showing monthly Trend fitted by Least Square

MONTHS	Closing value (Y)	Transformation (Monthly Return) TY	t	Dt	Dt*Dt	YDt	TDt	Y=a+bDt	Ty=e+fDt
Apr-00	1406.55	7.248895177	1	-59	3481	10195.93	-427.685	1642.275	6.9185
May-00	1380.45	7.230164812	2	-58	3364	9980.881	-419.35	1658.725	6.934
Jun-00	1471.45	7.294003588	3	-57	3249	10732.76	-415.758	1675.175	6.9495
Jul-00	1332.85	7.195074786	4	-56	3136	9589.955	-402.924	1691.625	6.965
Aug-00	1394.1	7.240004325	5	-55	3025	10093.29	-398.2	1708.074	6.9805
Sep-00	1271.65	7.148070549	6	-54	2916	9089.844	-385.996	1724.524	6.996
Oct-00	1172.75	7.067106697	7	-53	2809	8287.949	-374.557	1740.974	7.0115
Nov-00	1268.15	7.145314425	8	-52	2704	9061.33	-371.556	1757.424	7.027
Dec-00	1263.55	7.141680499	9	-51	2601	9023.87	-364.226	1773.874	7.0425
Jan-01	1371.7	7.223806125	10	-50	2500	9908.895	-361.19	1790.323	7.058
Feb-01	1351.4	7.208896371	11	-49	2401	9742.103	-353.236	1806.773	7.0735
Mar-01	1148.2	7.045950778	12	-48	2304	8090.161	-338.206	1823.223	7.089
Apr-01	1125.25	7.025760512	13	-47	2209	7905.737	-330.211	1839.673	7.1045
May-01	1167.9	7.062962543	14	-46	2116	8248.834	-324.896	1856.123	7.12
Jun-01	1107.9	7.010221611	15	-45	2025	7766.625	-315.46	1872.572	7.1355
Jul-01	1072.85	6.978073938	16	-44	1936	7486.427	-307.035	1889.022	7.151
Aug-01	1053.75	6.960110509	17	-43	1849	7334.216	-299.285	1905.472	7.1665
Sep-01	913.85	6.817666444	18	-42	1764	6230.324	-286.342	1921.922	7.182
Oct-01	971.9	6.879252919	19	-41	1681	6685.946	-282.049	1938.372	7.1975
Nov-01	1067.15	6.972746822	20	-40	1600	7440.967	-278.91	1954.821	7.213
Dec-01	1059.05	6.965127559	21	-39	1521	7376.418	-271.64	1971.271	7.2285
Jan-02	1075.4	6.980447964	22	-38	1444	7506.774	-265.257	1987.721	7.244
Feb-02	1142.05	7.040580172	23	-37	1369	8040.695	-260.501	2004.171	7.2595
Mar-02	1129.55	7.029574602	24	-36	1296	7940.256	-253.065	2020.621	7.275
Apr-02	1084.5	6.98887433	25	-35	1225	7579.434	-244.611	2037.07	7.2905
May-02	1028.8	6.936148353	26	-34	1156	7135.909	-235.829	2053.52	7.306
Jun-02	1057.8	6.963946559	27	-33	1089	7366.463	-229.81	2069.97	7.3215
Jul-02	958.9	6.865786794	28	-32	1024	6583.603	-219.705	2086.42	7.337
Aug-02	1010.6	6.918299493	29	-31	961	6991.633	-214.467	2102.87	7.3525
Sep-02	963.15	6.870209163	30	-30	900	6617.042	-206.106	2119.319	7.368
Oct-02	951.4	6.857934584	31	-29	841	6524.639	-198.88	2135.769	7.3835
Nov-02	1050.15	6.95668829	32	-28	784	7305.566	-194.787	2152.219	7.399
Dec-02	1093.5	6.99713884	33	-27	729	7651.371	-188.923	2168.669	7.4145
Jan-03	1041.85	6.948753258	34	-26	676	7239.559	-180.668	2185.119	7.43
Feb-03	1063.4	6.969226601	35	-25	625	7411.076	-174.231	2201.568	7.4455
Mar-03	978.2	6.885714148	36	-24	576	6735.606	-165.257	2218.018	7.461
Apr-03	934.05	6.83952997	37	-23	529	6388.463	-157.309	2234.468	7.4765
May-03	1006.8	6.914532263	38	-22	484	6961.551	-152.12	2250.918	7.492
Jun-03	1134.15	7.033638751	39	-21	441	7977.201	-147.706	2267.368	7.5075
Jul-03	1185.85	7.078215096	40	-20	400	8393.701	-141.564	2283.817	7.523
Aug-03	1356.55	7.212699991	41	-19	361	9784.388	-137.041	2300.267	7.5385
Sep-03	1417.1	7.256367809	42	-18	324	10283	-130.615	2316.717	7.554
Oct-03	1555.9	7.349809435	43	-17	289	11435.57	-124.947	2333.167	7.5695
Nov-03	1615.25	7.387245022	44	-16	256	11932.25	-118.196	2349.617	7.585
Dec-03	1879.75	7.538894068	45	-15	225	14171.24	-113.083	2366.066	7.6005
Jan-04	1809.75	7.500943993	46	-14	196	13574.83	-105.013	2382.516	7.616
Feb-04	1800.3	7.495708597	47	-13	169	13494.52	-97.4442	2398.966	7.6315

Appendix 2. Contd

Mar-04	1771.9	7.479807696	48	-12	144	13253.47	-89.7577	2415.416	7.647
Apr-04	1796.1	7.493372927	49	-11	121	13458.85	-82.4271	2431.866	7.6625
May-04	1483.6	7.302226846	50	-10	100	10833.58	-73.0223	2448.315	7.678
Jun-04	1505.6	7.316946769	51	-9	81	11016.4	-65.8525	2464.765	7.6935
Jul-04	1632.3	7.397745342	52	-8	64	12075.34	-59.182	2481.215	7.709
Aug-04	1631.75	7.397408338	53	-7	49	12070.72	-51.7819	2497.665	7.7245
Sep-04	1745.5	7.464796327	54	-6	36	13029.8	-44.7888	2514.115	7.74
Oct-04	1786.9	7.488237554	55	-5	25	13380.73	-37.4412	2530.564	7.7555
Nov-04	1958.8	7.58008732	56	-4	16	14847.88	-30.3203	2547.014	7.771
Dec-04	2080.5	7.640363528	57	-3	9	15895.78	-22.9211	2563.464	7.7865
Jan-05	2057.6	7.629295534	58	-2	4	15698.04	-15.2586	2579.914	7.802
Feb-05	2103.25	7.651239046	59	-1	1	16092.47	-7.65124	2596.364	7.8175
Mar-05	2035.65	7.618570457	60	0	0	15508.74	0	2612.813	7.833
Apr-05	1902.5	7.55092409	61	1	1	14365.63	7.550924	2629.263	7.8485
May-05	2087.55	7.643746409	62	2	4	15956.7	15.28749	2645.713	7.864
Jun-05	2220.6	7.705532709	63	3	9	17110.91	23.1166	2662.163	7.8795
Jul-05	2312.3	7.745997979	64	4	16	17911.07	30.98399	2678.613	7.895
Aug-05	2384.65	7.776807642	65	5	25	18544.96	38.88404	2695.062	7.9105
Sep-05	2601.4	7.863805041	66	6	36	20456.9	47.18283	2711.512	7.926
Oct-05	2370.95	7.771045998	67	7	49	18424.76	54.39732	2727.962	7.9415
Nov-05	2652.25	7.883163615	68	8	64	20908.12	63.06531	2744.412	7.957
Dec-05	2836.55	7.950343804	69	9	81	22551.55	71.55309	2760.862	7.9725
Jan-06	3001.1	8.006734167	70	10	100	24029.01	80.06734	2777.311	7.988
Feb-06	3074.7	8.030962615	71	11	121	24692.8	88.34059	2793.761	8.0035
Mar-06	3402.55	8.132280429	72	12	144	27670.49	97.58737	2810.211	8.019
Apr-06	3557.6	8.176841439	73	13	169	29089.93	106.2989	2826.661	8.0345
May-06	3071.05	8.029774802	74	14	196	24659.84	112.4168	2843.111	8.05
Jun-06	3128.2	8.048213038	75	15	225	25176.42	120.7232	2859.56	8.0655
Jul-06	3143.2	8.052996668	76	16	256	25312.18	128.8479	2876.01	8.081
Aug-06	3413.9	8.135610612	77	17	289	27774.16	138.3054	2892.46	8.0965
Sep-06	3588.4	8.1854617	78	18	324	29372.71	147.3383	2908.91	8.112
Oct-06	3744.1	8.227936547	79	19	361	30806.22	156.3308	2925.36	8.1275
Nov-06	3954.5	8.28260945	80	20	400	32753.58	165.6522	2941.809	8.143
Dec-06	3966.4	8.285614161	81	21	441	32864.06	173.9979	2958.259	8.1585
Jan-07	4082.7	8.314513813	82	22	484	33945.67	182.9193	2974.709	8.174
Feb-07	3745.3	8.228257	83	23	529	30817.29	189.2499	2991.159	8.1895
Mar-07	3821.55	8.248411378	84	24	576	31521.72	197.9619	3007.609	8.205
Apr-07	4087.9	8.31578667	85	25	625	33994.1	207.8947	3024.058	8.2205
May-07	4295.8	8.36539308	86	26	676	35936.06	217.5002	3040.508	8.236
Jun-07	4318.3	8.370617085	87	27	729	36146.84	226.0067	3056.958	8.2515
Jul-07	4528.85	8.418223323	88	28	784	38124.87	235.7103	3073.408	8.267
Aug-07	4464	8.403800504	89	29	841	37514.57	243.7102	3089.858	8.2825
Sep-07	5021.35	8.521454101	90	30	900	42789.2	255.6436	3106.307	8.298
Oct-07	5900.65	8.682817793	91	31	961	51234.27	269.1674	3122.757	8.3135
Nov-07	5762.75	8.65917007	92	32	1024	49900.63	277.0934	3139.207	8.329
Dec-07	6138.6	8.722351982	93	33	1089	53543.03	287.8376	3155.657	8.3445
Jan-08	5137.45	8.544312126	94	34	1156	43895.98	290.5066	3172.107	8.36
Feb-08	5223.5	8.560922954	95	35	1225	44717.98	299.6323	3188.556	8.3755
Mar-08	4734.5	8.462631403	96	36	1296	40066.33	304.6547	3205.006	8.391
Apr-08	5165.9	8.549834616	97	37	1369	44167.59	316.3439	3221.456	8.4065
May-08	4870.1	8.49086975	98	38	1444	41351.38	322.6531	3237.906	8.422
Jun-08	4040.55	8.3041361	99	39	1521	33553.28	323.8613	3254.356	8.4375
Jul-08	4332.95	8.374003882	100	40	1600	36284.14	334.9602	3270.805	8.453
Aug-08	4360	8.380227336	101	41	1681	36537.79	343.5893	3287.255	8.4685
Sep-08	3921.2	8.274153008	102	42	1764	32444.61	347.5144	3303.705	8.484
Oct-08	2885.6	7.96748813	103	43	1849	22990.98	342.602	3320.155	8.4995
Nov-08	2755.1	7.921209019	104	44	1936	21823.72	348.5332	3336.605	8.515
Dec-08	2959.15	7.992657344	105	45	2025	23651.47	359.6696	3353.054	8.5305
Jan-09	2874.8	7.963738386	106	46	2116	22894.16	366.332	3369.504	8.546
Feb-09	2763.65	7.924307549	107	47	2209	21900.01	372.4425	3385.954	8.5615
Mar-09	3020.95	8.01332663	108	48	2304	24207.86	384.6397	3402.404	8.577
Apr-09	3473.95	8.153047554	109	49	2401	28323.28	399.4993	3418.854	8.5925

Appendix 2. Contd

May-09	4448.95	8.400423392	110	50	2500	37373.06	420.0212	3435.303	8.608
Jun-09	4291.1	8.364298389	111	51	2601	35892.04	426.5792	3451.753	8.6235
Jul-09	4636.45	8.441704266	112	52	2704	39139.54	438.9686	3468.203	8.639
Aug-09	4662.1	8.447221269	113	53	2809	39381.79	447.7027	3484.653	8.6545
Sep-09	5083.95	8.533843797	114	54	2916	43385.64	460.8276	3501.103	8.67
Oct-09	4711.7	8.457804056	115	55	3025	39850.64	465.1792	3517.552	8.6855
Nov-09	5032.7	8.523711898	116	56	3136	42897.28	477.3279	3534.002	8.701
Dec-09	5201.05	8.556615807	117	57	3249	44503.39	487.7271	3550.452	8.7165
Jan-10	4882.05	8.493320493	118	58	3364	41464.82	492.6126	3566.902	8.732
Feb-10	4922.3	8.50153118	119	59	3481	41847.09	501.5903	3583.352	8.7475
Mar-10	5249.1	8.565811912	120	60	3600	44962.8	513.9487	3599.801	8.763
TOTAL	314509.55	924.0382488		60	144020	2525869	2702.29		

$$Y = a + b$$

$$314509.55 = 120a + 60b \quad 2525869.0 = 60a + 144020b \quad \Rightarrow \quad a = 2612.8 \quad \Rightarrow \quad b = 16.45$$

$$T = e + fDt$$

$$924.0382488 = 120e + 60f \quad 2702.29 = 60e + 144020f \quad \Rightarrow \quad e = 7.833 \Rightarrow \quad f = 0.0155$$