Price Volatility: An Evaluation of the Indian Stock Market During Global Financial Crisis

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This paper studies the problems associated with the prediction of future share prices in the Indian context. The period chosen for this study is highly critical due to the presence of financial crisis and meltdown as a result of subprime market. This study tries to find out whether the Indian market, during the time of financial crisis and the meltdown across the world adjusts to the new information or not. It is found that the trend projection almost lost its grip over the Indian share market during the study period. A distribution in which the ratio of the fourth moment to the square of the second moment is greater than 3—which is the value for a normal distribution—appears to be more heavily concentrated about the mean, or more peaked, than a normal distribution. Therefore, the share prices of the Indian market during the period of current financial crisis yields a typical leptokurtic normal distribution. It means that there exists fatter tails and greater risk of extreme outcomes. It also reveals the high volatility of the present share market. The study concludes that no market in the world is insulated from externalities as it is advocated in the decoupling theories of today.

Introduction

The behavior of stock prices has been an important topic of discussion in the academic circles for a long time. In this context, financial researchers have developed various theories and models which have been tested empirically for different equity markets. Among them is the Random Walk (RW) theory, one of the earliest theories proposed for stock price behavior, which states that future stock prices cannot be predicted on the basis of past price movements.

Many research studies have been carried out by international economists and professors. Some of them are: Kendel (1965), Dryden (1970), Solink (1973), Malaikah (1990), Aybar (1992), Khiliji (1993, 1994), Uppal (1993), Ahmed (1995), and Hussain (1997). There are also recent studies in this area.

The present study seeks to find out the problems in the prediction of future share prices in the Indian context. The period chosen for this study is highly critical, in the sense that financial crisis and economic meltdown due to subprime market are very much present. This study analyzes the problems associated with RW theory.

The objectives of the study are:

- To give a brief historical account of the Indian stock market;
- To select the indices and shares to initiate RW analysis;

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- To evaluate the results of the study, in the context of statistical distribution; and
- To record and suggest possible directions to the investors for their investments.

This study is basically a descriptive one, and is based on the past information. Secondary data, such as the daily share prices of the chosen companies and the daily movement of some indices, was collected from the National Stock Exchange of India (NSE). The volume is considered as the base for the selection. Only the top companies are chosen for the study. Three important and popular indices such as Nifty, Junior Nifty, and CNX 500 are chosen to represent the indices. Eleven top companies from different sectors are chosen for this study as the purpose of the study is to know the share price movements and the type of distribution each had during the crisis period. The study covers the period from October 1, 2007 to October 1, 2008. On the whole, the data consists of 11 individual stocks and three indices.

Statistical Design

Following Fama (1965) and other studies, the return on stocks or indices is defined as the first differences of the natural logarithm of the stock prices or index yield, i.e.,

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

where R_t = Return

t = Time period

P = Price (closing) of the stock or index yield

The Random Walk Model

The model is based on two assumptions:

1. Successive values of returns in an individual stock are independent; and
2. The stock returns conform to some probability distributions.

To test the first hypothesis, the serial correlation test is used. Serial correlation or autocorrelation is a parametric test that measures the relationship between the value of random variable at time *t*, and its value *k* period earlier, i.e.,

$$R_t (or\ \rho_t) = \frac{Cov (R_t - R_{t-k})}{Var (R_t)}$$

where R_t is the return on stock at time *t*. The standard error of r_k(or ρk) is:

$$SE(rk) = \sqrt{\frac{1}{n-k}}$$

Besides the individual coefficients, the joint hypothesis that all the correlation coefficients up to log k are zero is tested by Lyung-Box $Q(k)$ statistic, computed as:

$$Q(k) = n(n+2)\sum_{k=1}^{k} \frac{r_k^{\,2}}{n-1},$$

which has χ^2 distribution with k degree of freedom.

Significance of the Study

The study has the following significance in the field of capital market:

- Investors know that the market has weak and semi-weak (strong) forms of market movements. This study explores these pattern of movements during the time of financial crisis; and
- The distribution pattern proposed by this study is expected to help the market players to combat the risks associated with their investment.

Analysis

The data consists of 11 individual stocks and 3 indices, covering the period from October 1, 2007 to October 1, 2008. Information on individual stocks and indices regarding closing prices was collected from the NSE website and the *Financial Times* (a daily newspaper).

Companies chosen for the study are: DFC, Reliance, ICICI, RPL, IFC, SBI, Infosys, TTM, NTPC, TATA, and RCOM.

The indices chosen from the NSE are: CNX Nifty, CNX 500 and Nifty Junior.

The first stage of the analysis focuses on the trend. It tests whether the successive values of share price (or the successive values of the change in share price) and indices yield are independent or dependent. For this purpose, a Random Walk analysis is initiated. The serial dependence test is also employed to explore the dependence of one value over another. The second stage of the analysis is concerned with testing whether the closing prices of shares and yield of indices do have a type of distribution or not. If there is a pattern of distribution, the analysis tries to find out the most probable distribution pattern of the data under study.

Analysis with Raw Yield

The distribution is positively skewed and the values of the kurtosis are between 1 and 3. Therefore, the distribution curve takes the shape of mesokurtic. Figures 1 and 2 depict the trends of share prices and indices. The trend is visible when the closing price of all the selected shares and indices is plotted in a figure. The movement of indices and share prices are downwards. It reflects the general trend of the market during the period of financial crisis and economic meltdown across the world in 2008. With this kind of trend, one is not able to predict the future trend of shares and indices. Also, how quickly the Indian market can absorb information or cue from the world market cannot be ascertained with these figures. Tables in Annexures 3 and 4 consist of the values of various statistical test results of the selected shares of the NSE. The distribution is positively skewed and the values of the kurtosis are between 1 and 3 (See Annexure 1a and 1b).

Figure 3 removes the trend prevailing in raw yields of shares and indices as depicted in Figures 1 and 2. The volatility of the yields is also well-captured in Figure 3. This is due to the fact that the yields are converted into difference between successive periods yields. This data is useful in carrying out further analysis to know whether there exists predictability of share price and index movements.

Serial Dependence

The independence hypothesis was examined through the serial correlation test. The serial correlation coefficients for the sample stocks and indices up to lag 20, along with the Ljung-Box Q-values are estimated. They reveal that the market, in general, exhibits a strong serial independence. The plots of the autocorrelations are the approximate two standard error bounds computed as $\pm 2\sqrt{T}$. If the autocorrelation is within these bounds, it is not significantly different from zero at (approximately) 5% significance level. Out of 280 values, about 157 values are less than ± 0.01 or nearer to zero terms (See Annexure 2a and 2b). It confirms the strong serial independence. Most of the serial correlation coefficients of the daily returns have negative signs, implying that shares usually perform reverse in consecutive days (Table 1). The general trend in the world market is downward sloping. This is due to the fact that the subprime market crisis of the US influences the share price yields of the world. This is a common characteristic also observed in other markets, particularly in the emerging markets.

Figure 1: Raw Indices Yield

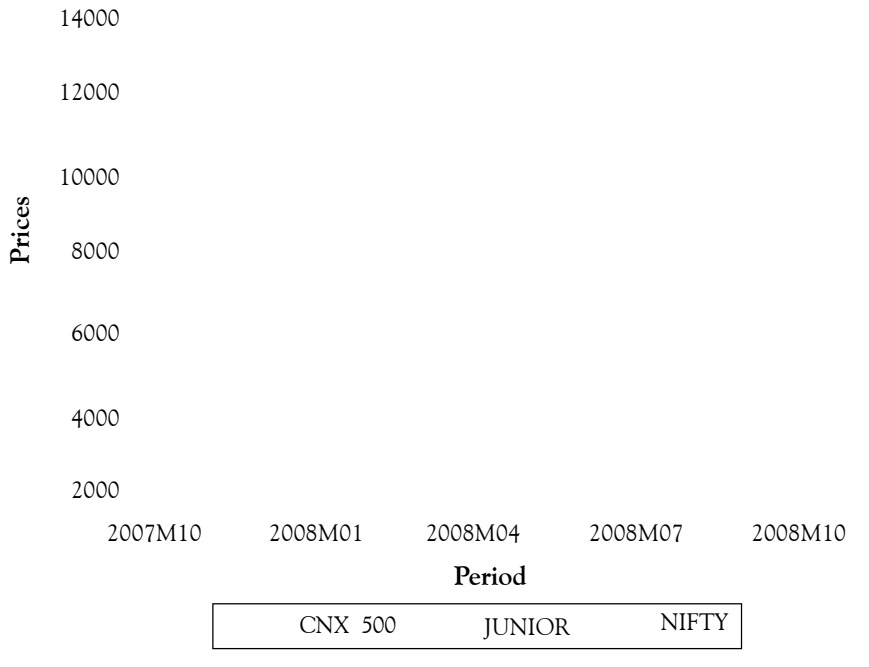
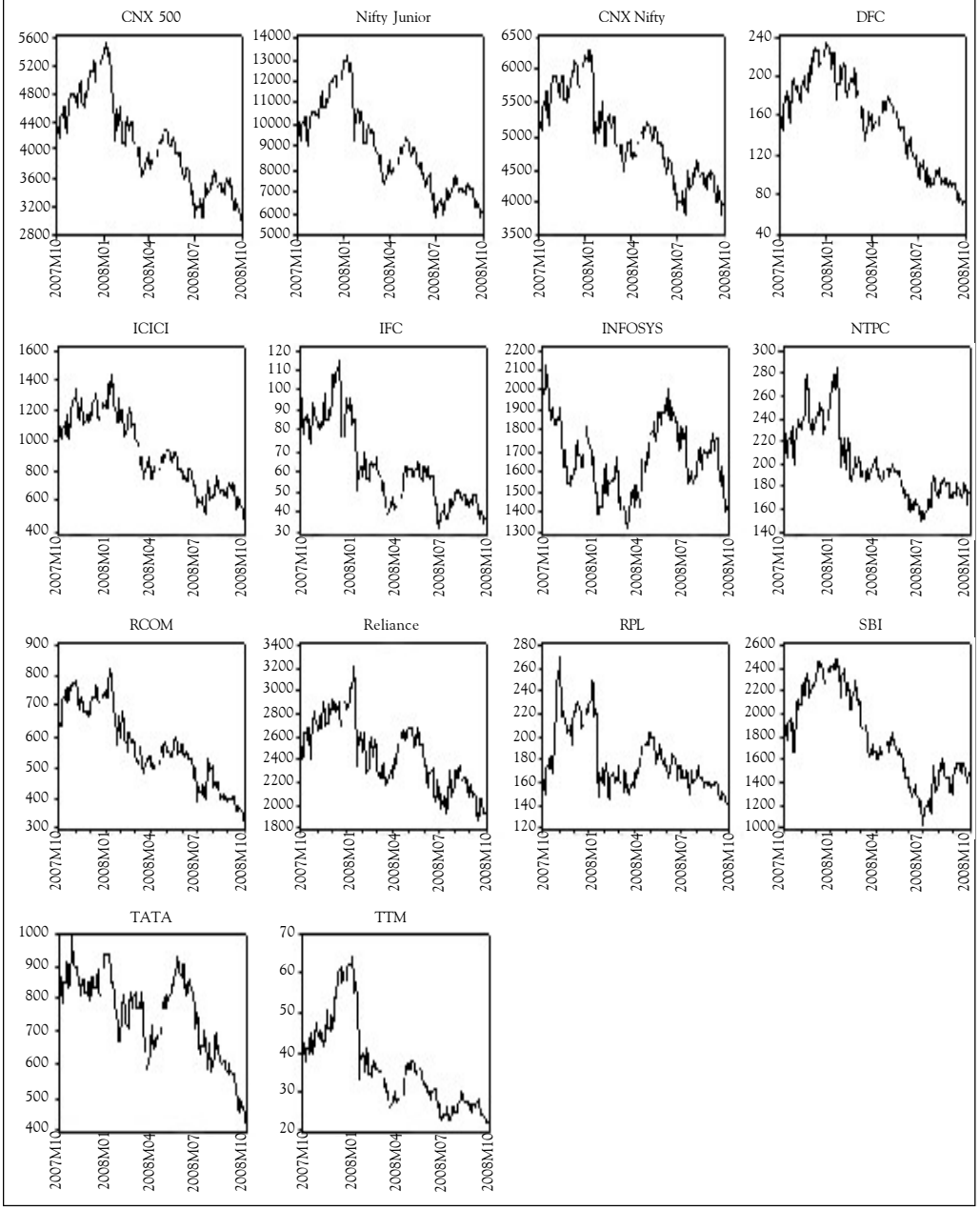


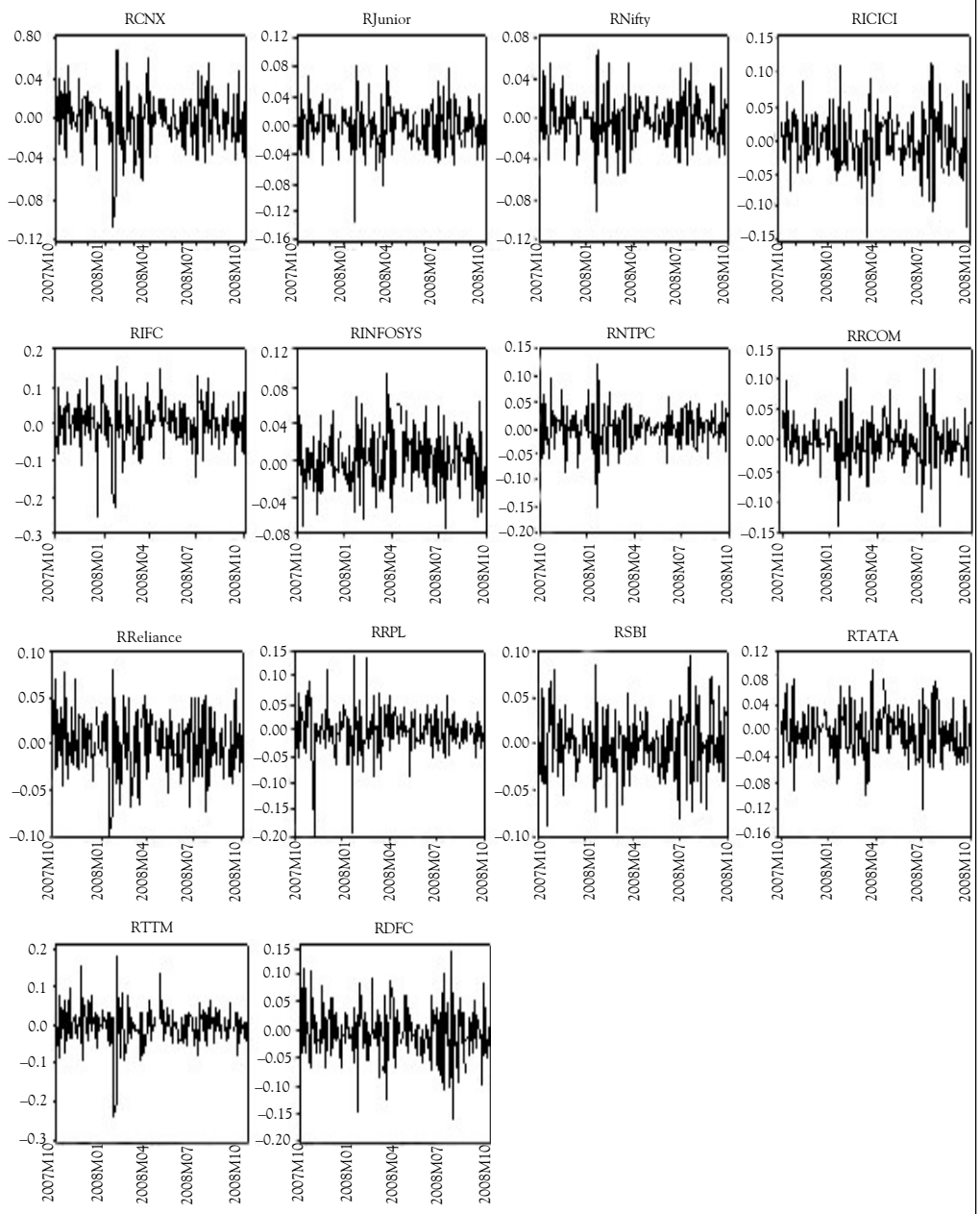
Figure 2: Closing Selected Share Prices and Indices

Sample: October 1, 2007 to October 1, 2008



It can be observed that the serial independence is equally likely in indices. Out of 60 observations, 55 values are less than ± 0.09. Only five values go beyond that value. Among the stocks, more serial independence is noticed in the share price yields of ICICI, RPL, SBI and TTM. CNX 500 and Nifty Index also have the same trend.

Figure 3: Share Price and Indices Yield (Differences)



Note: X axis is the period and Y axis is the returns.

This implies that the serial independence is affected by the trading activity of stocks, and is likely to be more serious in active stocks. Almost all stocks show the probability of above 0.05 levels (Table 2). It means almost all stocks and indices are very much independent and not being influenced by their previous prices. All the stocks, except two,

are showing the probability value above 0.05. Similarly, all the indices, except Nifty Junior, also have values over and above 0.05. These results indicate that the market is vibrant and that it is not being influenced by the previous price movement. This has been the finding of few studies made in the emerging economies in the Asian segments. This has also been proved to be true by some studies in the context of developed economies as well.

Table 1: Signs of the Autocorrelation Values	
Negative Numbers	143
Positive Numbers	135
Zeros	2
Total	**280**

Table 2: Probability of Serial Correlation	
> 0.05	208
< 0.05	69
0.05	3
Total	**280**

Distribution of Stock Returns

The second hypothesis deals with the distribution of stock returns, which is an important issue both for investors and researchers. To an investor, it is important to determine the riskiness of investments in common stocks, i.e., he/she is interested in knowing the probability of gains or losses. On the other hand, it provides descriptive information concerning the nature of the process generating returns. In addition, understanding the returns distribution is crucial for the development and application of theoretical models. However, there is a lack of consensus among researchers regarding the form of distribution of stock returns. Earlier studies assumed the distribution to be normal, but Mandelbrot (1963) and Fama (1965) show that the normality assumption is not compatible with empirical observations.

In fact, the distribution observed empirically is leptokurtic that has fatter tails and a higher peak than normal. There is a general agreement that the distribution of stock returns is leptokurtic, whereas there is no agreement on the form of the distribution that can explain these leptokurtoses observed consistently in empirical studies. Due to this disagreement most of the studies that tested the RW model restricted their analysis to testing for the conformity of stock returns to normal distribution. The conventional way of analyzing the distribution of stock returns is to construct the frequency distribution for stocks and compare them with that of the normal distribution. The excess of relative frequency in the center indicates higher peaks. Similarly, the excess of relative frequency in the tails implies fatter tails. This measure provides a direct comparison of observed distribution with normal distribution and shows the degree of deviations of observed distribution from normality.

It can be observed from Figure 4, that the QQ-plot for the log of share prices falls nearly on a straight line except at the left end, where the plot curves downward. QQ-plots that fall on a straight line in the middle but curve upward at the left end and curve downward at the right end indicate that the distribution is leptokurtic and has

Figure 4: Theoretical Quantile-Quantiles

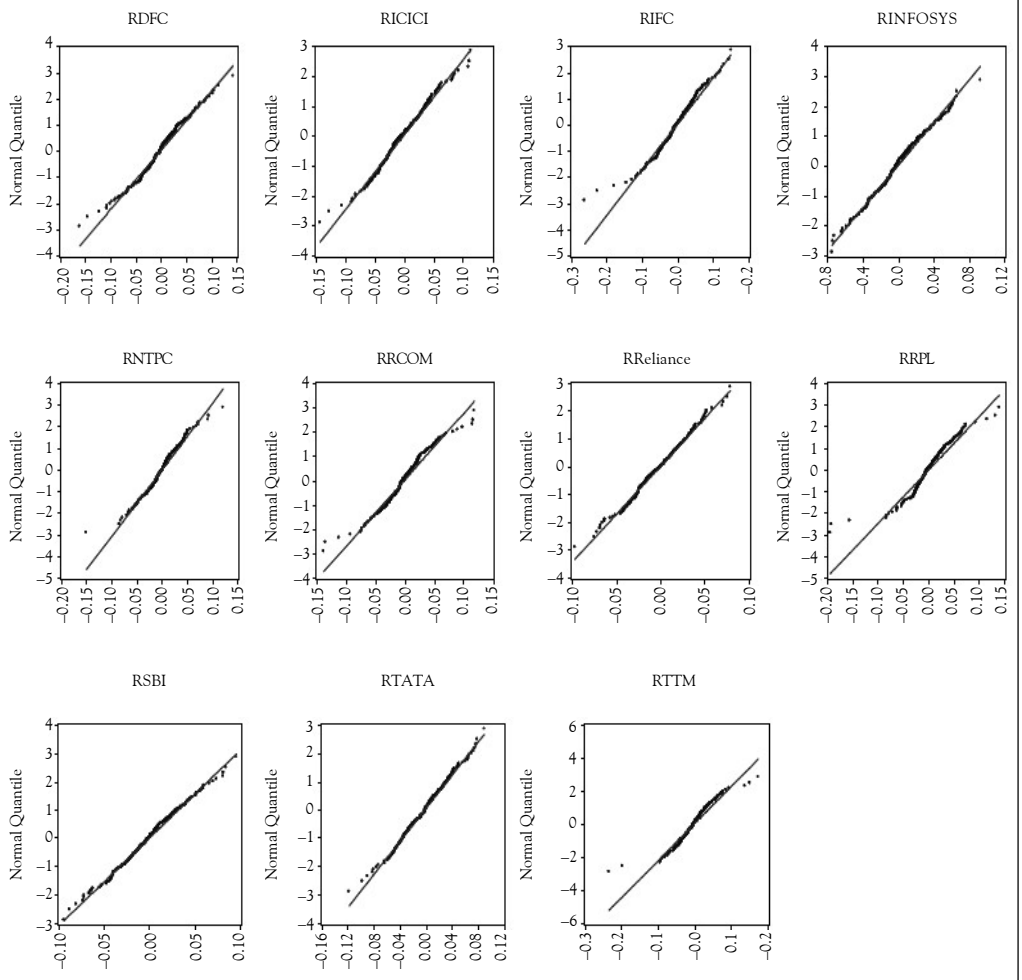


Figure 5: Empirical Quantiles

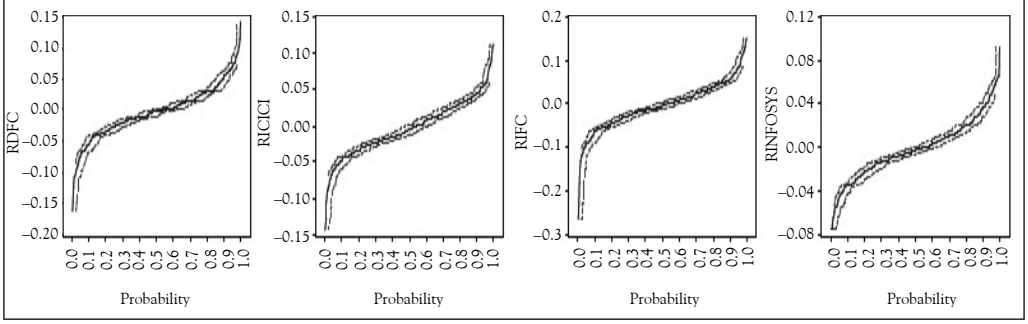


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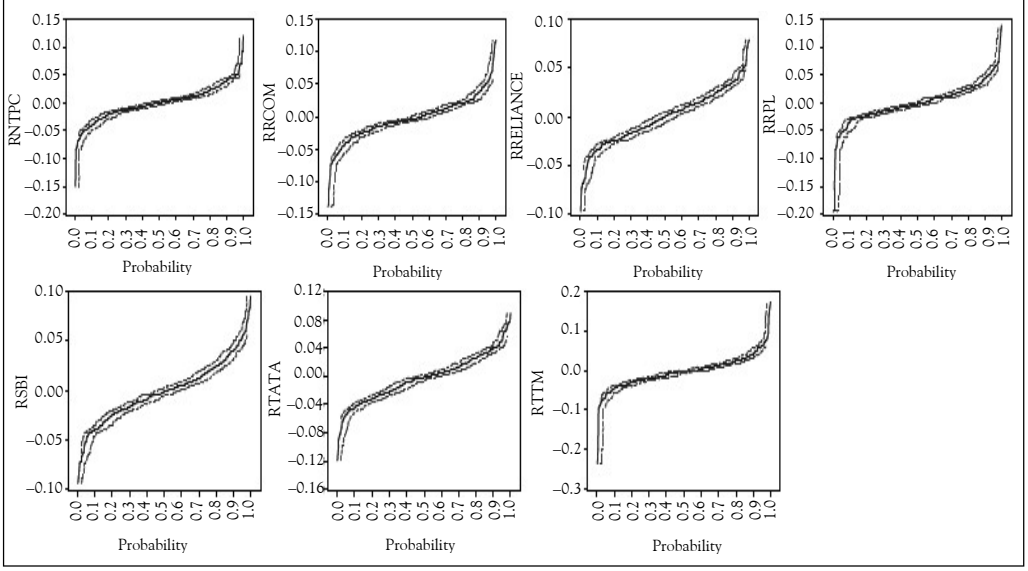
Figure 5: Empirical Quantiles



a thicker tail than the normal distribution. If the plot curves upward at the left, and downward at the right, it is an indication that the distribution is leptokurtic. It is made clear from Figure 4, that the share price movements of the selected shares are leptokurtic—the distribution is normal and the tails are thicker than the normal distribution curve.

Tables in Annexures 6a and 6b reveal that the value of the estimated kurtosis of all share yields exceeds the value 3. They also confirm that the distribution of all shares is leptokurtic.

CDF-Survivor-Quantile

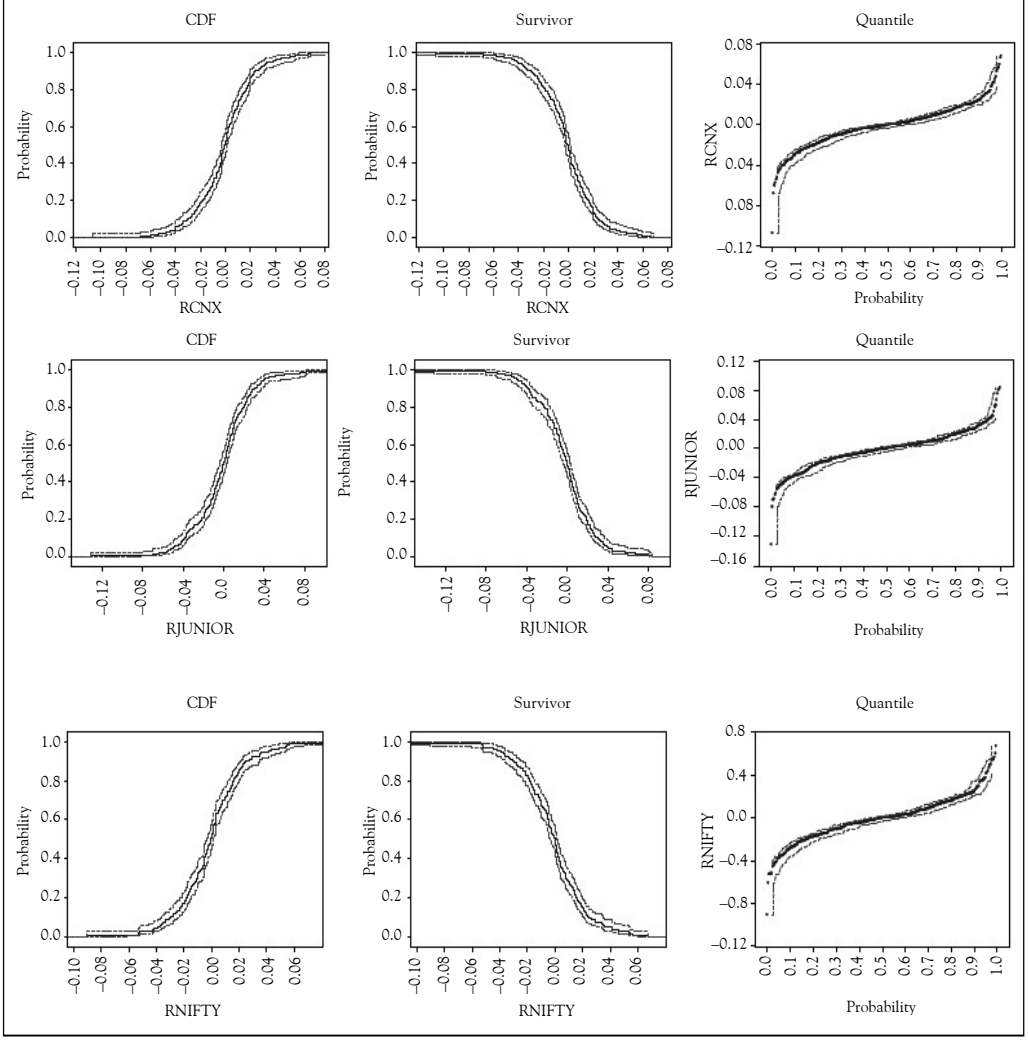
This view plots the empirical cumulative distribution, survivor, and quantile functions of the share price movements together with the plus or minus two standard error bands. Figure 5 shows that all curves fall within the two lines above and below of the curves passing through the figure from left to right. It again proves that the distribution is a normal one.

The cumulative distribution plots the empirical Cumulative Distribution Function (CDF) of the share prices. The CDF is the probability of observing a value from the share price movements not exceeding specified values.

The survivor option plots the empirical survivor function of the share market indices movements. The survivor function gives the probability of observing a value from the indices movements at least as large as some specified value and is equal to one minus the CDF. It can be found from Figure 6 that the survivor plots are just a reversal of CDF plots. It also confirms that the distribution of differenced indices movements is more than the normal.

The value of the estimated kurtosis of all indices' yields and share price yields (Annexures 5, 6a and 6b) exceeds the value 3. It also confirms that the distribution of all stocks and indices is leptokurtic.

Figure 6: Empirical Distribution



Conclusion

The serial correlation of the daily returns of 11 stocks and the returns on the three main indices has been much lower over different lag lengths. In all cases under observation, no significant correlation coefficients are observed. This shows that the historical information embedded in the series is less influential in determining the future prices of shares and indices. This suggests that the Indian market has a system which facilitates dissemination of global information rapidly. It is also inferred from this study that the trend projection has almost lost its grip over the Indian share market. A distribution in which the ratio of

the fourth moment to the square of the second moment is greater than three—which is the value for a normal distribution—appears to be more heavily concentrated about the mean, or more peaked, than a normal distribution. Therefore, the share prices of Indian market during the period of current financial crisis yield a typical leptokurtic normal distribution. It means that there exists fatter tails and greater risk of extreme outcomes. It also reveals the high volatility of the present Indian share market. It also proves that no market in the world is insulated from externalities as it is advocated in the decoupling theories of today.

The study has some limitations. Firstly, the study concentrates only on the share price movements during the financial crisis. It does not consider other situations generally prevailing in the share market. Secondly, the study period is about 250 days, which may not be sufficient to produce innovations or revisions. This may hamper the quality of the results. Finally, only a few companies and a few indices are considered in the study. These companies were assumed to be the true representatives of the population. However, in reality, the share price movements of these companies may take some deviations from the arrived results of the study. ❖

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Annexure 1a

Descriptive Analysis of Share Price Yield						
Sample: October 1, 2007 to October 1, 2008						
	DFC	**ICICI**	**IFC**	**INFOSYS**	**NTPC**	**RCOM**
Mean	156.4839	930.1964	62.88008	1671.719	200.8092	572.8022
Median	164.2000	882.3000	59.15000	1659.950	193.0000	553.9000
Maximum	232.5000	1435.000	113.7500	2125.050	284.6500	821.5500
Minimum	70.00000	493.3000	32.15000	1314.600	150.8000	326.4000

(Cont.)

Annexure 1a

Descriptive Analysis of Share Price Yield						
Sample: October 1, 2007 to October 1, 2008						
	DFC	**ICICI**	**IFC**	**INFOSYS**	**NTPC**	**RCOM**
Std. Dev.	45.67779	242.2613	20.18271	163.6567	31.46574	126.3776
Skewness	–0.209692	0.105008	0.609559	0.131963	0.685008	0.066206
Kurtosis	1.823936	1.676617	2.273601	2.339429	2.606818	1.934950
Jarque-Bera	16.30463	18.77740	21.06206	5.292043	21.24646	12.04660
Probability	0.000288	0.000084	0.000027	0.070933	0.000024	0.002422
Sum	39277.45	233479.3	15782.90	419601.4	50403.10	143773.3
Sum Sq. Dev.	521615.2	14672631	101835.4	6695880	247523.2	3992825
Observations	251	251	251	251	251	251

Annexure 1b

Descriptive Analysis of Share Price Yield					
Sample: October 1, 2007 to October 1, 2008					
	Reliance	**RPL**	**SBI**	**TATA**	**TTM**
Mean	2455.272	180.8916	1803.507	754.4301	36.07371
Median	2463.450	171.4500	1712.850	798.8500	34.25000
Maximum	3220.850	269.6000	2464.550	988.9000	63.75000
Minimum	1876.650	140.2500	1025.300	427.1500	21.65000
Std. Dev.	297.7720	26.77092	397.2936	123.5642	10.98656
Skewness	0.146694	0.969177	0.124341	–0.628175	0.891018
Kurtosis	2.222314	3.199648	1.745711	2.562399	2.855690
Jarque-Bera	7.225379	39.71106	17.10024	18.51032	33.42984
Probability	0.026979	0.000000	0.000194	0.000096	0.000000
Sum	616273.2	45403.80	452680.2	189362.0	9054.500
Sum Sq. Dev.	22167047	179170.5	39460547	3817027	30176.11
Observations	251	251	251	251	251

(Cont.)

Annexure 2a

Serial Correlation										
Sample: October 1, 2007 to October 1, 2008										
Lags	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Indices										
CNX	0.093	0.076	–0.057	–0.124	–0.121	–0.047	0.035	0.100	0.063	0.017
JUNIOR	0.124	0.056	–0.01	–0.186	–0.143	0.002	0.017	0.114	0.106	0.036
NIFTY	0.036	0.075	–0.089	–0.098	–0.126	–0.082	0.030	0.082	0.051	0.023
Shares										
DFC	0.026	–0.086	–0.027	–0.088	–0.096	–0.007	–0.081	0.061	0.165	0.038
ICICI	0.124	0.016	–0.079	–0.084	–0.154	–0.147	–0.028	0.142	0.079	0.030
IFC	0.050	0.086	–0.041	–0.132	–0.107	0.030	0.003	0.009	0.133	–0.008
Infosys	0.016	–0.070	0.016	–0.071	0.011	–0.016	0.002	0.052	0.038	–0.007
NTPC	0.010	–0.032	–0.048	–0.020	–0.116	–0.122	0.091	0.050	0.049	0.023
RCOM	0.023	0.060	–0.125	–0.089	–0.087	–0.044	0.032	0.077	0.023	–0.017
Reliance	0.038	0.047	–0.161	–0.093	–0.157	0.028	0.029	0.090	0.024	0.015
RPL	0.071	0.027	–0.109	–0.065	–0.052	–0.078	0.084	0.064	0.058	–0.101
SBI	0.073	0.040	–0.102	–0.020	–0.128	–0.048	0.042	0.131	0.091	0.033
TATA	0.024	0.036	–0.037	–0.141	–0.078	0.020	–0.003	0.147	0.039	–0.006
TTM	0.080	–0.044	–0.026	–0.062	0.001	–0.002	0.056	0.109	0.048	0.021

Annexure 2b

Serial Correlation										
Sample: October 1, 2007 to October 1, 2008										
Lags	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Indices										
CNX	–0.105	0.023	–0.052	0.083	0.075	0.073	0.001	–0.057	–0.061	–0.058
Junior	–0.064	–0.027	–0.066	0.070	0.074	0.069	0.022	–0.015	–0.052	–0.045
Nifty	–0.110	0.042	–0.054	0.081	0.061	0.072	–0.004	–0.055	–0.054	–0.062

(Cont.)

Annexure 2b

Serial Correlation										
Sample: October 1, 2007 to October 1, 2008										
Lags	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Shares										
DFC	–0.133	0.043	–0.040	0.022	0.012	0.038	0.086	0.091	–0.080	–0.037
ICICI	–0.038	0.043	–0.020	–0.016	–0.036	0.077	–0.019	–0.041	–0.077	–0.069
IFC	–0.073	0.037	–0.128	0.005	0.035	–0.043	–0.016	0.02	0.003	0.028
Infosys	0.067	0.020	–0.124	–0.066	–0.022	–0.029	0.123	0.011	–0.011	–0.030
NTPC	–0.200	–0.068	–0.075	0.170	–0.009	0.107	0.022	–0.078	–0.018	–0.100
RCOM	–0.124	–0.028	0.057	0.000	0.070	0.039	–0.056	–0.062	–0.019	–0.004
Reliance	–0.084	0.003	–0.02	0.088	0.068	0.100	–0.053	–0.076	–0.139	–0.019
RPL	–0.103	–0.062	–0.023	0.159	0.033	0.138	–0.072	–0.152	–0.125	–0.012
SBI	–0.006	–0.043	–0.111	0.001	0.069	0.016	0.035	–0.072	0.012	–0.039
TATA	–0.068	0.000	–0.052	0.023	0.112	–0.005	0.022	–0.063	–0.055	–0.060
TTM	–0.096	–0.045	–0.027	0.040	0.123	0.076	–0.038	–0.016	–0.069	0.001

Annexure 3a

Q-Statistics										
Sample: October 1, 2007 to October 1, 2008										
(0.05, the Q-Statistics Value should be 3.46)										
Lags	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CNX	2.2108	3.6593	4.4797	8.4085	12.1770	12.7550	13.0810	15.6830	16.7170	16.7900
Junior	3.9184	4.7044	4.7280	13.5550	18.8060	18.8070	18.8830	22.2660	25.2220	25.5570
Nifty	0.3235	1.7365	3.7727	6.2509	10.3580	12.0750	12.3130	14.0530	14.7240	14.8620
DFC	0.1683	2.0264	2.2182	4.2170	6.6021	6.6159	8.3205	9.2823	16.4230	16.7990
ICICI	3.8961	3.9590	5.5598	7.3484	13.4830	19.0550	19.2570	24.5360	26.1820	26.4180
IFC	0.6418	2.5048	2.9435	7.3899	10.3230	10.5490	10.5510	10.5730	15.2070	15.2240
Infosys	0.0631	1.3015	1.3657	2.6520	2.6806	2.7505	2.7521	3.4436	3.8246	3.8393

(Cont.)

Annexure 3a

Q-Statistics										
Sample: October 1, 2007 to October 1, 2008										
(0.05, the Q-Statistics Value should be 3.46)										
Lags	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
NTPC	0.0278	0.2934	0.8729	0.9783	4.4433	8.3092	10.4790	11.1270	11.7540	11.8930
RCOM	0.1306	1.0470	5.0517	7.0777	9.0433	9.5421	9.8011	11.3410	11.4790	11.5520
Reliance	0.3706	0.9321	7.5399	9.7748	16.1330	16.3390	16.5640	18.6710	18.8190	18.8810
RPL	1.2733	1.4521	4.4728	5.5395	6.2426	7.8051	9.6410	10.7060	11.5930	14.2730
SBI	1.3514	1.7620	4.3937	4.4972	8.7419	9.3469	9.8045	14.2900	16.4760	16.7650
TATA	0.1418	0.4772	0.8219	5.9269	7.4858	7.5925	7.5949	13.2480	13.6520	13.6610
TTM	1.6217	2.1103	2.2770	3.2465	3.2469	3.2478	4.0483	7.1678	7.7786	7.8972

Annexure 3b

Q-Statistics										
Sample: October 1, 2007 to October 1, 2008										
(0.05, the Q-Statistics Value should be 3.46)										
Lags	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
CNX	19.6950	19.8350	20.5560	22.373	23.864	25.318	25.318	26.204	27.218	28.138
Junior	26.6450	26.8340	27.9840	29.301	30.778	32.051	32.178	32.241	32.986	33.550
Nifty	18.0690	18.5270	19.3020	21.043	22.035	23.445	23.448	24.280	25.089	26.128
DFC	21.4350	21.9300	22.3650	22.500	22.537	22.927	24.932	27.188	28.954	29.320
ICICI	26.8030	27.2990	27.4070	27.472	27.828	29.406	29.503	29.956	31.593	32.883
IFC	16.6150	16.9820	21.3270	21.333	21.659	22.153	22.224	22.337	22.339	22.548
Infosys	5.0147	5.1258	9.2182	10.390	10.519	10.738	14.833	14.866	14.898	15.139
NTPC	22.4470	23.6570	25.1690	32.865	32.889	35.960	36.092	37.757	37.844	40.575
RCOM	15.5870	15.8010	16.6670	16.667	17.991	18.406	19.269	20.318	20.413	20.418
Reliance	20.7210	20.7220	20.8250	22.885	24.115	26.801	27.564	29.121	34.388	34.483
RPL	17.0920	18.1160	18.2530	25.001	25.293	30.410	31.823	38.063	42.292	42.329
SBI	16.7730	17.2730	20.5650	20.565	21.836	21.904	22.245	23.671	23.708	24.126
TATA	14.8630	14.8630	15.5720	15.715	19.098	19.104	19.237	20.307	21.130	22.115
TTM	10.3370	10.8630	11.0560	11.479	15.536	17.108	17.493	17.561	18.878	18.878

(Cont.)

Annexure 4a

Q-Statistics										
Probability (0.05)										
Sample: October 1, 2007 to October 1, 2008										
Lags	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CNX	0.137	0.160	0.214	0.078	0.032	0.047	0.070	0.047	0.053	0.079
Junior	0.048	0.095	0.193	0.009	0.002	0.005	0.009	0.004	0.003	0.004
Nifty	0.570	0.420	0.287	0.181	0.066	0.060	0.091	0.080	0.099	0.137
DFC	0.682	0.363	0.528	0.377	0.252	0.358	0.305	0.319	0.059	0.079
ICICI	0.048	0.138	0.135	0.119	0.019	0.004	0.007	0.002	0.002	0.003
IFC	0.423	0.286	0.400	0.117	0.067	0.103	0.159	0.227	0.085	0.124
Infosys	0.802	0.522	0.714	0.618	0.749	0.839	0.907	0.904	0.923	0.954
NTPC	0.868	0.864	0.832	0.913	0.488	0.216	0.163	0.195	0.228	0.292
RCOM	0.718	0.592	0.168	0.132	0.107	0.145	0.200	0.183	0.244	0.316
Reliance	0.543	0.627	0.057	0.044	0.006	0.012	0.020	0.017	0.027	0.042
RPL	0.259	0.484	0.215	0.236	0.283	0.253	0.210	0.219	0.237	0.161
SBI	0.245	0.414	0.222	0.343	0.120	0.155	0.200	0.075	0.058	0.080
TATA	0.706	0.788	0.844	0.205	0.187	0.270	0.370	0.104	0.135	0.189
TTM	0.203	0.348	0.517	0.517	0.662	0.777	0.774	0.519	0.557	0.639

Annexure 4b

Probability (0.05)										
Sample: October 1, 2007 to October 1, 2008										
Lags	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
CNX	0.050	0.070	0.082	0.071	0.067	0.064	0.088	0.095	0.100	0.106
Junior	0.005	0.008	0.009	0.010	0.009	0.010	0.014	0.021	0.024	0.029
Nifty	0.080	0.101	0.114	0.101	0.107	0.102	0.135	0.146	0.158	0.162
DFC	0.029	0.038	0.050	0.069	0.094	0.116	0.096	0.076	0.067	0.082
ICICI	0.005	0.007	0.011	0.017	0.023	0.021	0.030	0.038	0.035	0.035
IFC	0.120	0.15	0.067	0.093	0.117	0.138	0.176	0.217	0.268	0.312
Infosys	0.930	0.954	0.756	0.733	0.786	0.825	0.607	0.671	0.729	0.768

(Cont.)

Annexure 4b

Probability (0.05)										
Sample: October 1, 2007 to October 1, 2008										
Lags	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
NTPC	0.021	0.023	0.022	0.003	0.005	0.003	0.004	0.004	0.006	0.004
RCOM	0.157	0.201	0.215	0.274	0.263	0.301	0.313	0.315	0.370	0.432
Reliance	0.036	0.055	0.076	0.062	0.063	0.044	0.050	0.047	0.017	0.023
RPL	0.105	0.112	0.148	0.035	0.046	0.016	0.016	0.004	0.002	0.003
SBI	0.115	0.140	0.082	0.113	0.112	0.146	0.175	0.166	0.208	0.237
TATA	0.189	0.249	0.273	0.331	0.209	0.263	0.315	0.316	0.330	0.334
TTM	0.500	0.541	0.606	0.648	0.414	0.379	0.421	0.485	0.465	0.530

Annexure 5

Descriptive Analysis of Indices Yield (Differences)			
	RCNX	**RJunior**	**RNifty**
Mean	–0.001273	–0.001981	–0.000997
Median	–0.000407	–0.000579	–0.000305
Std. Dev.	0.023174	0.028194	0.022863
Skewness	–0.300832	–0.269013	–0.049944
Kurtosis	4.936712	4.936274	4.059049
Jarque-Bera	42.842210	42.069050	11.787120
Probability	0.000000	0.000000	0.002757
Sum	–0.318206	–0.495146	–0.249228
Sum Sq. Dev.	0.133719	0.197926	0.130156

Annexure 6a

Descriptive Analysis of Share Price Yield (Differences)						
Sample: October 1, 2007 to October 1, 2008						
	RDFC	**RICICI**	**RIFC**	**RInfosys**	**RNTPC**	**RRCOM**
Mean	–0.002759	–0.002610	–0.004105	–0.001094	–0.000686	–0.002315
Median	–0.002009	–0.005315	–0.004096	–0.002644	0.000204	–0.003681
Std. Dev.	0.043650	0.039503	0.056357	0.027891	0.032052	0.035902
Skewness	–0.137613	–0.008207	–0.563444	0.174429	–0.183529	–0.043695

(Cont.)

Annexure 6a

Descriptive Analysis of Share Price Yield (Differences)						
Sample: October 1, 2007 to October 1, 2008						
	RDFC	**RICICI**	**RIFC**	**RInfosys**	**RNTPC**	**RRCOM**
Kurtosis	4.254686	3.743805	5.530652	3.384408	5.372517	5.241934
Jarque-Bera	17.18735	5.765786	79.93831	2.806995	60.03717	52.43650
Probability	0.000185	0.055973	0.000000	0.245736	0.000000	0.000000
Sum	–0.689710	–0.652393	–1.026245	–0.273585	–0.171533	–0.578845
Sum Sq. Dev.	0.474434	0.388557	0.790858	0.193704	0.255811	0.320954

Annexure 6b

Descriptive Analysis of Share Price Yield (Differences)					
Sample: October 1, 2007 to October 1, 2008					
	RReliance	**RRPL**	**RSBI**	**RTATA**	**RTTM**
Mean	–0.000737	–0.000512	–0.000922	–0.002609	–0.002864
Median	–0.000525	–0.003135	–0.001521	–0.001176	–0.003160
Std. Dev.	0.028945	0.038688	0.032022	0.034050	0.042684
Skewness	–0.080086	–0.727881	0.085748	–0.093962	–0.408012
Kurtosis	3.228817	8.949897	3.377405	3.282991	9.046787
Jarque-Bera	0.812632	390.8387	1.790054	1.202075	387.807600
Probability	0.666100	0.000000	0.408597	0.548242	0.000000
Sum	–0.184138	–0.127990	–0.230580	–0.652168	–0.715875
Sum Sq. Dev.	0.208616	0.372691	0.255334	0.288699	0.453670

Reference # 37J-2009-06-01-01