

The Impact of Stock Index Futures on Volatility of National Stock Exchange: An Empirical Study

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1. Abstract: - In this paper, two research issues related to introduction of index futures have been studied. First issue is related to the impact of introduction of stock index futures on the underlying stock market volatility. Second, a comparison is made of futures market volatility with spot market volatility. Both these issues have been studied in relation to National Stock Exchange (NSE).

Keywords: - NSE, N FUTIDX, S.D, F- Ratio, S&P CNX

Background: - In the Indian context derivatives were mainly introduced with a view to curb the increasing volatility in financial markets. These instruments bring sophisticated risk management tools leading to higher returns by reducing risk and transaction costs. The launch of derivative products has significantly altered the movements of share prices in the spot market. This raises important question about the effect that stock index futures have on volatility of the spot market.

At NSE security description for stock index futures is N FUTIDX NIFTY. The underlying instrument is S&P CNX Nifty index and contract is traded in the size of 200 or multiples thereof. A maximum of three month trading cycle is prevalent. The near month (one), the next month (two) and the far month (three) is used at NSE. New contract is introduced on the next trading day following the expiry of near month contract. Index closing price on the last trading day will be the final settlement price.

2. Volatility Conditions in NSE Before and After Introduction of Stock Index Futures: -

Under this head the volatility conditions in the market have been studied for two periods, before and after the introduction of stock index futures. First period is taken from June 1995 to May 2000 (before starting of stock index futures) and second is June 2000 to June 2005 (after starting trading of stock index futures). Following measures of volatility are used to study the impact of stock index futures on volatility of spot market volatility.

- (a) **Open-to-open prices**
- (b) **Intra-day volatility:**
 - (i) **Based upon lowest prices**
 - (ii) **Based upon highest prices**
- (c) **Close-to-close prices.**

To study impact of stock index futures on Nifty, two window periods have been used, first period is taken from June 1995 to May 2000 (before starting trading of stock index futures) and second is June 2000 to June 2005 (after starting trading of stock index futures).

2.1 Results

2.1 (a) Based upon Open-to-Open Prices

Table 1.1 depicts volatility of Nifty (that means underlying market for stock index futures) based upon open-to-open prices. As the stock index futures were introduced at NSE in June 2000, therefore two window periods are taken to measure the volatility of the market. With the help of F-ratio, volatility in these two window periods is calculated based upon open-to-open prices. As per results in Table 4.1 volatility of prices in pre-futures period was more as compared to post-futures period. Starting from one month the volatility has been calculated cumulatively taking three months together. All the results were statistically significant at 5 per cent level of significance.

Table 1.1

Volatility of Nifty Based on Opening Prices

Ln Open	S.D. Before	S.D. After	F-ratio
1 Month	0.0578	0.0188	5.1371*
2 Months	0.0443	0.0330	1.1593*
3 Months	0.0445	0.361	2.6819*
6 Months	0.0855	0.0714	3.0637*
9 Months	0.1039	0.0839	3.6886*
12 Months	0.0947	0.0879	2.9134*
15 Months	0.0993	0.890	1.9910*
18 Months	0.0951	0.0920	2.2683*
21 Months	0.1026	0.0980	2.3160*
24 Months	0.1085	0.1033	2.3742*
27 Months	0.1031	0.0998	1.9986*
30 Months	0.1026	0.0986	2.3238*
33 Months	0.1015	0.0972	2.7331*
36 Months	0.1077	0.0988	2.2145*
39 Months	0.1112	0.1059	3.1013*
42 Months	0.108	0.0992	4.5506*
45 Months	0.1146	0.1020	3.6932*
48 Months	0.1355	0.1140	5.0062*
51 Months	0.1559	0.1233	6.3201*
54 Months	0.1787	0.1480	7.7402*
57 Months	0.1789	0.1520	6.0315*
60 Months	0.1981	0.1083	14.2617*

* At 5% level of significance.

2.1 (b) Based upon Intra-day Volatility: Tables 1.2 and 1.3 present intra-day volatility of Nifty. Intra-day volatility is calculated by using the lowest and highest values during the day. Again, the volatility is calculated for two window periods, i.e., June 1995 to May 2000 and June 2000 to June 2005. On the same pattern as in case of open-to-open prices the volatility of pre-futures period was more as compared to the post-futures period. All the results were again statistically significant at 5 per cent level of significance.

Table 1.2

Volatility of Nifty Based on Highest Prices

L _n High	S.D. Before	S.D. After	F-ratio
1 Month	0.0546	0.0164	4.9822*
2 Months	0.0420	0.0311	1.9870*
3 Months	0.0428	0.0350	1.9890*
6 Months	0.0857	0.0695	3.3627*
9 Months	0.1039	0.0844	3.6370*
12 Months	0.1180	0.0943	3.2515*
15 Months	0.1111	0.0968	2.2900*
18 Months	0.1120	0.0945	2.0316*
21 Months	0.1021	0.0982	2.0548*
24 Months	0.1082	0.1040	2.0443*
27 Months	0.1027	0.1005	1.9405*
30 Months	0.1025	0.0994	1.9860*
33 Months	0.1011	0.0980	2.2762*
36 Months	0.1180	0.9970	2.8283*
39 Months	0.1674	0.1107	7.6190*
42 Months	0.2004	0.1075	15.0032*
45 Months	0.2070	0.1145	18.1438*
48 Months	0.2168	0.1358	18.2869*
51 Months	0.2365	0.1568	18.4228*
54 Months	0.2547	0.1807	17.5538*
57 Months	0.265	0.1820	19.7155*
60 Months	0.2830	0.1940	20.1011*

* At 5% level of significance.

Table 1.3

Volatility of Nifty Based on Lowest Prices

L _n Low	S.D. Before	S.D. After	F-ratio
1 Month	0.0593	0.0168	4.8730*
2 Months	0.0440	0.0323	1.9537*
3 Months	0.0439	0.0358	2.4427*
6 Months	0.0850	0.0759	2.3843*
9 Months	0.1035	0.0850	3.3630*
12 Months	0.1188	0.0947	2.8983*
15 Months	0.1130	0.1014	2.8626*
18 Months	0.1024	0.0920	2.3550*
21 Months	0.1030	0.0982	2.5161*
24 Months	0.1087	0.1030	2.6197*
27 Months	0.1033	0.0993	2.2700*
30 Months	0.1028	0.0982	2.6401*
33 Months	0.1020	0.0966	3.2027*
36 Months	0.1160	0.1024	2.2510*
39 Months	0.1650	0.1116	6.7679*
42 Months	0.1981	0.1083	14.2617*
45 Months	0.2040	0.1149	17.3035
48 Months	0.2147	0.3580	17.6568*
51 Months	0.2351	0.1561	18.0332*
54 Months	0.2538	0.1777	17.7149*
57 Months	0.2646	0.1786	20.0975*
60 Months	0.2930	0.1830	22.0132*

* At 5% level of significance.

2.1 (c) Based upon Close-to-Close Prices: -

Table 1.4 presents close-to-close price volatility of Nifty. F-ratio is calculated for the two window periods. Again, the volatility in pre-futures period was more than post-futures period. All the values were statistically significant at 5 per cent level of significance.

Table 1.4

Volatility of Nifty Based on Closing Values

L _n Close	S.D. Before	S.D. After	F-ratio
1 Month	0.0597	0.0161	5.769*
2 Months	0.0464	0.0320	2.7967*
3 Months	0.0468	0.0354	2.7670*
6 Months	0.0846	0.0717	2.9472*
9 Months	0.1026	0.0841	3.3219*
12 Months	0.1183	0.0937	3.1766*
15 Months	0.1111	0.0982	1.2108*
18 Months	0.1022	0.920	2.0548*
21 Months	0.1019	0.0982	2.0955*
24 Months	0.1077	0.1034	2.1684*
27 Months	0.1024	0.0098	1.9936*
30 Months	0.1020	0.0987	2.1705*
33 Months	0.1009	0.0972	2.6002*
36 Months	0.1073	0.0990	2.4370*
39 Months	0.1665	0.1107	7.3506*
42 Months	0.1995	0.1075	14.8136*
45 Months	0.2057	0.1144	17.8811*
48 Months	0.2160	0.1354	18.1585*
51 Months	0.2361	0.1561	18.3981*
54 Months	0.25.41	0.1786	17.8160*
57 Months	0.2650	0.1797	20.1015*
60 Months	0.2834	0.1934	22.1314*

* At 5% level of significance.

On the basis of above results it can be concluded that overall volatility of Nifty was less in post-futures period as compared to pre-futures period.

3. Relative Volatility of NSE: Index Futures and Spot Markets: - In this section the relative volatility of futures and spot market in respect of both National Stock Exchange (NSE) the indices has been studied. It helped to see whether index futures are more or less volatile than the underlying spot index.

The relative volatility is computed upon five basis.

- (a) **Open-to-open prices basis**
- (b) **Close-to-close prices basis**
- (c) **Lowest-to-lowest prices basis**
- (d) **Highest-to-highest prices basis**
- (e) **High-to-low price basis.**

Following hypothesis can be stated in statistical terms:

$H_{O(1)} = \sigma (\text{Index Futures}) = \sigma (\text{Spot index})$ $H_{A(1)} = \sigma (\text{Index Futures}) \neq \sigma (\text{Spot index})$
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3(a) Open-to-Open Prices Basis

Starting from June 2000, the month of introduction of stock index futures at NSE, the volatility is computed up to June 2005 on monthly basis. Although during the period of study the volatility of Nifty Index Futures is different from the volatility of Nifty Index. According to F-ratio calculation (which signifies the difference of standard

deviations of two markets) the difference of variance was not statistically significant at 5 per cent level of significance (Table 4.8).

Table 1.5

Daily Price Volatility: Nifty Index Futures and Nifty Index based on Opening Prices

L _n Open	Observations	S.D.Nifty Index Futures	S.D.Nifty	F-ratio*
Jun-00	15	0.0147	0.0173	0.202
Jul-00	21	0.0517	0.0548	0.160
Aug-00	22	0.0171	0.0192	1.410
Sep-00	20	0.0525	0.0540	0.114
Oct-00	19	0.0448	0.0436	0.015
Nov-00	22	0.0163	0.0188	0.106
Dec-00	20	0.0282	0.0302	0.129
Jan-01	22	0.0273	0.0273	0.044
Feb-01	20	0.0215	0.0232	0.021
Mar-01	21	0.0573	0.0520	0.248
Apr-01	19	0.0293	0.0363	1.376
May-01	22	0.0161	0.0193	2.077
Jun-01	21	0.0198	0.0217	0.002
Jul-01	22	0.0161	0.0174	0.175
Aug-01	21	0.0057	0.0043	0.007
Sep-01	20	0.0796	0.0810	0.015
Oct-01	21	0.0327	0.0348	0.442
Nov-01	20	0.0380	0.0343	1.135
Dec-01	19	0.0239	0.0281	0.630
Jan-02	23	0.0152	0.0147	0.010
Feb-02	20	0.0290	0.0323	0.221
Mar-02	19	0.0127	0.0166	2.117
Apr-02	21	0.0187	0.0175	0.112
May-02	22	0.0280	0.0298	0.041
Jun-02	20	0.0151	0.0174	0.093
Jul-02	23	0.0343	0.0357	0.021
Aug-02	21	0.0122	0.0139	1.131
Sep-02	20	0.0192	0.0160	0.023
Oct-02	21	0.0144	0.0154	0.020
Nov-02	19	0.0314	0.0332	0.139
Dec-02	21	0.0136	0.0148	0.098
Jan-03	23	0.0178	0.0179	0
Feb-03	19	0.0087	0.0088	0.244
Mar-03	20	0.0206	0.0198	0.005
Apr-03	20	0.0358	0.0357	0.040
May-03	21	0.0199	0.0198	0.001
Jun-03	21	0.0319	0.0336	0.103
Jul-03	23	0.0180	0.0172	0.154
Aug-03	20	0.0466	0.0429	0.263
Sep-03	22	0.0260	0.0255	0
Oct-03	22	0.0270	0.0265	0.059
Nov-03	20	0.0186	0.0185	0.003
Dec-03	22	0.0423	0.0432	0.038
Jan-04	21	0.0271	0.0298	0.097

Feb-04	19	0.0276	0.0277	0.007
Mar-04	22	0.0347	0.0365	0.095
Apr-04	20	0.0165	0.0156	0.227
May-04	21	0.0818	0.0760	0.133
Jun-04	22	0.0180	0.0185	0.015
Jul-04	22	0.0253	0.0208	0.832
Aug-04	22	0.0133	0.0138	0.344
Sep-04	22	0.0247	0.0245	0.005
Oct-04	20	0.0118	0.0099	0.227
Nov-04	20	0.0212	0.0199	0.034
Dec-04	23	0.0188	0.0177	0.008
Jan-05	19	0.0314	0.0320	0.006
Feb-05	20	0.0081	0.0074	0.112
Mar-05	22	0.0248	0.0279	0.228
Apr-05	20	0.0301	0.0271	1.153
May-05	22	0.0216	0.0239	0.011
Jun-05	23	0.0201	0.0198	0

* At 5% level of significance.

Table 1.5 presents the number of observations taken in a particular month, which signify the trading days of that month. Due to this reason the number of observations differ from month to month. The standard deviation of return has been calculated by using average returns so that the difference of observations has no impact on the calculations. The comparison of the variance of both the markets has shown difference of returns and standard deviations. In statistical terms, none of the differences throughout the study is significant (at 5 per cent level of significance). The standard deviation on month-to-month basis was less in case of stock index futures. The variation of return in case of spot market was not statistically different from stock index futures.

3(b) Close-to-Close Prices Basis

The relative volatility has been computed upon close-to-close prices basis.

Table 1.6 shows the variance of both Nifty Index and Nifty futures. Again, starting from June 2000, the volatility is computed up to June 2005 on month basis. Although, Nifty Index is underlying asset for Nifty Index Futures, but the volatility of both the markets was different. In all, a total of 1,249 observations were considered for studying difference of variance.

Table 1.6

Daily Price Volatility: Nifty Index Futures and Nifty Index based on Closing Prices

L _n Close	Observations	S.D. Nifty Index Futures	S.D. Nifty	F-ratio*
Jun-00	15	0.0148	0.0159	0.171
Jul-00	21	0.0534	0.0575	0.335
Aug-00	22	0.0135	0.0203	6.828
Sep-00	20	0.0539	0.0567	0.339
Oct-00	19	0.0427	0.0425	0.007
Nov-00	22	0.0147	0.0161	0.047
Dec-00	20	0.0300	0.0304	0.030
Jan-01	22	0.0264	0.0273	0.055
Feb-01	20	0.0216	0.0234	0.054
Mar-01	21	0.0531	0.0480	0.193

Apr-01	19	0.0335	0.0357	0.083
May-01	22	0.0150	0.0182	1.850
Jun-01	21	0.0157	0.0181	0.296
Jul-01	22	0.0132	0.0165	1.494
Aug-01	21	0.0040	0.0052	0.756
Sep-01	20	0.0801	0.0778	0.077
Oct-01	21	0.0323	0.0338	0.118
Nov-01	20	0.0360	0.0326	0.715
Dec-01	19	0.0260	0.0283	0.182
Jan-02	23	0.0144	0.0143	0.074
Feb-02	20	0.0262	0.0300	0.406
Mar-02	19	0.0111	0.0179	4.757
Apr-02	21	0.0143	0.0190	2.553
May-02	22	0.0301	0.0317	0.047
Jun-02	20	0.0140	0.0158	0.185
Jul-02	23	0.0370	0.0390	0.067
Aug-02	21	0.0124	0.0156	1.408
Sep-02	20	0.0156	0.0161	0.130
Oct-02	21	0.0138	0.0151	0.094
Nov-02	19	0.0311	0.0350	0.622
Dec-02	21	0.0127	0.0149	0.481
Jan-03	23	0.0181	0.0192	0.107
Feb-03	19	0.0092	0.0083	0.454
Mar-03	20	0.0204	0.0195	0.051
Apr-03	20	0.0345	0.0365	0.101
May-03	21	0.0208	0.0214	0.003
Jun-03	21	0.0334	0.0341	0.012
Jul-03	23	0.0185	0.0183	0.077
Aug-03	20	0.0467	0.0444	0.107
Sep-03	22	0.0265	0.0262	0.003
Oct-03	22	0.0244	0.0242	0.001
Nov-03	20	0.0180	0.0185	0
Dec-03	22	0.0438	0.0441	0.008
Jan-04	21	0.0301	0.0313	0.012
Feb-04	19	0.0284	0.0280	0.006
Mar-04	22	0.0355	0.0364	0.022
Apr-04	20	0.0160	0.0145	0.353
May-04	21	0.0848	0.0773	0.178
Jun-04	22	0.0169	0.0182	0.027
Jul-04	22	0.0234	0.0213	0.346
Aug-04	22	0.0139	0.0137	0
Sep-04	22	0.0254	0.0245	0.143
Oct-04	20	0.0087	0.0090	0.002
Nov-04	20	0.0204	0.0202	0
Dec-04	23	0.0182	0.0177	0.001
Jan-05	19	0.0319	0.0313	0.003
Feb-05	20	0.0088	0.0078	0.484
Mar-05	22	0.0265	0.0286	0.119
Apr-05	20	0.0302	0.0286	0.175
May-05	22	0.0219	0.0235	0.030
Jun-05	23	0.0215	0.0211	0.002

* At 5 % level of significance.

A comparison of the variance of returns for both the markets has shown different trends. In statistical terms, however, none of the differences significant (at 5 per cent level of significance) as the values of F-ratio (which signify difference of standard deviations) were not significant. The standard deviations on month-to-month basis were less in case of Nifty Index Futures. The trends of standard deviation in case of Nifty (Spot) were not very different from Nifty Index Futures in statistical terms.

3 (c) Lowest-to-Lowest Prices Basis

The lowest prices of particular contracts give an idea regarding the depth of a particular market. The sustainability of a particular stock either under futures category or otherwise depends upon its lowest limit. So, the relation of stock market volatility corresponding to futures market deserves attention from the lowest prices point of view too.

Table 1,7 presents the variance of both Nifty index and Nifty futures. Here also the volatility is computed from January 2000 to June 2005 on monthly basis. Nifty Index is underlying instrument for Nifty Index Futures, but the variations of returns for both markets were different.

Table 1.7

Daily Price Volatility: Nifty Index Futures and Nifty Index based on Lowest Prices

Ln Low	Observations	S.D.Nifty Index Futures	S.D.Nifty	F-ratio*
Jun-00	15	0.0142	0.0162	0.243
Jul-00	21	0.0563	0.0629	0.529
Aug-00	22	0.0170	0.0217	3.630
Sep-00	20	0.0559	0.0587	0.191
Oct-00	19	0.0459	0.0442	0.108
Nov-00	22	0.0147	0.0168	0.351
Dec-00	20	0.0292	0.0315	0.179
Jan-01	22	0.0269	0.0259	0.053
Feb-01	20	0.0233	0.0263	0.260
Mar-01	21	0.0576	0.0513	0.418
Apr-01	19	0.0350	0.0413	0.505
May-01	22	0.0159	0.0212	2.086
Jun-01	21	0.0191	0.0213	0.141
Jul-01	22	0.0134	0.0162	0.967
Aug-01	21	0.0039	0.0048	0.777
Sep-01	20	0.0852	0.0839	0.036
Oct-01	21	0.0331	0.0361	0.551
Nov-01	20	0.0357	0.0325	0.624
Dec-01	19	0.0260	0.0306	0.462
Jan-02	23	0.0130	0.0128	0.043
Feb-02	20	0.0268	0.0295	0.142
Mar-02	19	0.0113	0.0165	3.213
Apr-02	21	0.0194	0.0190	0.169
May-02	22	0.0317	0.0338	0.177
Jun-02	20	0.0144	0.0159	0.119

Jul-02	23	0.0391	0.0411	0.06
Aug-02	21	0.0134	0.0158	0.798
Sep-02	20	0.0155	0.0162	0.109
Oct-02	21	0.0147	0.0160	0.105
Nov-02	19	0.0298	0.0334	0.645
Dec-02	21	0.0136	0.0161	1.034
Jan-03	23	0.0196	0.0210	0.113
Feb-03	19	0.0085	0.0088	0.069
Mar-03	20	0.0211	0.0205	0.007
Apr-03	20	0.0359	0.0349	0.005
May-03	21	0.0191	0.0192	0.003
Jun-03	21	0.0313	0.0330	0.032
Jul-03	23	0.0181	0.0184	0.004
Aug-03	20	0.0445	0.0434	0.061
Sep-03	22	0.0286	0.0285	0.031
Oct-03	22	0.0238	0.0258	0.109
Nov-03	20	0.0179	0.0185	0.094
Dec-03	22	0.0433	0.0431	0
Jan-04	21	0.0305	0.0320	0.015
Feb-04	19	0.0295	0.0298	0
Mar-04	22	0.0351	0.0358	0.001
Apr-04	20	0.0167	0.0159	0.057
May-04	21	0.0984	0.0903	0.192
Jun-04	22	0.0164	0.0179	0.030
Jul-04	22	0.0258	0.0236	0.184
Aug-04	22	0.0130	0.0124	0.032
Sep-04	22	0.0232	0.0232	0
Oct-04	20	0.0110	0.0106	0.111
Nov-04	20	0.0203	0.0196	0.012
Dec-04	23	0.0188	0.0184	0
Jan-05	19	0.0316	0.0299	0.054
Feb-05	20	0.0083	0.0058	1.117
Mar-05	22	0.0273	0.0293	0.140
Apr-05	20	0.0302	0.0289	0.219
May-05	22	0.0209	0.0233	0.023
Jun-05	23	0.0208	0.0193	0.121

* At 5% level of significance.

A comparison of the standard deviations for both the markets has shown difference of returns as well as variances. Again, in statistical terms, none of the observations was significant at 5 per cent level of significance. Still the standard deviations on month-to-month basis were less in case of Nifty Index Futures. The standard deviations of Nifty (spot) were not very different (in statistical terms).

3 (d) Highest-to-highest Prices Basis

Under this category the relative volatility is computed upon high-to-high prices basis. The highest price means maximum during a particular day. As there can be many changes in the market parameters due to a specific highest price of a particular contract, so it is important to

study the volatility conditions in both the markets due to change of highest prices.

Table 1.8
Daily Price Volatility: Nifty Index Futures and Nifty Index based on Highest Price

L _n High	Observations	S.D.Nifty Index Futures	S.D.Nifty	F-ratio
Jun-00	15	0.0151	0.0179	0.241
Jul-00	21	0.0476	0.0515	0.235
Aug-00	22	0.0166	0.0190	0.953
Sep-00	20	0.0513	0.0515	0.073
Oct-00	19	0.0414	0.0413	0
Nov-00	22	0.0148	0.0164	0.202
Dec-00	20	0.0281	0.0282	0.007
Jan-01	22	0.0263	0.0261	0.002
Feb-01	20	0.0193	0.0202	0.031
Mar-01	21	0.0538	0.0520	0.018
Apr-01	19	0.0270	0.0322	0.398
May-01	22	0.0153	0.0188	2.468
Jun-01	21	0.0171	0.0199	0.105
Jul-01	22	0.0159	0.0182	0.315
Aug-01	21	0.0050	0.0049	0.159
Sep-01	20	0.0754	0.0727	0.104
Oct-01	21	0.0324	0.0344	0.225
Nov-01	20	0.0380	0.0343	1.069
Dec-01	19	0.0246	0.0287	0.785
Jan-02	23	0.0160	0.0156	0.035
Feb-02	20	0.0273	0.0312	0.349
Mar-02	19	0.0116	0.0181	3.879
Apr-02	21	0.0132	0.0178	2.885
May-02	22	0.0267	0.0290	0.223
Jun-02	20	0.0143	0.0163	0.249
Jul-02	23	0.0325	0.0349	0.052
Aug-02	21	0.0116	0.0147	1.658
Sep-02	20	0.0190	0.0168	0.002
Oct-02	21	0.0131	0.0145	0.210
Nov-02	19	0.0331	0.0356	0.267
Dec-02	21	0.0123	0.0129	0.013
Jan-03	23	0.0173	0.0168	0.018
Feb-03	19	0.0087	0.0073	0.321
Mar-03	20	0.0205	0.0185	0.198
Apr-03	20	0.0338	0.0361	0.209
May-03	21	0.0210	0.0217	0.012
Jun-03	21	0.0343	0.0339	0.012
Jul-03	23	0.0184	0.0170	0.710
Aug-03	20	0.0462	0.0443	0.066
Sep-03	22	0.0222	0.0226	0.008
Oct-03	22	0.0251	0.0246	0.010
Nov-03	20	0.0158	0.0170	0.230
Dec-03	22	0.0446	0.0447	0.005
Jan-04	21	0.0231	0.0248	0.165
Feb-04	19	0.0237	0.0233	0.023

Mar-04	22	0.0339	0.0355	0.125
Apr-04	20	0.0153	0.0131	0.421
May-04	21	0.0705	0.0665	0.154
Jun-04	22	0.0156	0.0175	0.315
Jul-04	22	0.0228	0.0195	0.679
Aug-04	22	0.0136	0.0132	0.004
Sep-04	22	0.0260	0.0252	0.062
Oct-04	20	0.0086	0.0083	0.006
Nov-04	20	0.0207	0.0203	0
Dec-04	23	0.0175	0.0171	0.001
Jan-05	19	0.0316	0.0312	0.004
Feb-05	20	0.0082	0.0074	0.309
Mar-05	22	0.0237	0.0263	0.267
Apr-05	20	0.0280	0.0265	0.059
May-05	22	0.0221	0.0235	0.024
Jun-05	23	0.0208	0.0209	0.007

* At 5% level of significance.

Table 1.8 shows the variance of both Nifty index and Nifty Index Futures. The daily price volatility has been computed from June 2000 to June 2005 on month-to-month basis. A comparison of the variance of returns for the both the markets has shown difference of returns and standard deviation. In statistical terms, none of the difference throughout the study was statistically significant (at 5 per cent level of significance). As the values of F-ratio were not significant in statistical terms, so due to this reason it cannot be concluded that the standard deviation of Nifty Index is different from Nifty Index Futures.

3(e) High-to-low Prices Basis

Under this category, the volatility conditions in both the markets have been studied in the context of high-to-low prices basis. This aspect has an impact on the price variations in particular market. So, the condition of relative volatility from high-to-low basis is worth studying.

Table 1.9

Daily Price Volatility: Nifty Index Futures and Nifty Index based on Highest and Lowest Price

L_n H_t/L_t	Observations	S.D.Nifty Index Futures	S.D.Nifty	F-Ratio
Jun-00	15	0.0067	0.0154	2.934
Jul-00	21	0.0325	0.0330	0.005
Aug-00	22	0.0127	0.0105	0.571
Sep-00	20	0.0230	0.0259	0.842
Oct-00	19	0.0229	0.0210	0.125
Nov-00	22	0.0142	0.0133	0.001
Dec-00	20	0.0189	0.0178	0.020
Jan-01	22	0.0151	0.0158	0.003
Feb-01	20	0.0173	0.0207	0.333
Mar-01	21	0.0407	0.0376	0.050
Apr-01	19	0.0249	0.0293	0.582

May-01	22	0.0082	0.0167	2.723
Jun-01	21	0.0181	0.0142	0.243
Jul-01	22	0.0146	0.0103	0.267
Aug-01	21	0.0123	0.0067	0.657
Sep-01	20	0.0326	0.0424	1.682
Oct-01	21	0.0090	0.0115	0.032
Nov-01	20	0.0177	0.0160	0.029
Dec-01	19	0.0218	0.0152	1.365
Jan-02	23	0.0175	0.0147	0.002
Feb-02	20	0.0245	0.0212	0.778
Mar-02	19	0.0101	0.0143	1.152
Apr-02	21	0.0191	0.0101	0.405
May-02	22	0.0150	0.0189	0.040
Jun-02	20	0.0070	0.0106	4.433*
Jul-02	23	0.0143	0.0150	0.245
Aug-02	21	0.0088	0.0109	0.202
Sep-02	20	0.0122	0.0074	0.062
Oct-02	21	0.0048	0.0072	5.915*
Nov-02	19	0.0136	0.0077	0.359
Dec-02	21	0.0109	0.0122	0.076
Jan-03	23	0.0084	0.0127	4.363*
Feb-03	19	0.0060	0.0089	1.109
Mar-03	20	0.0124	0.0106	0.497
Apr-03	20	0.0184	0.0184	0.071
May-03	21	0.0068	0.0064	0.810
Jun-03	21	0.0111	0.0101	0.418
Jul-03	23	0.0189	0.0126	1.631
Aug-03	20	0.0225	0.0259	0.122
Sep-03	22	0.0176	0.0186	0.121
Oct-03	22	0.0175	0.0181	0.005
Nov-03	20	0.0122	0.0111	0.428
Dec-03	22	0.0089	0.0116	1.297
Jan-04	21	0.0223	0.0216	0.010
Feb-04	19	0.0167	0.0184	0.314
Mar-04	22	0.0134	0.0164	1.964
Apr-04	20	0.0136	0.0180	1.750
May-04	21	0.0860	0.0850	0.074
Jun-04	22	0.0178	0.0174	0.001
Jul-04	22	0.0230	0.0219	0.183
Aug-04	22	0.0137	0.0085	1.092
Sep-04	22	0.0140	0.0085	5.111*
Oct-04	20	0.0135	0.0084	3.282
Nov-04	20	0.0161	0.0079	1.711
Dec-04	23	0.0063	0.0070	2.032
Jan-05	19	0.0185	0.0205	0.023
Feb-05	20	0.0140	0.0104	0.749
Mar-05	22	0.0124	0.0108	0.191
Apr-05	20	0.0146	0.0138	0.444
May-05	22	0.0107	0.0083	0.952
Jun-05	23	0.0074	0.0085	0.672

At 5% level of significance.

Conclusion: -

Table 1.9 presents the volatility of both Nifty Index and Nifty Index Futures. The daily price volatilities have been computed from June 2000 to June 2005 on month-to-month basis. Again, a comparison of variance of returns for both the markets has shown difference of returns and standard deviations. The values of F-ratio were not statistically significant. Although the values of standard deviations were different in both the markets but it cannot be concluded that the standard deviation in case of Nifty Index is different from Nifty Index Futures.

The empirical results relating to relative volatility of Nifty Index Futures and Nifty Spot Index have been shown in Tables 1.5 to 1.9

Overall, the results reported indicate that the daily volatility on month-to-month basis for the stock market and for futures market was not significantly different during the study period. The results were more or less similar even for intra-day volatility. Although there were some exceptions also that means in certain months stock market volatility was found to be higher than the futures volatility. However, the overall volatility for the two markets was not significantly different from each other.

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