

Trading Opportunities in the Singapore Exchange: CNX Nifty (India) Index Futures

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Abstract

This paper examines the intraday market depth, bid-ask spread and price volatility of the CNX Nifty (India) Index Futures that is traded in the Singapore Exchange (SGX). Given the significant growth in trading volume of this derivative since Oct 2007, it is of interest to evaluate the existence of potentially profitable intraday trading opportunities for high frequency traders. Using intraday data from the 1st Oct 2007 to 29th May 2008, we segregate the concurrent opening hours of the futures market and the underlying stock market (1230 to 1800, Singapore time) into 22 *fifteen* minutes time to analyse which time blocks provide possibly the best trading period for these market participants. On an intraday basis, we find that price volatility and trading are most active around the opening and closing periods. Liquidity and bid-ask spreads are observed to be the most attractive near the closing time intervals. Time series analysis also shows that over the sample period, the average bid-ask spreads have decreased significantly by 81.6% and market depth have increased substantially.

1. Introduction

Since Oct 2007, the CNX Nifty (India) Index Futures (Nifty Index Futures) trading in the Singapore Exchange (SGX) have experienced significant growth in trading volume from approximately 113,000 contracts in Nov 2007 to excess of 990,000 contracts in May 2008³. This approximately 8.8 times increase in trading volume reflects strong interest from market participants and represent potential profitable opportunities for high frequency traders.

High frequency traders generally seek to exploit short term price movements and often depend on intraday price volatility for opportunities to make profits. They also require high levels of liquidity and low bid-ask spreads so that they can enter and exit the market at low cost. For this purpose, this paper examines the intraday patterns in price volatility, bid-ask spreads and market depth for the SGX Nifty Index Futures. The patterns described in this paper are relevant to assessing the magnitude of potential profits from trading on intraday price movements, as well as the cost of trading in exploiting such price movements. In this context, the findings provide important clues about when during the trading day the most profitable opportunities are likely to arise for intraday traders.

The analysis draws on intra-day trade and quote data provided by Reuters and made available through SIRCA that contains date, price, time, volume, contract code, best ask price, best bid price, depth at best ask and depth at best bid fields for each trade executed between 1st Oct 2007 and 29th May 2008⁴. For the purpose of this study, we focus on the *near* month expiry contract and analyse the time intervals from 1230 to 1800 as this is the peak trading period during which both the future markets and the underlying stock markets are simultaneously open. This time frame is then segregated into 22 *fifteen* minutes blocks for analytical purpose.

³ These statistics represents the total trading volume of SGX Nifty Index futures on a monthly basis. For the purpose of this study, only the near contracts are used and all negotiated large trades (NLTs) and the spread (roll) markets are excluded from all calculations. See Section 4 for more information.

⁴ Through a time series analysis, it is observed that increased trading interest in the SGX Nifty Index futures originate around Oct 2007. As there was a change in the contract specifications on the 19th November 2007, the contracts volumes prior to this date were multiplied by 5 for consistency purposes.

The remainder of the paper is set out as follow. Section 2, 3 and 4 describes the methodology used and presents the results for price volatility, bid-ask spreads and market depth, respectively. Section 5 provides further analysis on the observed trends and additional statistics on trading volume. The final section provides a conclusion on the findings.

2. Price Volatility

Price volatility is calculated on a *fifteen* minutes basis for the Nifty future contracts across the period of analysis. Two alternative measures of price volatility are examined. The first is the price range ($Range_t$) and the second is the absolute value of the price movement ($|Movement_t|$). Averages of these alternative measures of price volatility are taken for each *fifteen* minutes interval across trading days over the period of analysis.

Price range is calculated as,

$$Range_t = High_t - Low_t$$

where $High_t$ is the highest trade price during the half-hour interval t and Low_t is the lowest trade price during the same half-hour interval t .

Absolute value of the price movement is calculated as,

$$|Movement_t| = |Price_t - Price_{t-1}|$$

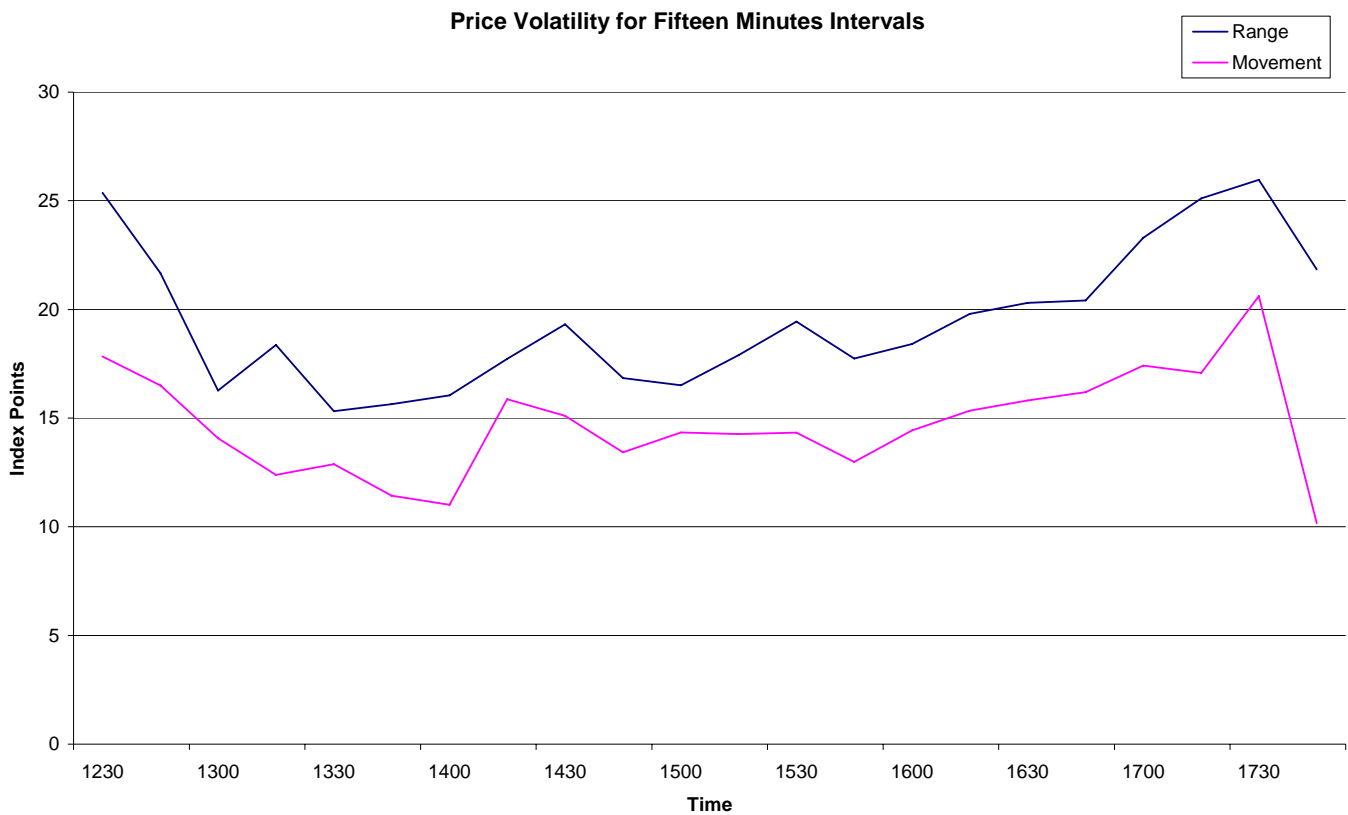
where $Price_t$ is the last trade price in the interval t .

The following interpretations can be made of the two measures of price volatility with respect to high frequency traders. The range measures the largest price movement which occurs in an interval and therefore represents the maximum total profit that could be earned in one round-trip trade within a *fifteen* interval (that is, if a trader had perfect foresight and bought at the lowest price and sold at the highest price during the interval). In contrast, the absolute value of the price movement measures the maximum total profit

that could be earned if an intraday trader was able to correctly predict the direction of the price movement over the half-hour interval (that is, by taking a long position at the start of the interval when they expect the price to rise and a short position at the start of the interval when they expect the price to fall).

The results of the analysis (for both range and movement) are presented in Figure 1. Results show that elevated levels of volatility occur during the opening period of 1230-1245 and near the closing period from 1700-1745. This suggests that the time intervals at the opening and near the close are potentially the most profitable times for traders seeking intraday opportunities.

Figure 1
Price Volatility for Fifteen Minutes Intervals
1st October 2007 – 29th May 2008



3. Bid-Ask Spread

High frequency traders require the immediacy to be able to rapidly enter and exit the market to exploit short-term price movements. Consequently, they often pay the bid-ask spread and execute market orders against available depth at the best quotes. We illustrate the intraday patterns in bid-ask spreads and depth for the SGX Nifty Index Futures to assess the implicit transaction costs likely to be incurred by intraday traders and the maximum sizes that can be traded without incurring additional market impact costs at different times throughout the trading day.

Consistent with the methodology of McNish and Wood (1992), we calculate the time-weighted average bid-ask spreads for each *fifteen* minutes interval. The time weighting is based on the number of minutes that a quotation is outstanding during the fifteen minute interval. The spreads estimated in this way for each fifteen minute block are averaged across days over the period of analysis.

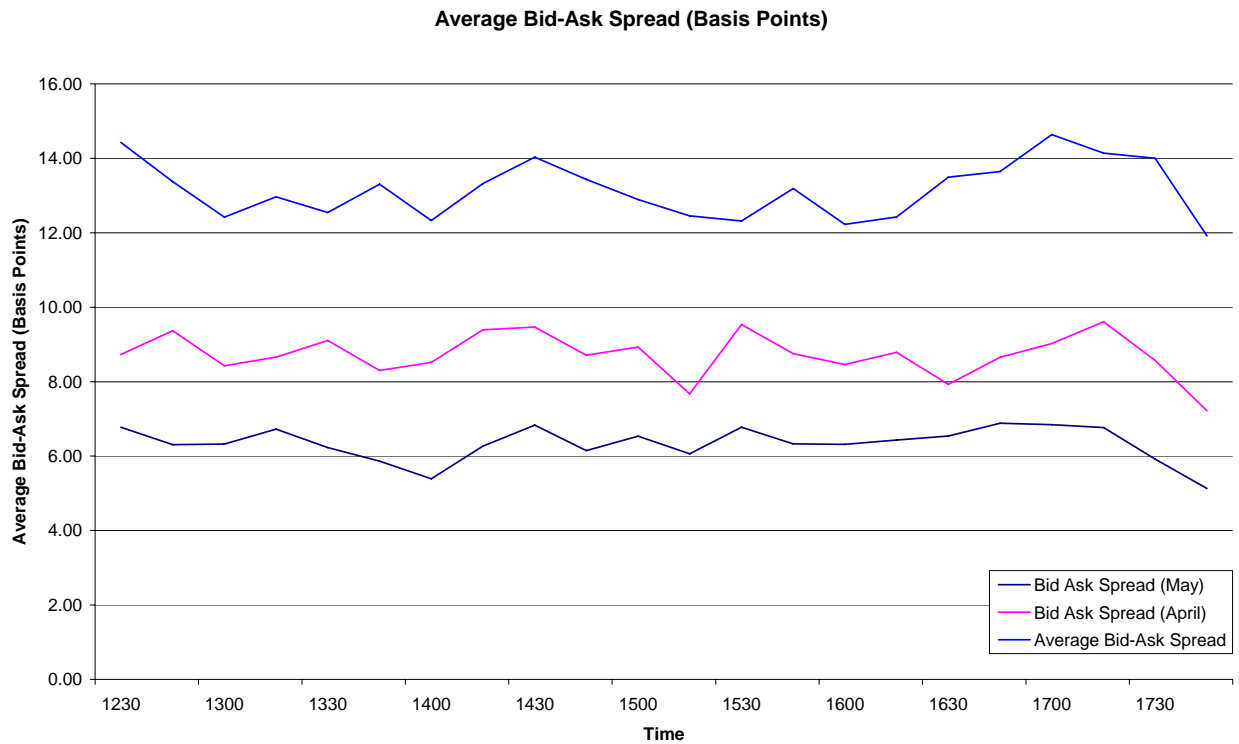
Specifically, bid-ask spreads are calculated as follows,

$$Spread_t = \frac{\sum_{i=1}^n BAS_i t_i}{\sum_{i=1}^n t_i}$$

where BAS_i is the quoted bid-ask spread in percentage, t_i is the length of time that spread i exists and n is the number of different bid-ask spreads outstanding during interval t .

The intraday patterns in bid-ask spreads for the latest two month⁵ and the average over the sample period are presented in Figure 2. Results show that the intraday bid-ask spread is relatively stable (hovering near the monthly average) throughout the day with the period nearest to closing (1745-1800) experiencing the lowest gap. More importantly, results suggest the existence of a substantial decline in the bid-ask spread over the past 8 months (see Figure 3 for more information).

Figure 2
Average Bid-Ask Spreads for Fifteen Minutes Intervals
1st October 2007 – 29th May 2008



⁵ Due to the high growth rate of SGX Nifty Index Futures, the average results are diluted by the higher bid-ask spreads incurred in the earlier months. To provide a more informative study, statistical data for the most recent two months are also included in the analysis. Further analysis (see Section 5) was also conducted to ensure the robustness of the results.

Figure 3
Average Bid-Ask Spread (Monthly)
1st October 2007 – 29th May 2008

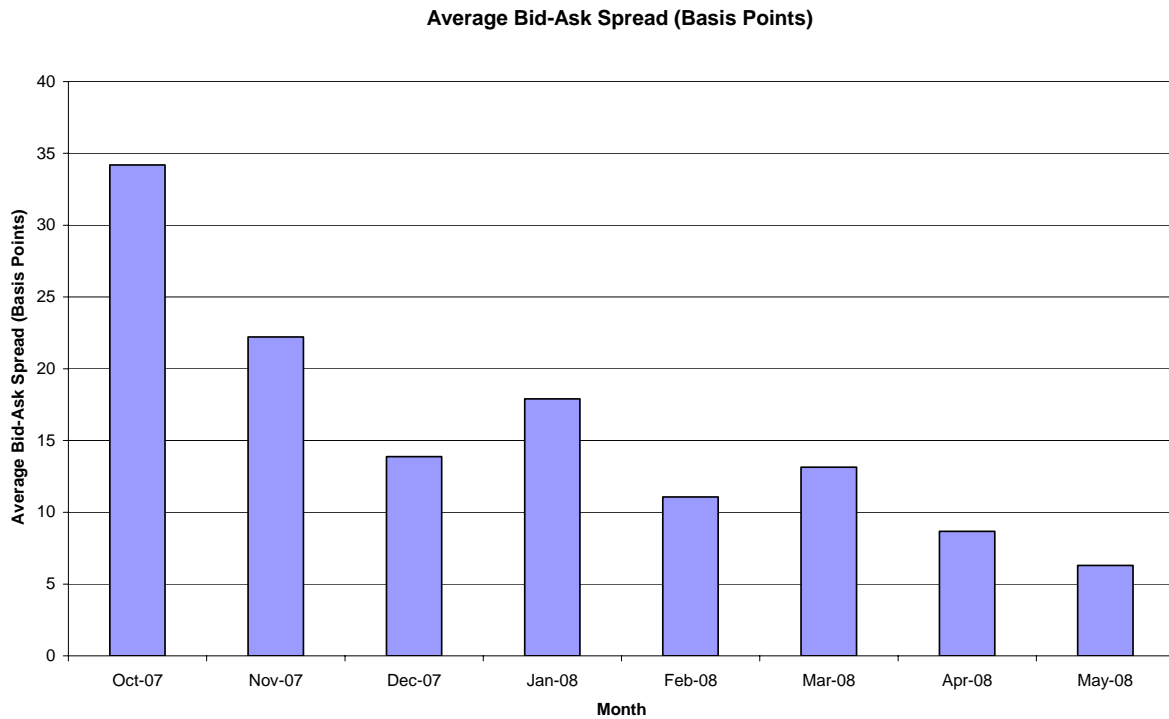


Figure 3 above illustrates the change in bid-ask spread over the study period. Results show that with the exception of January and March 2008 (where global markets have been most adversely affected by the credit crisis), there have been a steady and continuous decline in the spreads of the Nifty Index Futures traded in SGX. Overall, this represents a significant reduction in transaction costs of approximately 81.6% (since Oct 2007) which allows high frequency traders to more efficiently exploit price volatility.

4. Market Depth⁶

Market depth provides insights into the liquidity of a security, markets with higher quotes at the best prevailing levels provide intraday traders with the ability to enter and exit the market with minimum costs. Given that the SGX Nifty Index future is an emerging market, two alternative sets of market depth are examined to provide more information on the available depth of this derivative.

The first method (denoted MD₁) of computing the market depth of a stock involves the sum of the volume of shares on offer at the best bid and ask price immediately prior to a trade occurring. This provides an indication on the available depth at the best prevailing bid-ask quotes for intraday traders to execute against their orders. The second method (denoted MD₂) of calculation sums all bid and ask quotes on offer that does not exceed 0.25% of the best prevailing bid-ask quotes within a one minute interval. This methodology provides traders seeking immediate execution in the market with the average available depth when they are willing to incur a market impact cost of 0.25%.

Consistent with the methodologies in the previous sections, both market depth are calculated on a time-weighted basis for each *fifteen* minute interval and averaged across days over the period of analysis.

Depth is calculated as follows:

$$Depth_t = \frac{\sum_{i=1}^n Depth_i t_i}{\sum_{i=1}^n t_i}$$

where $Depth_i$ is the average of the number of lots quoted at the bid and ask, t_i is the length of time that depth i is available and n is the number of different size quotes outstanding during interval t .

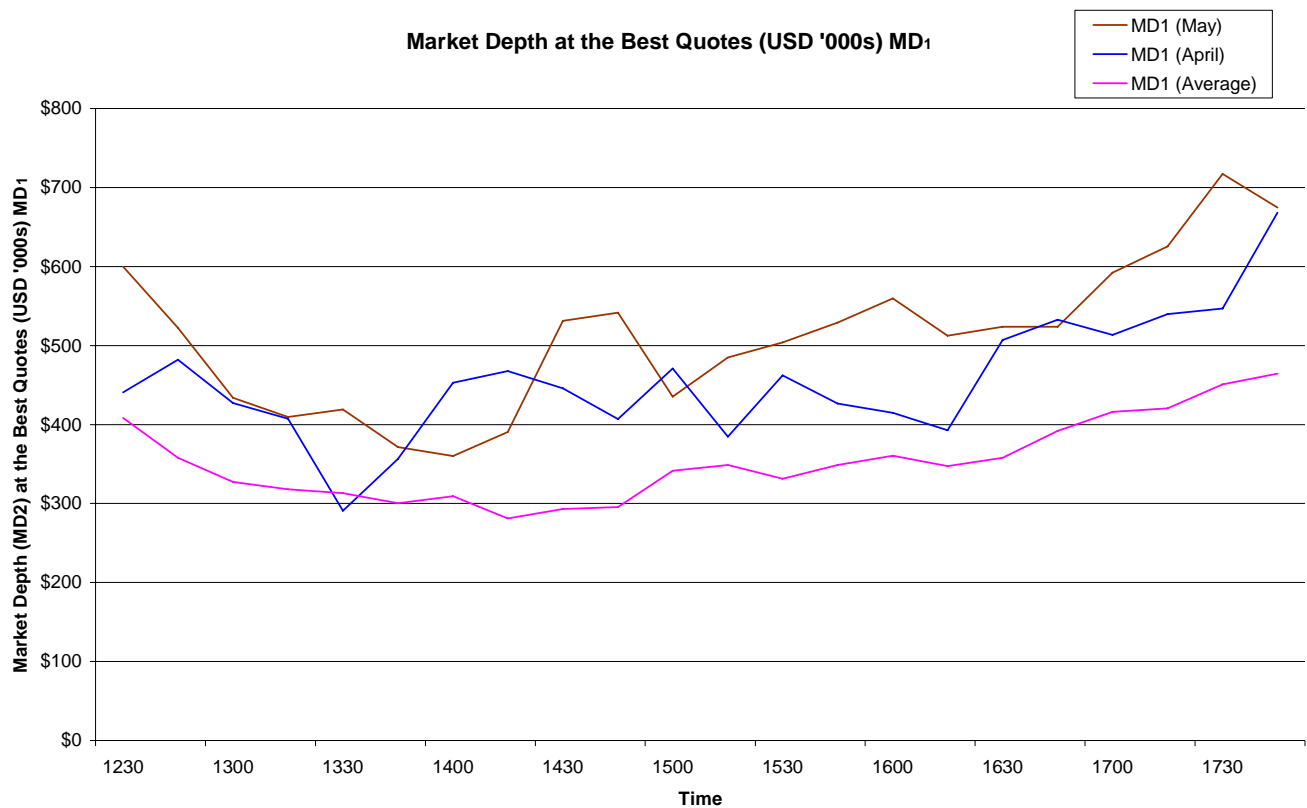
⁶ As previously highlighted in footnote 4, there was a change in the specifications of the SGX Nifty future contracts on the 19th November 2007. For consistency purposes, the contracts volumes at the bid and ask quotes prior to this date were multiplied by 5.

The intraday patterns in depth for the latest two month⁷ and the average over the sample period are presented in Figure 4 and 5 below. Figure 4 presents the market depth at the best quotes (MD₁). Depth is observed to surge towards the closing period with liquidity consistently at or near its peak around the time block from 1730-1800. This confirms the results for bid-ask spreads which highlight that liquidity is cheaper and more plentiful towards the end of the session.

Figure 4

Market Depth at the Best Quotes (USD'000s) MD₁ (Intraday)

1st October 2007 – 29th May 2008



⁷ Similar to the bid-ask spread analysis, the average results are diluted by the significantly lower market depth experienced in the earlier months. To provide a more informative study, statistical data for the most recent two months are also included in the analysis. Further analysis was also conducted to ensure the robustness of the results.

Figure 5 shows the available market depth within 0.25% of the best prevailing bid-ask quotes. Consistent with the results in MD₁, depth is observed to be highest towards the end of day.

Figure 5

Available Market Depth within 0.25% of the Best Prevailing Bid-Ask Quotes (USD'000s)

MD₂ (Intraday)

1st October 2007 – 29th May 2008

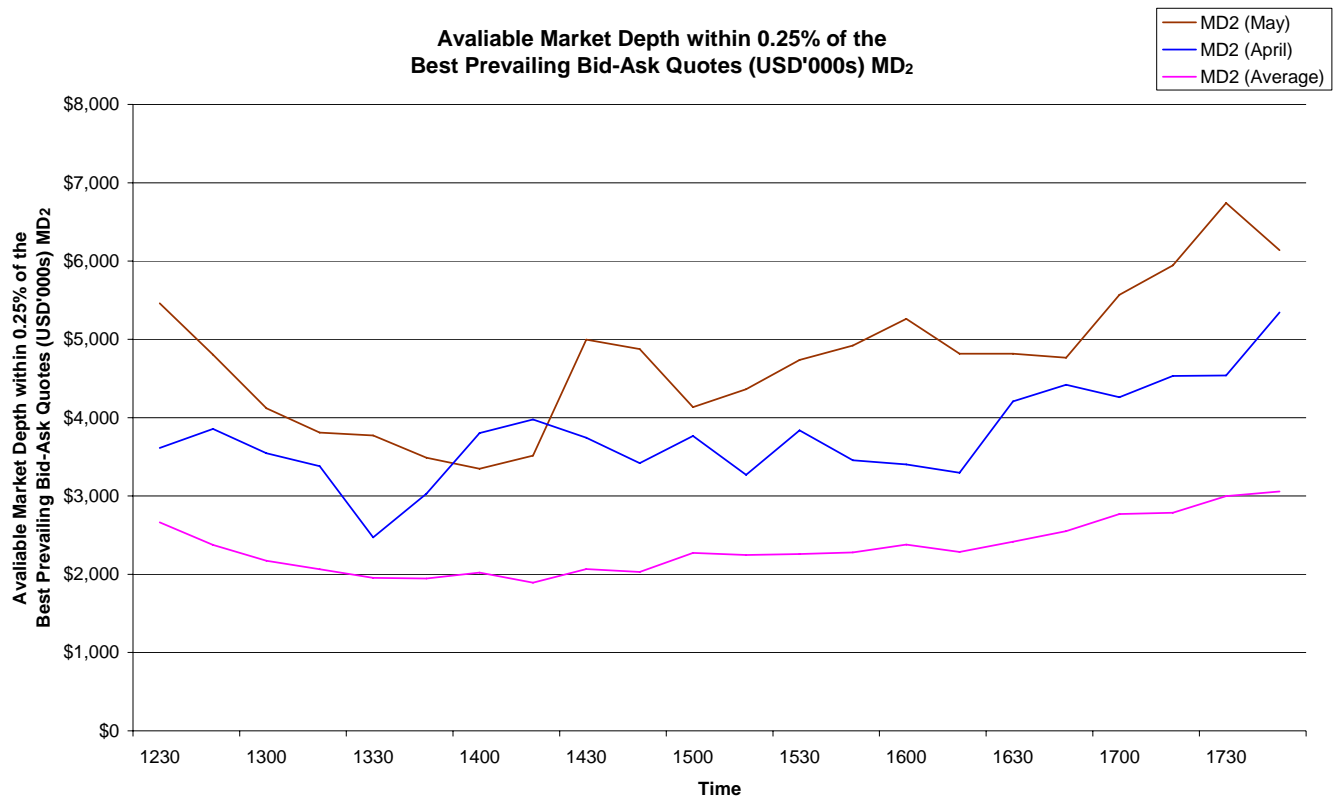


Figure 6

Market Depth at the Best Quotes and One Minute Interval (Monthly Analysis)

26th October 2007 – 29th May 2008

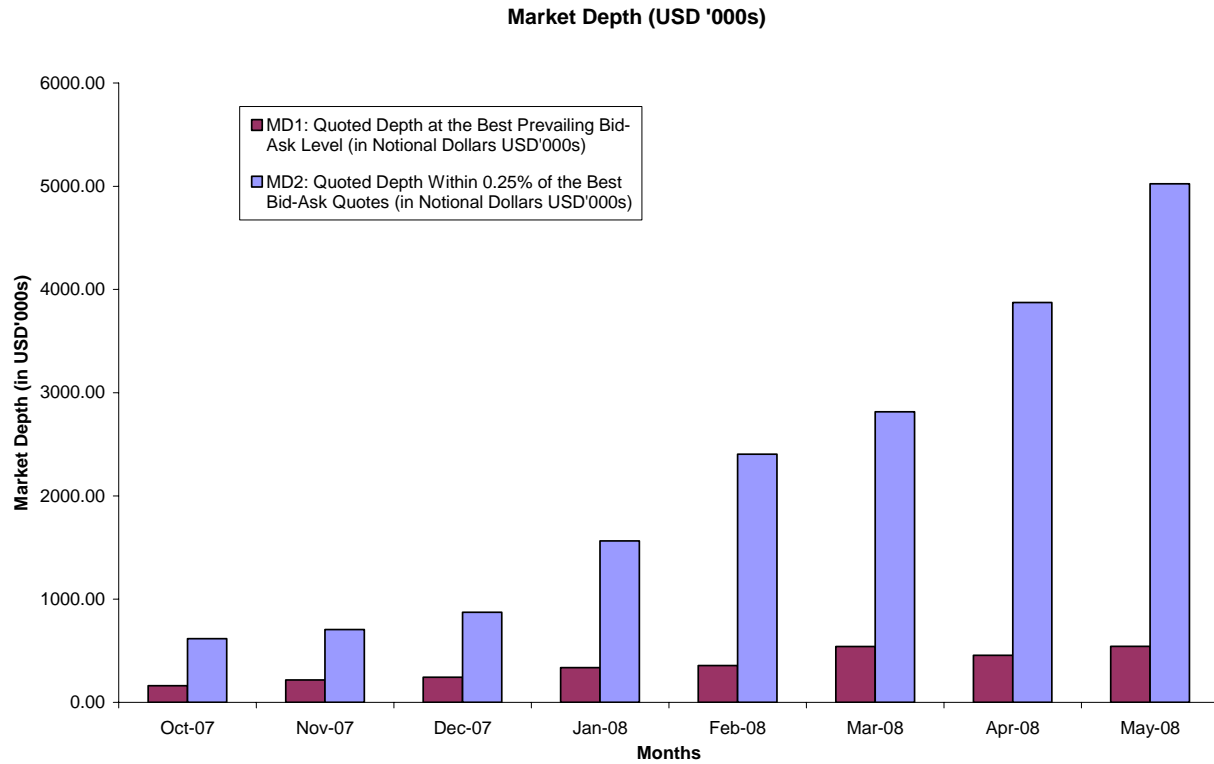


Figure 6 illustrate the change in market depth for both methods over the sample period. Over the past 8 months, it is observed that the market depth has increased significantly for both MD₁ and MD₂. This significant increase in market depth provides traders with enhanced trading opportunities to exploit price movements with minimum entry and exit costs.

5. Further Analysis and Additional Statistics

5.1 Further Analysis

Given the tremendous growth rate of the SGX Nifty Index Futures, statistics from the last few months (which are larger in value) can potentially dominate and bias results based on average across the study period. To ensure the robustness of the presented results, monthly intraday statistics were analysed and results were found to be supportive of the conclusion reached in this paper.

5.2 Additional Statistics

For the purpose of this study, both negotiated large trades (NLTs)⁸ and the spread (roll) market⁹ were excluded from all analysis. This methodology is consistent with those of prior academic research like Frino, Kruk and Lepone (2008).

To provide a more comprehensive view of the trading growth in the SGX Nifty Index Futures, Table 1 below provides a segmental analysis. Table 2 provides the statistics used in the diagrams for Figure 3 and Figure 6.

⁸ Since negotiated large trades (NLTs) are completed off-market, they provide price and execution certainty for traders and come into the market crossed. These types of trades do not affect the market statistics reported in this study and are hence not included in the computation.

⁹ Both Frino and McKenzie (2002) and Frino and Oetomo (2005) observed increased activities, declining spreads, and lower market impact costs in the period before contract maturity. Consistent with their findings, it is observed that the spread (roll) markets of the SGX Nifty Index futures have lower bid-ask spreads, higher market depth and higher trading activities in the last few days of contract expiry. To avoid any “positive” bias associated with the rolling over of contracts that may distort the intraday patterns of a “normal” trading day, these trades were not included in our calculations.

Table 1 : Total Trading volume (in Contracts)

	Bloomberg Near contract	Bloomberg Deferred Month contract	Negotiated Large Trades	Spreads (Roll) Market	Total Volume
Oct	33,990	24,215	18,355	36,665	113,225
Nov	50,018	12,340	231,967	22,550	316,875
Dec	53,200	13,981	169,268	93,572	316,040
Jan	203,449	27,485	540,834	156,020	927,788
Feb	229,433	57,885	507,576	173,470	968,364
Mar	255,653	53,018	471,910	255,703	1,036,284
Apr	193,492	57,494	403,802	142,183	796,971
May	216,225	46,996	460,503	268,658	992,382

Table 2: Statistics for Bid- Ask Spreads and Market Depth

	Bid-Ask Spread (Basis Points)	
Oct-07	34.19	
Nov-07	22.21	
Dec-07	13.88	
Jan-08	17.90	
Feb-08	11.07	
Mar-08	13.13	
Apr-08	8.68	
May-08	6.30	
	<i>MD₁: Market depth at the Best Prevailing Bid-Ask Level (in Notional Dollars USD'000s)</i>	<i>MD₂: Market depth Within 0.25% of the Best Bid-Ask Quotes (in Notional Dollars USD'000s)</i>
Oct-07	\$161.95	\$616.25
Nov-07	\$215.91	\$705.35
Dec-07	\$243.25	\$873.44
Jan-08	\$336.76	\$1,565.38
Feb-08	\$357.25	\$2,403.84
Mar-08	\$540.01	\$2,815.61
Apr-08	\$456.07	\$3,874.43
May-08	\$542.02	\$5,023.44

6. Conclusion

For intraday traders participating in the SGX Nifty Index Futures, some of the best opportunities occur towards or at the end of the trading session where there is high price volatility (1700-1745), bid-ask spreads at their lowest level (1745-1800) and peak market depth (1730-1800). Other potentially profitable time intervals exist at the beginning of the session where there is comparable price volatility (1230-1245) and sufficient liquidity in the market for traders to exploit the price movements. Further to these results, it is also observed that the bid-ask spreads have decreased significantly by approximately 81.6% over the sample period and the market depth has increased tremendously. These results suggest market participants trading in the SGX Nifty Index Futures are likely to experience increasingly lower transaction costs with enhanced trading opportunities to exploit price movements.

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Appendix

Table 3: SGX CNX Nifty (India) Index Futures Contract Specifications

	Specifications
Underlying Stock Index	CNX Nifty Index
Contract Size	US\$2 x SGX Nifty Index Futuresprice
Minimum Tick Value	0.5 index point (US\$1)
Contract Months	2 nearest serial months and 4 quarterly months on March, May, September and December cycle.
Trading Hours	T Session:
	Pre -Opening 8.45am -8.58 am
	Non -Cancel Period 8.58 am -9.00 am
	Opening 9.00 am -6.15 pm
	T+1 Session:
	Pre -Opening 7.00 pm - 7.13 pm
	Non -Cancel Period 7.13 pm - 7.15pm
	Opening 7.15 pm -10.55 pm
Trading Hours on Last Trading Day	9.00 am - 6.15 pm
Last Trading Day	Last Thursday of the month. If this happens to fall on an India holiday, the last trading day shall be the preceding business day.
	The expiring contract shall close on its last trading day at 6.15 pm.
Daily Price Limits	Whenever the price moves by 10%, in either direction from the previous day's settlement price, trading at or within the price limit of 10% is allowed for the next 10 minutes. After the 10 minutes have lapsed, an expanded price limit shall come into effect. The expanded price limit shall be 20% above or below the previous day's settlement price. There shall be a further 10 minutes cooling-off period after the expanded price limit has been reached. Thereafter, there shall be no price limits for the rest of the day.
	There shall be no price limits on the Last Trading Day of the expiring contract.
Settlement Basis	Cash Settlement. The Final Settlement Price shall be the official closing price of the CNX Nifty Index, which is derived based on the average weighted prices of the individual component stocks of the index during the last 30 minutes of trading. The official closing price will be rounded to two decimal places.
Additional Trading Facilities	Negotiated Large Trade (NLT) : Minimum size 100 lots