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Equity derivatives in India: The state of the art

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Equity derivatives trading started in India in June 2000, after a regulatory process which stretched over more than four years. In July 2001, the equity spot market moved to rolling settlement. Thus, in 2000 and 2001, the Indian equity market reached the logical conclusion of the reforms program which began in 1994. It is important to learn about the behaviour of the equity market in this new regime.

India's experience with the launch of equity derivatives market has been extremely positive, by world standards. NSE is now one of the prominent exchanges amongst all emerging markets, in terms of equity derivatives turnover. There is an increasing sense that the derivatives market is playing a major role in shaping price discovery.

The goal of this paper is to convey a detailed sense of the functioning of the equity derivatives market, in order to convey the 'state of the art'. We seek to convey some insights into what is going on with the equity deriva-

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tives market, and summarise broad empirical regularities about pricing and liquidity.

Our treatment is organised around the following issues. We start with a treatment of some general issues about measurement in Section 1. The state of the art in terms of pricing, and the characteristics of futures and options prices are presented in Section 2. We examine the growth in liquidity in Section 3, and turn to problems of turnover in Section 4. Questions about market participants are examined in Section 5. We conclude in Section 7.

1 Problems of measurement

Many of the interesting quantities of interest in the derivatives markets unfold in realtime and require unprecedented care in terms of creating and handling data. This necessitates special care in processing data when doing measurement.

Implied rates of return At any point in time, there can be an arbitrage transaction for a given underlying, such as buying on the spot and selling at the future date. To correctly measure the returns in arbitrage, we need to accurately utilise the offer price on the spot market and the bid price on the futures market. In the case of the spot market, we need to be sure that the offer price pertains to a transaction which is as big as one market lot on the futures market.[2]

Since bid and offer prices fluctuate from moment to moment, it is important to utilise a 'snapshot' of both markets, at a certain point in time, in measuring the rates of return. Hence, sound measurement of the rates of return in arbitrage always pertain to *a point in time*, and seeks to accurately portray the returns that an arbitrageur would have obtained if the transaction had been initiated at that timepoint. If information from different timepoints for the spot and derivatives market is utilised, i.e. if the data is 'nonsynchronous', then misleading rates of return are obtained.[3]

[2] The market lot on the spot market is 1 share and the 'typical' market lot on the derivatives market is Rs.200,000. Hence, the computation of the effective transaction price on the spot market requires computation of 'impact cost' for a transaction of Rs.200,000, using the limit order book of the spot market.

[3] This also requires that the trading computers at the exchanges should all be highly synchronised. If the NSE trading computer for the spot market has a different clock than

If the official closing prices on the spot and derivatives markets are utilised, then they yield extremely misleading information when it comes to computation of implied rates of return. Each of these represents an average of traded prices of the last 30 minutes. The averaging involved in the computation of the 'official closing price' masks important problems with time synchronisation, since the timepoints at which trades took place in the last 30 minutes on the spot market could differ considerably from the timepoints at which trades took place on the derivatives market. A rate of return computed between the official closing price on the spot and the official closing price on the derivative conveys the true returns in arbitrage at no point in time.

Implied volatility Similar issues are faced with implied volatility. Generally, the bid-offer spread on the spot market is fine enough to allow us to merely focus on (bid+offer)/2 as an estimator of "the price" on the spot market. On the options market, the bid-offer spread is generally wider. The bid price yields one implied volatility, and the offer price yields another implied volatility. It is meaningful to average these, so as to get a sense of "the implied volatility" that prevails at a point in time.

Once again, all values utilised in this calculation need to be synchronous - they should reflect a set of limit orders available for trading at a point in time. If official closing prices are used, or any kind of averaging *over time* is done in computing prices, then the consequential estimates of implied volatility are blurred. If the last traded price (LTP) on the spot market is combined with the LTP on the options market, the implied volatility obtained is problematic since the two pertain to different points in time.

Liquidity Finally, liquidity is easily measured using the bid/offer spread on the derivatives market, which can be observed at any point in time. However, in order to make comparisons against the spot market, we need to measure the effective purchase price and sale price that would prevail on the spot market for a transaction which had the same size as one market lot on the derivatives market. The bid/offer

the NSE trading computer for the derivatives market, then erroneous values are obtained in measuring returns on arbitrage. It is easy for both NSE and BSE to utilise the *Network Time Protocol* (NTP) in order to have highly accurate timekeeping.

spread seen on the spot market (which pertains to transactions of size 1 share) is highly non-comparable as compared with the bid/offer spread seen on the derivatives market (which pertains to transactions of roughly Rs.200,000).

Once again, we need synchronous information for both spot and derivatives market in order to make sound comparisons. Liquidity fluctuates from moment to moment, and if the limit order book on the spot market at 2 PM is compared against the state of the derivatives market at 3 PM, then this will be an inaccurate comparison.

The measurement problems on liquidity are acute, owing to NSE's release of limit order book snapshots on the spot market only, at four timepoints a day only. At present, NSE releases no information about liquidity on the derivatives market.

Whether we are measuring rates of return, or implied volatility, or liquidity, there is little use for the 'last traded price' (LTP) in realtime, or the 'official closing price' released at the end of day. The data resources required are the intra-day series of time-stamped bid/offer, and the intra-day time-series of the limit order book.

In measurement, there can be a role for averaging. For example, it is useful and meaningful to compute the average of the implied volatility across a day. Similarly, it is useful to compute the average rate of return available in cash and carry arbitrage. This can be interpreted as an estimator of the average returns available to an arbitrageur. However, owing to nonlinearities of transformation, it is important to not utilise *average prices* in such calculations. For example, if a futures contract has T years till expiration, and if we observe prices (S_1, F_1) at time t_1, and prices (S_2, F_2) at time t_2:

$$\frac{\left(\frac{F_1}{S_1}\right)^{\frac{1}{T}} + \left(\frac{F_2}{S_2}\right)^{\frac{1}{T}}}{2} \neq \left(\frac{F_1 + F_2}{S_1 + S_2}\right)^{\frac{1}{T}}$$

The expression on the left hand side is the average return across the two timepoints. The expression on the right hand side is erroneous and lacks a clear interpretation.

Similarly, the average of implied volatilities over the last 30 minutes of trading (which could be useful in some situations) is not the implied volatility computed using the average price over the last 30 minutes (which

should never be used). Hence, if averaging is desired, it is important to use intra-day time-stamped data to first correctly compute a time-series of implied volatility, and then do averaging.

It is only in the case of turnover that measurement is relatively straightforward. Turnover over a day, or over any set of minutes, can (in principle) be easily measured and compared. Here the only problem faced is transparency of the exchange. NSE releases information for intra-day turnover on the spot market, but not for the derivatives market.

India's equity derivatives market is fundamentally based on a transparent market design – an anonymous electronic limit order book. At a conceptual level, this offers the best opportunities for sound measurement. As a contrast, if there was an OTC government bond market and an OTC interest rate forward market, then it would be infeasible, even in principle, to accurately measure the returns in arbitrage. The basic opportunity is there, for the equity derivatives market to do better.

However, weaknesses on disclosure at NSE prevent us from harnessing the full benefits of the innate transparency of the electronic limit order book market. A limit order book market where information is not released shares some important characteristics with an OTC market. The lack of transparency at NSE in terms of release of information is an important weak link in the market design that is now prevalent. This paper often resorts to complex imputation based on various third party information sources.

2 Pricing

2.1 Cost of carry on futures market

In the ideal efficient market, transactions costs should be zero, and there should be a generous supply of sophisticated arbitrageurs. This should yield a cost of carry on the futures market which exactly reflects the zero coupon yield curve for government bonds, with a slight risk premium to reflect the failure probability of the clearing corporation.

Table 1.1 shows the cost of carry across multiple futures contracts at 3 PM on one day - 9 December 2002. This table does not appear to have come out of a highly competitive market where many arbitrageurs are active. In an efficient market, all the rates of return should be very similar to each other, however we see that is not the same, with rates of return rang-

Table 1.1 Variation of cost of carry across futures contracts

This table shows annualised rates of return, calculated using (bid+offer)/2, on the spot versus the futures market at 3 PM on 9th December, 2002. If either bid or offer was unobserved, the cost of carry is missing and designated as "."

Underlying	Cost of carry	
	1-month	2-month
BHEL	2.22	.
HINDALCO	3.82	.
DRREDDY	5.27	.
NIFTY	9.71	.
DIGITALEQP	10.41	15.58
STROPTICAL	12.43	.
HINDLEVER	12.54	3.63
RANBAXY	13.00	.
INFOSYSTCH	13.64	10.53
ITC	13.69	.
GRASIM	14.09	.
ACC	14.53	.
BPCL	14.71	22.45
SATYAMCOMP	15.53	.
TISCO	16.55	11.04
L&T	17.00	.
TATATEA	18.38	.
SBIN	18.85	.
HINDPETRO	19.70	13.72
BSES	20.53	.
RELIANCE	21.85	10.67
TELCO	22.52	16.16
VSNL	22.76	.
TATAPOWER	23.39	35.96
MTNL	25.50	.
GUJAMBCEM	23.57	.
M&M	25.96	18.28
BAJAJAUTO	.	.
CIPLA	.	.
HDFC	.	.

ing between 2.22 percent and 35.96 percent. In an efficient market, all the rates of return should be close to those found at the short end of the zero coupon yield curve, however this is clearly not satisfied.

In summary, this table conveys a picture of a market without pricing relationships that are, as yet, determined by arbitrage. This suggests that there are good opportunities in establishing equity derivatives arbitrage activities.

2.2 Implied volatility

In an efficient market, the implied volatility seen in the options market should be the best predictor of future volatility. Generally, at the money options have the highest vega, and are hence used as the most sensitive indicators of implied volatility.

Turning to the implied volatilities themselves, the index is expected to have low implied volatility as compared with individual stocks, since it is a diversified portfolio. The implied volatility of Nifty proves to be the lowest in Table 1.2, at 17.8 percent annualised. Apart from this, individual stock implied volatilities have a very wide range, from 22 percent to 92 percent annualised.

There are fairly substantial differences between the implied volatility of call and put options. This may be associated with violations of put-call parity, and consequential arbitrage opportunities. One puzzling feature in this table is the fact that put prices appear to be non-observed with a greater probability.

Option implied volatilities vary considerably, intra-day. In a rational world, the market's implied volatility should reflect a good forecast of the "average" volatility expected from trade date till expiration date.

Figure 1.1 shows the time-series of implied volatility on the two most traded underlyings – Satyam Computer and Nifty – on 9 December 2002. The upper curve in the graph is obviously that for Satyam, and the lower one is for Nifty. This graph plots the implied volatility associated with *the price observed on every trade for ATM call or put options*.[4]

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[4] The gap in the time-series is a blemish in our data for the evolution of the spot and derivatives market on NSE for 9 December 2002, which was obtained from Indian Quotation Systems since it was not available from NSE.

Table 1.2 Variation of implied volatility across underlyings

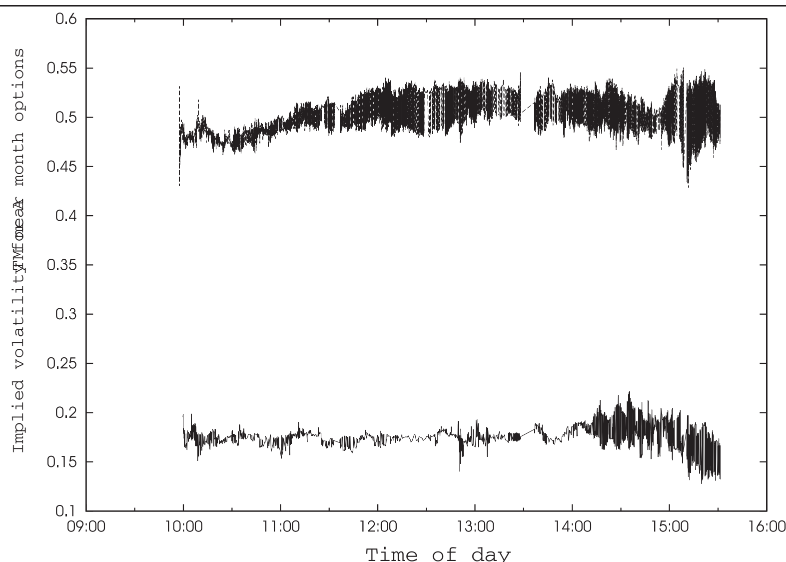
These are calculated using (bid+offer)/2 available at 3 PM for near–month ATM contracts on Nifty and the stock options on 9th December, 2002.

Underlying	Call	Put
NIFTY	0.1876	0.1759
GUJAMBCEM	0.2978	.
ITC	0.3188	.
DRREDDY	0.3235	.
BHEL	0.3298	.
SBIN	0.3475	0.3051
RANBAXY	0.3789	.
TATAPOWER	0.3792	0.3931
HINDLEVER	0.3800	0.2953
INFOSYSTCH	0.3985	0.3787
TISCO	0.4300	0.3586
L&T	0.4380	0.3206
RELIANCE	0.4644	0.3846
ACC	0.4861	.
TATATEA	0.4894	.
DIGITALEQP	0.5156	0.5050
SATYAMCOMP	0.5231	0.4866
TELCO	0.5330	0.4329
M&M	0.5876	0.4610
MTNL	0.6019	0.5349
VSNL	0.6287	.
BPCL	0.7665	0.7012
STROPTICAL	0.8090	0.7435
HINDPETRO	0.9180	0.8617

The range of values seen in this graph, even at a single point in time, reflect (a) the bid/offer spread on both call and put option markets, i.e. the "bid ask bounce", and (b) the lack of put-call parity arbitrage, through which call and put options do not trade at identical implied volatilities. A casual perusal of the graph seems to suggest that there is a good deal of potential for intra-day trading on the options market.

The derivatives market is producing *new* information in the Indian economy, by making available these market-based volatility forecasts (Bodie & Merton 1995). As option liquidity builds up, we will be able to obtain a *term structure of volatility*, showing market forecasts of volatility between

Figure 1.1 Intra-day evolution of implied volatility (9 December 2002)



the trading day and various different expiration dates. Such interpretations, and uses of implied volatility, will be much more justifiable after put-call parity is established by arbitrageurs, whereby put and call options will show near-identical implied volatilities.

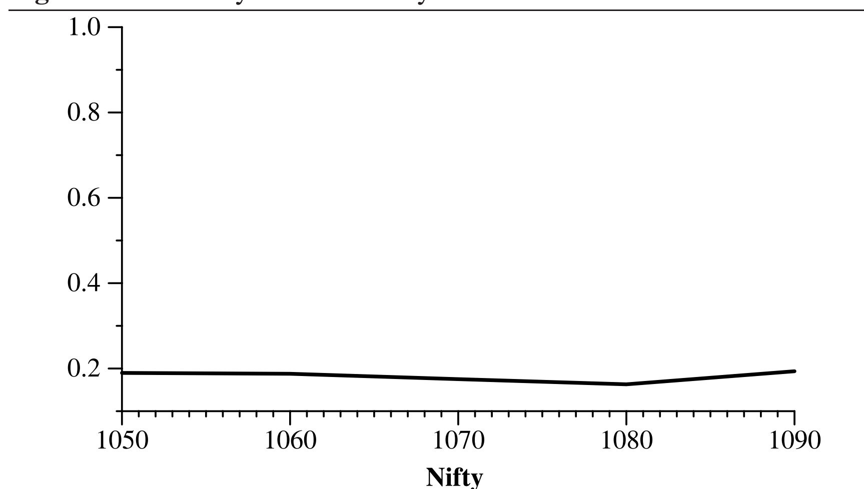
2.3 Volatility smile

In an ideal Black/Scholes world, the market should use a single implied volatility in pricing options for a given maturity, with various different strikes. However, in the real world, the phenomenon of 'the volatility smile' has been repeatedly observed. This is depicted pictorially in a graph where option strikes are placed on the x axis, and implied volatilities are placed on the y axis. This figure often looks like "a smile", with higher implied volatilities for strikes which are far away from the spot price. The smile is generally interpreted as evidence that the simple Black/Scholes model does not fully capture the behaviour of the market.

Figure 1.2 shows a typical smile diagram for Nifty, and Figure 1.3 shows the diagram for a few stocks. We do see significant variation of the implied volatility depending on the strike price. However, there is no simple 'smile' pattern. It is striking to see a greater flatness of the smile

when the bid/offer spread is tight, i.e. when there is greater liquidity. There may be an underlying phenomenon where higher implied volatilities and higher bid/offer spreads are both reflecting underlying uncertainty in the market.

Figure 1.2 Volatility smile for Nifty at 3 PM on 9th December 2002



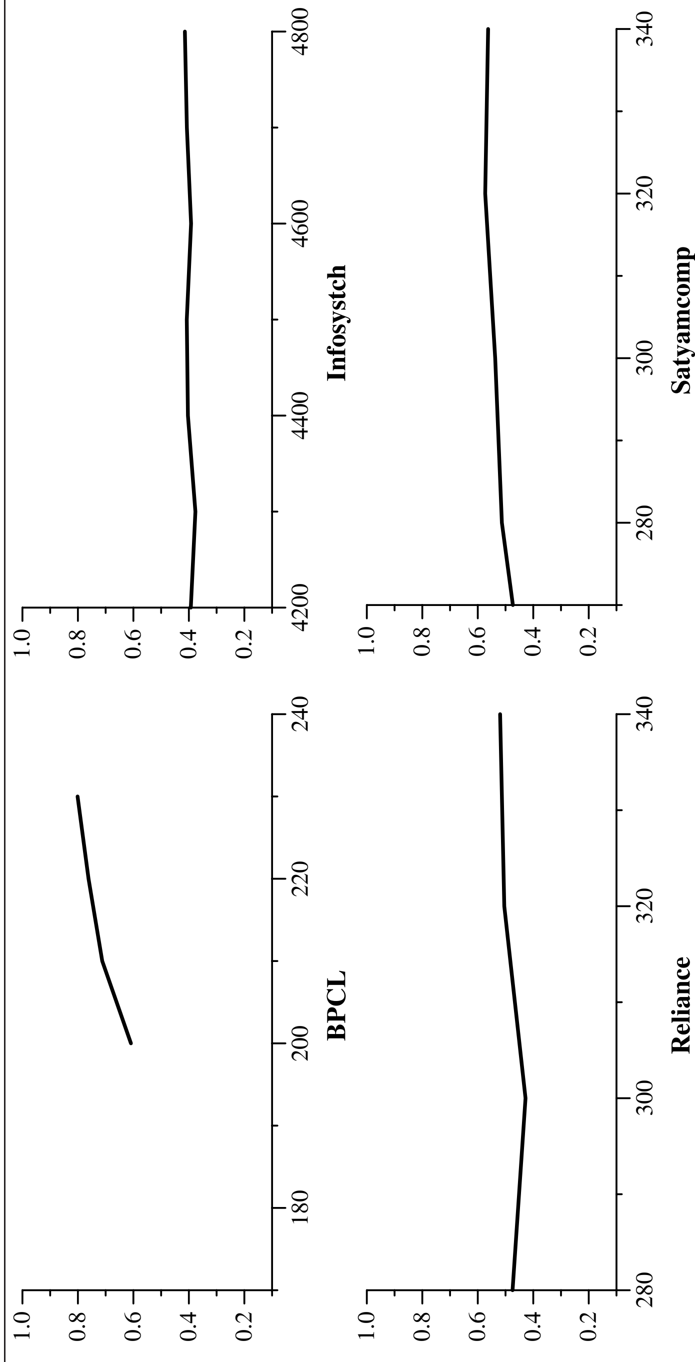
3 Liquidity

The term 'liquidity' pertains to transactions costs. A more liquid market is one in which large transactions can be undertaken while suffering low transactions costs. One element of liquidity is easily observed on the electronic limit order book market: this is the 'impact cost' suffered when placing market orders. In the case of the derivatives market, since all contracts have a transaction size of roughly Rs.200,000 rupees, a casual perusal of the bid/offer spread is useful, and full-fledged analysis of the order book is not essential in obtaining comparability.

3.1 Comparing liquidity on futures versus options

Table 1.3 shows the bid/offer spread for futures and for ATM options. The Nifty futures stand out as the most liquid futures in the country, with a bid/offer spread which is less than half that of the most liquid individual

Figure 1.3 Volatility smiles for four underlyings at 3 PM on 9th December 2002



stock futures (L&T and Satyam). This is consistent with the international experience, where 'macro-economic' underlyings, such as Nifty, have less asymmetric information and hence better liquidity.

Table 1.3 Bid-offer spreads (in percent) at 3 PM on 9 December 2002

Security	Futures	Options	
		Call	Put
NIFTY	0.0184	8.8772	11.4286
L&T	0.0492	8.5938	20.0758
SATYAMCOMP	0.0570	0.4926	0.4988
SBIN	0.0728	5.0000	23.4200
RELIANCE	0.0866	4.3894	11.5942
TELCO	0.0956	8.1672	8.9552
RANBAXY	0.1198	29.5454	.
TISCO	0.1420	8.9552	19.1964
ITC	0.1508	9.8766	.
TATATEA	0.1706	12.0730	.
INFOSYSTCH	0.2142	8.3590	2.5766
STROPTICAL	0.2320	9.1604	24.6268
TATAPOWER	0.2410	15.9898	26.9230
M&M	0.3718	5.7786	11.7648
DIGITALEQP	0.1046	10.3756	12.9032
HINDLEVER	0.1124	8.2902	11.4630
ACC	0.1596	13.3334	7.6924
BHEL	0.2104	17.3914	.
BPCL	0.2316	5.7142	8.6124
DRREDDY	0.2966	20.1860	.
CIPLA	0.2976	48.4848	.
BAJAJAUTO	0.3130	.	.
GRASIM	0.3216	.	.
BSES	0.3744	.	.
VSNL	0.3802	21.5384	11.1112
HINDALCO	0.5934	.	.
HINDPETRO	0.4618	6.8050	5.1470
MTNL	0.5610	4.8780	31.9328
GUJAMBCEM	0.7132	15.6862	.
HDFC	.	.	.

We see a striking difference where spreads on the futures market are much finer. However, options are sufficiently different from futures, and direct comparisons of the spread on the two markets should be viewed with caution.

As a first approximation, this table suggests that call options are more liquid than put options.

3.2 Dropoff in futures liquidity by maturity

Table 1.4 shows the extent to which the bid/offer spread on the futures market gets worse for various underlyings, when we compare the two-month and three-month contract against the near month contract. For example, in the case of Nifty, the 2nd month has a bid/offer spread which is 6.16 times larger than the spread of the near month, and the far month has a spread which is 22.95 times larger than the spread of the near month.

This shows a very dramatic dropoff of liquidity, suggesting that futures liquidity is as yet confined to the near month. In 9 of the 29 underlyings, the three-month contract does not have a spread.

3.3 Variation in liquidity by option strike

Figure 1.4 shows the variation of the bid/offer spread in Nifty options, by strike. We see that the tightest spreads are found for ATM options, and spreads diverge considerably (by a factor of more than five times) when we get to options with strike prices away from the spot price.

Figure 1.4 Variation in spread across strikes for Nifty on 9th December 2002

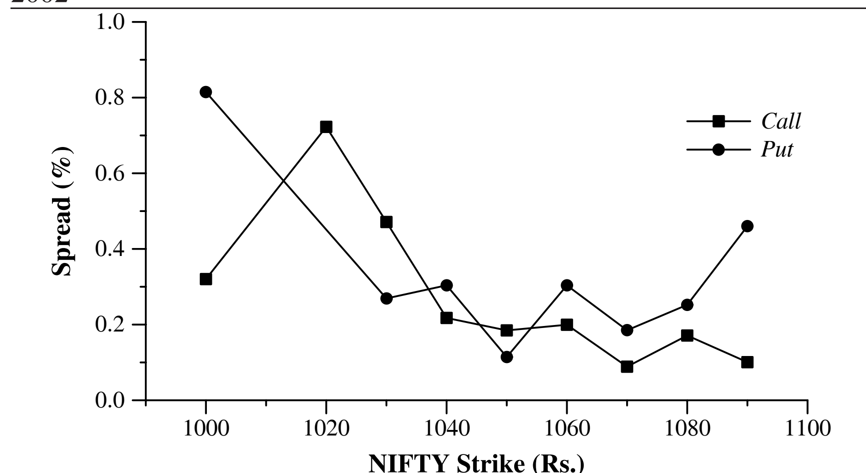
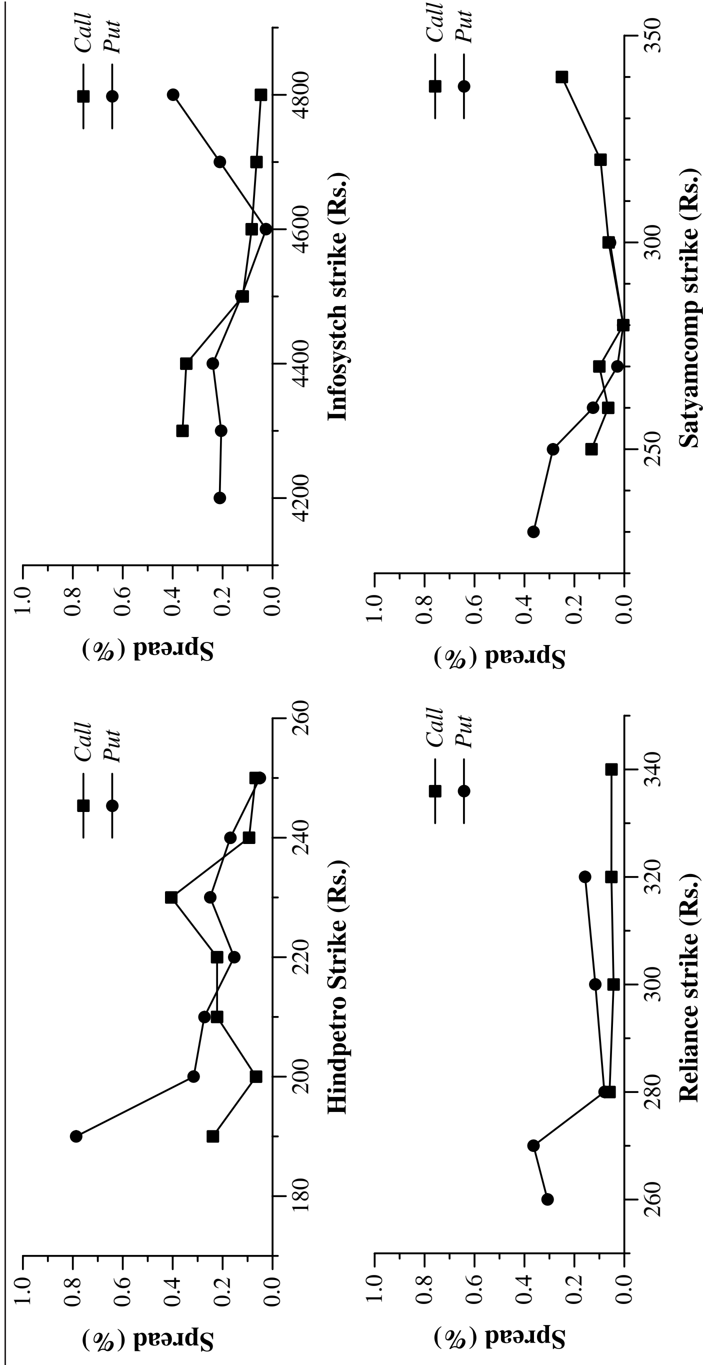


Table 1.4 Ratio of the spreads at two-month and three-month to the near-month at 3 PM on 9th December 2002

Underlying	Two-month	Three-month
HDFC	1.05	2.71
TATAPOWER	2.71	.
VSNL	2.99	.
HINDLEVER	3.06	13.79
TISCO	3.18	133.70
DRREDDY	3.97	42.23
M&M	4.04	54.62
CIPLA	4.12	8.00
RELIANCE	4.62	45.61
TELCO	4.63	78.55
BHEL	4.82	.
STROPTICAL	4.91	.
NIFTY	6.16	22.95
L&T	6.37	62.86
HINDALCO	6.37	27.78
INFOSYSTCH	6.76	106.71
BPCL	6.95	76.25
TATATEA	7.03	29.39
ACC	7.58	.
GUJAMBCEM	7.58	.
HINDPETRO	8.18	112.52
SATYAMCOMP	9.02	.
SBIN	9.53	.
BAJAJAUTO	11.47	61.5689
MTNL	12.0	.
ITC	16.26	65.53
BSES	16.48	34.40
GRASIM	16.91	83.84
DIGITALEQP	25.02	154.27
RANBAXY	39.44	138.74

Similar patterns are found in Figure 1.5, which deals with this same graph for four individual stocks as underlyings. Individual stock options appear to command liquidity for a smaller range of strikes when compared with Nifty.

Figure 1.5 Variation in spread across strikes for the top most traded underlyings on 9th December 2002



4 Turnover

While turnover has been often confused with liquidity, the two are highly distinct concepts. Liquidity pertains to transactions costs faced in trading. Turnover is important from the viewpoint of the revenue models of securities firms, since the tariff structure used in the securities markets are generally proportional to the number of trades or the rupee trading volume.

Table 1.5 summarises the experience with turnover in December 2002. The aggregate turnover for December 2002 was Rs.55,620 crore, which works out to an average of Rs.2649 crore per day over the 21 trading days in December 2002.

Table 1.5 Structure of turnover by product classes (December 2002)

This table summarises the turnover on the NSE equity derivatives market, as of December 2002. We see that 12.7 percent of the turnover was index derivatives; the remainder was individual stock derivatives. 74.6 percent of the turnover was futures, the remainder was options.

Category	Volume (Rs.crore)	Share in total (Percent)
Index futures	5,958	10.7
Index options	1,087	2.0
Stock futures	35,532	63.9
Stock options	13,043	23.4
Total	55,620	100.0

Of this, index derivatives accounted for 12.7 percent and stock futures accounted for 63.9 percent. However, this understates the importance of the index futures, since the individual stock derivatives constitute an aggregate of a large number of underlyings. We return to this question in Section 4.3.

Another aspect of this table is the turnover of futures versus options. The table shows that the total futures volume was 74.6 percent of the total market. This suggests that a great deal of the human capital building, that has to happen for a vibrant options market, still lies ahead of us, and economic agents are still focusing on the relatively simple futures products.

4.1 Derivatives versus spot

Figure 1.6 shows the time-series of turnover on NSE's "CM" segment (where the equity spot is traded) versus NSE's "F&O" segment, where derivatives are traded. In early 2001, there was a sharp drop in turnover, in response to the episode of market misconduct which surfaced at the time. In the following period, the derivatives market has built up to turnover which is of the same order of magnitude as that of the spot market. The total equity turnover in India is now back to fairly high levels, since it constitutes the sum of spot and derivatives.

Figure 1.6 NSE spot versus NSE derivatives turnover

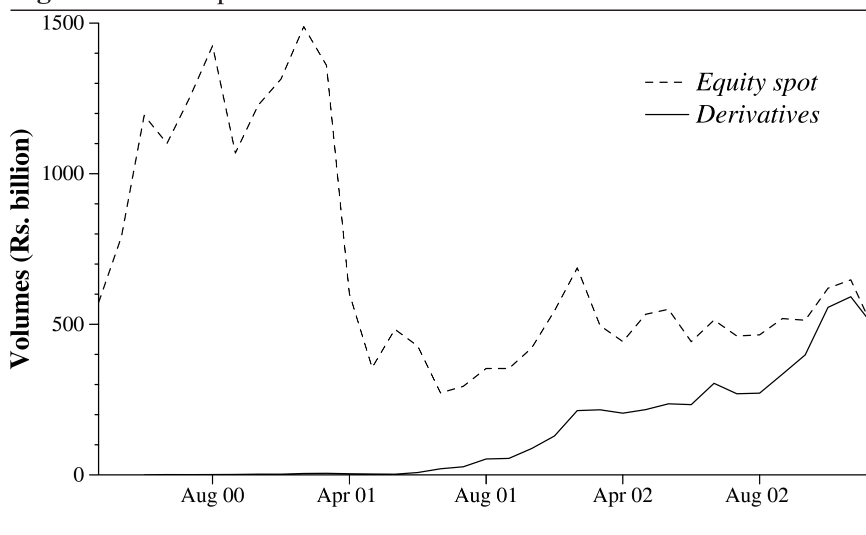


Table 1.6 shows this data in greater numerical detail, focusing on the ratio of F&O turnover to CM turnover (expressed in percent). We see this ratio steadily growing from 0.029 percent in June 2000 to 102 percent in February 2003. This suggests that the equity derivatives market took roughly two years for 'takeoff', starting from its inception.

4.2 NSE and BSE

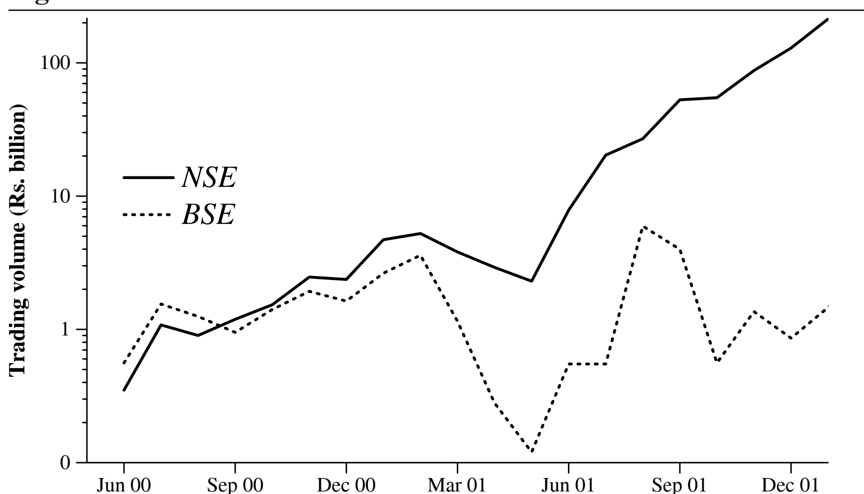
Figure 1.7 shows the time-series of NSE and BSE turnover. This graph is in log scale. Straight line segments in such graphs correspond to periods

Table 1.6 NSE derivatives turnover, as percent of NSE spot turnover

Month	F&O/CM	Month	F&O/CM	Month	F&O/CM
		Apr ’01	0.8198	Apr ’02	40.6489
		May ’01	0.4759	May ’02	42.9255
Jun ’00	0.0293	Jun ’01	1.8348	Jun ’02	52.7384
Jul ’00	0.0981	Jul ’01	7.4592	Jul ’02	59.1599
Aug ’00	0.0718	Aug ’01	9.1648	Aug ’02	58.4174
Sep ’00	0.0835	Sep ’01	14.9506	Sep ’02	58.3668
Oct ’00	0.1432	Oct ’01	15.5042	Oct ’02	64.4310
Nov ’00	0.2013	Nov ’01	20.7918	Nov ’02	77.5763
Dec ’00	0.1803	Dec ’01	23.7185	Dec ’02	89.7488
Jan ’01	0.3165	Jan ’02	31.0656	Jan ’03	91.3329
Feb ’01	0.3855	Feb ’02	43.6123	Feb ’03	102.2900
Mar ’01	0.6326	Mar ’02	46.2925		

of constant percentage compound growth rate. This suggests that NSE has had a phase of meteoric and steady growth from May 2001 onwards.

Figure 1.7 Derivatives markets volumes at NSE and BSE



As has taken place with competing derivatives markets elsewhere in the world, there was substantial competition in the early days of the market. However, once NSE obtained some critical mass, BSE turnover substantially faded away. Today NSE has become the clearly dominant market trading equity derivatives in India.

4.3 Most active underlyings

One of the puzzles in India's experience with equity derivatives has been the domination of individual stock derivatives. Table 1.7 shows the top five underlyings, based on turnover data for December 2002. Nifty appeared at rank 3 for futures and rank 4 for options.

Table 1.7 Top five underlyings by turnover for December 2002

No.	Futures	Rs.billion	Options	Rs.billion
1	Satyamcomp	8256.13	Satyamcomp	3450.60
2	Infosystch	6726.05	Infosystch	2077.33
3	**Nifty**	5958.00	Hindpetro	1717.78
4	Reliance	3336.35	**Nifty**	1087.00
5	Hindpetro	3296.70	Reliance	979.29

This partly reflects a problem with human capital, where the thought processes of speculation and market making on individual stocks, which have prevailed for many decades, were carried forward into the equity derivatives market from 2001 onwards. In contrast, trading in index derivatives requires new kinds of *thinking*.

As experience with derivatives trading grows, we may expect a greater shift away from individual stocks to index derivatives. In addition, the importance of index volatility is greater when faced with situations like the budget announcement, or the gulf war, as opposed to months where macroeconomic news appears to be unimportant.

Some of this is visible in Table 1.8, which pertains to February 2003, where Nifty appears as the largest turnover on the futures market, which reflects the emphasis upon 'macroeconomic' views in the pre-budget period. A similar phenomenon was observed in the context of the Iraq war also, where Nifty came to dominate as the largest single underlying.

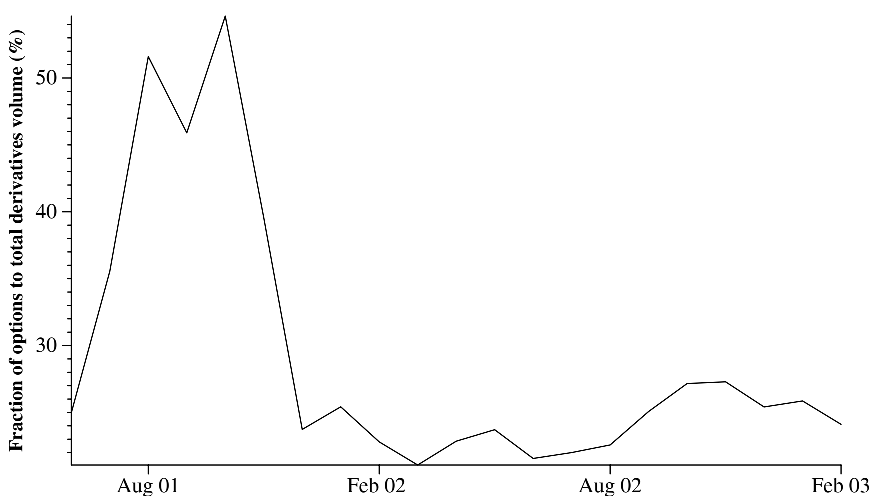
Table 1.8 Top five underlyings by turnover for February 2003

No.	Futures	Rs.billion	Options	Rs.billion
1	**Nifty**	5040.00	Satyamcomp	2218.69
2	Satyamcomp	5023.95	Infosystch	1541.57
3	Infosystch	4925.44	StateBank	1491.08
4	StateBank	3684.64	HindPetro	1202.99
5	Reliance	2391.84	**Nifty**	946.00

4.4 Activity on options market

Figure 1.8 shows the fraction of overall derivatives turnover which is made up by options. This fraction spiked in the early months of options trading, since individual stock derivatives were initially only available in the form of options on individual stocks. Once futures trading commenced on individual stocks, the fraction of options turnover dropped to levels of around 25 percent.

Figure 1.8 Fraction of turnover which is options



Looking forward, it is expected that as the market develops sophisticated human capital and IT systems, the fraction accounted for by options will rise substantially.

5 Intermediation

A nationwide network of brokerage firms is a key element of a successful derivatives market. These firms play a vital role in terms of giving direct market access to firms and individuals located across the country, by doing credit risk management about the failure of customers, and by performing knowledge functions in terms of training, technical support and consulting. This network of firms has been a key element in the nationwide outreach of

the modern securities industry, as opposed to the traditional south Bombay focus which prevailed prior to 1994.

5.1 Geographical distribution

Table 1.9 shows the distribution of equity spot and derivatives turnover by various urban centres, as of November 2002. This shows that equity derivatives trading is more concentrated in the top ten urban centres, when compared with the equity spot market. Turnover from outside the top 10 centres amounts to 13.5 percent for the equity spot, but only 5.2 percent for equity derivatives.

Table 1.9 Share of cities in NSE turnover (November 2002)

This table shows the fraction of overall NSE turnover, for equity spot and equity derivatives, that is accounted for by the top ten urban centres. The sorting order is based on the share in equity spot turnover.
These ten urban centres account for 86.5 percent of equity spot turnover, and 94.8 percent of equity derivatives turnover.

Rank	City	Share in NSE turnover	
		Spot	Derivatives
1.	Bombay	42.1	48.9
2.	Delhi	17.9	22.5
3.	Calcutta	12.1	14.3
4.	Madras	3.6	1.9
5.	Hyderabad	3.2	2.0
6.	Bangalore	2.3	0.6
7.	Ahmedabad	2.0	1.7
8.	Jaipur	1.3	0.3
9.	Cochin	1.0	1.6
10.	Chandigarh	1.0	1.0
	Remainder	13.5	5.2
	Total	100.0	100.0

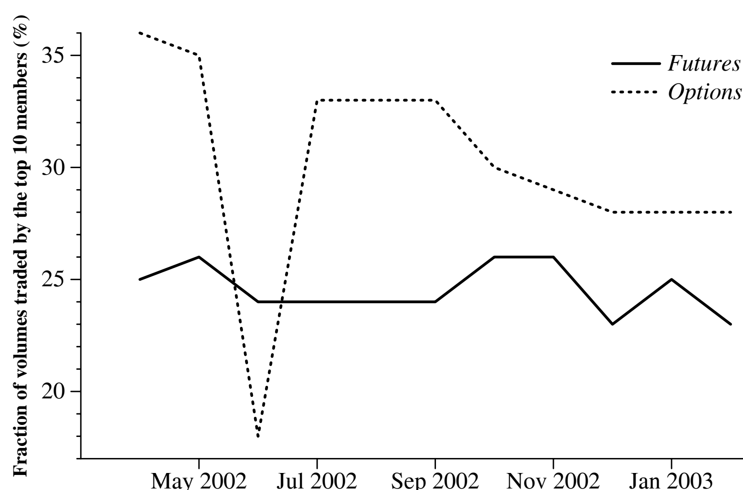
This difference is likely to be largely owing to gaps in knowledge on the part of employees of brokerage firms, and their customers, in locations outside the major urban centres. Conversely, this suggests that when locations outside the top ten centres are fully energised, it would add around 10 percent to overall market turnover.

5.2 Member concentration

In recent months, there has been a great deal of concern about the sharp concentration of derivatives market turnover and positions amongst a very small set of brokerage firms.

Figure 1.9 and Figure 1.10 address these issues. The former focuses on the number of members who have monthly turnover above Rs.5 crore. This is a rough definition of "brokerage firms with significant turnover." This number has come down from the region of 55 (in April 2002) to the region of 30 (in February 2003). This narrow set of 'nontrivial' brokerage firms is an important weakness of this market.

Figure 1.9 Fraction of F&O volumes captured by the top 10 trading members



At the same time, the fraction of turnover accounted for by the top ten members has dropped slightly: from 25 percent to 23 percent for futures, and from 36 percent to 28 percent for options. This suggests that small brokerage firms, i.e. firms with below Rs.5 crore of turnover in a month, have a growing role on the market. The top ten members are more important in the case of options, which perhaps reflects the greater demands upon human capital and IT systems for the options market, as opposed to futures trading where the human capital of the preceding years was more directly usable.

Figure 1.10 Number of members with monthly trading volumes greater than Rs.50 million

When the derivatives market was young, many brokerage firms made a business decision that this market was unlikely to succeed. This gave enormous success to the brokerage firms who were equipped with the vision to anticipate the success of this market, and invest in human capital and information technology. It is perhaps to be expected that these pioneering firms will at first have dominant market share. Over time, as other brokerage firms start building derivatives activities, it is expected that these numbers will be substantially transformed.

5.3 Human capital

From July 1998 onwards, the 'Derivatives Core Module' certification test, under the aegis of NCFM, has been in operation. This certification has been made mandatory by SEBI for the employees of brokerage firms who trade on the screen.

From July 1998 to November 2002, 12,497 tests took place, of which 8,145 certifications were awarded. Hence, we may say that there are roughly 8,000 modestly skilled individuals, who make up the supply side of this labour market. On a flow basis, the pass rate in November 2002 was 48 percent.

6 IT sophistication

The current state of the art on data access is extremely weak. NSE releases end-of-day data. There is currently no release of historical databases of intra-day information. This has effectively blocked research in academics and in industry on the subject of the equity derivatives market. As an example, the most important hurdle in writing this paper was non-transparency at NSE in terms of release of data.

The most important IT systems in the derivatives area would need to 'close the loop' by consuming feeds in realtime, taking decisions based on predefined rules and trading algorithms, and placing orders back on the market. Securities firms seeking to build such systems face the hurdles of taking permission from NSE, and paying substantial fees for this purpose. Similarly, software companies are not free to build products of this nature without first taking permission from NSE and paying substantial fees to NSE.

The lack of release of historical databases, and hurdles in the way of building sophisticated IT systems, are important impediments in the way of a more sophisticated equity derivatives market.

7 Conclusion

In this chapter, we have tried to convey the 'state of the art' in India's equity derivatives market, in a variety of aspects. India is one of the most successful developing countries in terms of a vibrant market for exchange-traded derivatives. This episode reiterates the strengths of the modern development of India's securities markets, which are based on the principles of nationwide market access, anonymous electronic trading, and a predominantly retail market.

Looking forward, one major question concerns institutional participation on the equity derivatives market. As with most of the financial sector innovations of the last decade, individuals have displayed intellectual capacity and a speed of exploiting new ideas which has just not been found with employees of large finance companies. Internationally, banks and mutual funds are major players on the equity derivatives market. In India, owing to a variety of regulatory and governance problems, this has just

not materialised. In December 2002, 0.77 percent of the NSE derivatives turnover came from institutional users.

SEBI's rules governing mutual funds have eased most of the legitimate difficulties of mutual funds in terms of regulatory restrictions. Rules governing FIIs, and insurance companies, have been partly eased. Banks currently continue to face stringent regulatory hurdles. As these players start utilising the equity derivatives market, we could see an enormous increase in liquidity.

The second key facet where the equity derivatives market has as yet not made substantial progress is the large-scale utilisation of IT systems in trading, arbitrage, market making, etc. When a few dozen underlyings generate thousands of derivative securities, it is essential to have computer systems primarily driving the actual implementation of trading strategies. The exchanges need to do more in terms of transparency, in terms of release of high quality historical databases, and release of documents required for building derivatives IT systems. When these systems fall into place, they will have a profound impact upon the nature of pricing and liquidity on this market.

References

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