Market Making and Creditworthiness for CNX Nifty Futures: A Signaling Equilibrium Approach

(ICSSR sponsored research project : January 2008 - December 2008)

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December 31, 2008

SUMMARY OF THE PROJECT

Following *IGARCH* (*1, 1*) methodology, the study on S & P CNX nifty futures shows that creditworthiness, trading margin, and price discreteness are market making signals, which have an important role as decision-making signals. Through these signals, investors will be able to infer the market knowledge and accordingly participate in trading for efficient returns.

It is empirically observed that there is a positive relationship between the trading price and number of market lots that has been traded. However, with negative creditworthiness the number of market lots has negative impact on trading transactions in all trading hours. Therefore, the price discreteness has a negative impact on trading transactions.

It is empirically observed that there is a direct relationship between the trading price and the total money supply (M_{3t}) and thus the trading transaction. Increase in total money supply increases money supply in derivatives market gradually until the last trading hour. In return, the total money supply is negatively related with the creditworthiness of market participants. In this case, the efficient inter-bank call rate is necessary to maintain the trading margin for efficient trading transaction and thus returns.

In addition to the above results, it is seen that the price elasticity is $|-0.1117|$, which shows that the transaction is inelastic leading to noncompetitive nature. Here the inequality

between the marginal revenue and marginal cost is observed. Thus, with the monopoly power *09* nifty is neither pure nor perfect competitive market. As a result, adverse selection effect on valuation, resource mobilization, and trading direction exists. The competitive profit maximization is not achieving for the nifty futures restricting the market efficiency, and transparency. Hence, the asymmetric information in nifty trading withstands. However, this is expected that in course of time nifty futures will evolve into a competitive market leading to efficient valuation.

Place : Dharwad
Date : December 31, 2008.

Dr. Prasanna Kumar Barik

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Prasanna Kumar Barik

CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The Indian futures trading system exists with passive day orders through the hierarchy of clearing members, branch managers, dealers, brokers and sub-brokers. Depending on the valid order entry in the market, clearing entities execute orders with clearing and settlement process. Here apart from the leveraging activities of derivatives instruments, one can benefit from both a downturn as well as an upturn market situation. Therefore, one can make money in both bull and bear market situations. However, the pathetic situation is that the above opportunity is not available to all of the market participants like investors, dealers, brokers, sub-brokers and market operators. This is also not easily and conveniently accessible to the retail investors. This leads to the autonomy, accountability, and transparency issues. In this context, the trading behaviour in asymmetric information situation is matter of concern.

The market participants' trading behaviour affects the market making. Hence, it is pertinent to understand their strategies. These market strategies have a direct bearing on valuation. Moreover, the informational gap among the market participants is a cause of concern.

In this context, studies like, the job market signaling (Spence, 1973 and 1974), the financial incentive signaling approach (Ross, 1977), the signaling hypothesis test on Harris and Raviv (1985) by Acharya (1988), and signaling in insurance market by Rothschild and Stiglitz (1976), are relevant. The 'lemon' effect on market making (Akerlof, 1970), 'learning process through the signaling instruments' suggested by Miller (2002), and the market making analysis with order flow (Schultz, 2003) are significant other contributions in this context.

Chung et. al, (1999) have examined the role of the limit order traders' intraday competitiveness, in limit order placements and executions. Chow et. al, (2002) have examined the various aspects of trading behaviour and found that both the institutional traders and individual traders supply liquidity in Taiwan stock exchange. The institutional traders do not trade on margin. Bondarenko and Sung (2003) have concluded in their paper that the

market makers wish to trade against the market trend when the realized depth of the limit book is significantly lower than the critical value and vice versa.

Naresh (2006) has found that in National Stock Exchange of India Ltd. *(NSE),* the market participants are not satisfied with the margining, cross-margining, minimum contract size, transaction tax, physical settlement, and eligibility requirement for the introduction of new derivatives. However, they are satisfied with the existing systems like the investors' protection, position limits, contract on the new indices, and use of derivatives by mutual funds.

Prasanna Kumar and Supriya (2005, 2007a and 2007b) have found that the signaling devices like efficient order entry system and efficient valuation are necessary to make a signaling equilibrium at *NSE* futures market. Through these informational norms, they have defined and measured the market activities like hedging, speculation, and arbitrage. It is observed that the market is not achieving the hedging, speculation and arbitrage positions efficiently. Therefore, futile trading and inconsistent profit maximization exist, suggesting the monopoly character of the market.

PERCEPTUAL APPROACH

Considering all of the above literature, this study has focused on the quest for strong or weak signals at the Indian futures market (*CNX* nifty). In this case queries for the study are; (i) on the definition and analysis of the signaling instruments or informational norms in derivatives market, (ii) on the relationship between the market participant's trading strategy and the above signals or informational norms and (iii) on the impact of the market participant's trading behaviour on market makings in relation to the market signals.

To justify and analyze the above queries, this study has conducted the fieldwork through survey method with prepared questionnaires (*Appendix A*). This survey is carried out for Hubli-Dharwad (Karnataka, India) city where this geographical area consists of twenty-one *NSE* nifty traders' samples. The total sample consists of six *NSE F&O* sub-brokers,

fourteen investors who are actively trading at *NSE* futures and options through Kotak Securities Ltd. and one independent investment consultant. Based on the responses to the questionnaires, the analysis on the above queries follows below.

The survey result shows that *50* per cent of sub-brokers and *53* per cent of investors are aged about *21* to *30* years (*Appendix A*). Regarding education, *50* per cent of sub-brokers are graduates and rest of them is post-graduates where as, *67* per cent of investors are graduates and *50* per cent of them are post-graduates. From this one can conclude that both sub-brokers and investors are educated enough for any kind of market trading. However, in the *NSE F&O* market, *67* per cent of sub-brokers have done professional courses related to the securities and derivatives market. About *83* per cent of sub-brokers have relevant training in these areas. About *67* per cent of investors have not done any professional courses on securities and derivatives market, and sadly, *73* per cent of them do not have any training in these areas. It suggests the need for emphasizing on appropriate education and training for investors to trade efficiently in this market.

It is observed that *33* per cent of sub-brokers have *5* years of trading experience in the securities market .About *16* per cent have experience above *15* years. The remaining *50* per cent have *5-15* years experience. It indicates that the sub-brokers may have an advantage over the individual investors because of this experience. In the case of trading in the derivatives market, *50* per cent of the sub-brokers have over *5* years of trading in the derivatives market. About *33* per cent of investors have *3-5* years of derivatives market trading experience. In the derivatives market also, the sub brokers appear to have an edge because of their experience.

In addition, *33* per cent of sub-brokers have less than *100* clients and *67* per cent have over *100* clients. Also *83* per cent of sub-brokers have the expectation that participation of the total number of clients in both securities and derivatives markets will increase. As far as trading volume is concerned, *50* per cent of *NSE F&O* sub-brokers are trading with daily nifty trading volume worth of *50, 00, 000 INR*. About *17* per cent of *NSE F&O* sub-brokers are trading with daily nifty trading volume worth of *80, 00, 000 INR*.

The demographics suggest that the derivatives market consists of fairly well educated, rational, and informed market participants. The Indian derivatives market is about eight years old. There is a possibility that trading in derivatives may see a rise in the near future. Given the volatility reported in the securities market across the globe it is natural that derivatives would be used for hedging. Therefore, the derivatives market is likely to witness more trading and client participation.

Majority of the sub-brokers (*67* per cent) have opined that they have comfortable trading relations with other market participants like dealers, brokers, and investors. In addition, *33* per cent of them have agreed that the daily nifty trading volume is enough for ensuring profit .The remaining respondents were non-committal on this issue. .In addition, all sub-brokers have agreed that daily open interest for nifty trading is not enough for assuring the profit. However, *80* per cent of investors have opined that daily nifty trading volume is sufficient to assure profit .Where as *47* per cent of them have opined that daily open interest is not sufficient to assure profit. Considering these inconsistencies, the question that arises is what factors affect the trading volume.

From the responses, it is observed that *83* per cent of sub-brokers and *67* per cent of investors have agreed that the trading volume and open interest heavily depend on the geographically local market. It is observed that local trading is preferred to out of state and foreign trading. In addition, *50* per cent of sub brokers and *73* per cent of investors expressed that online trading is convenient. Since trading preference is localized, there is a need for local advertisements for nifty trading. This will provide necessary information and knowledge about financial instruments like futures and options and their underlying variables (*FUTIDX, OPTIDX* etc.). This will have a reach on grass-root traders.

About *50* per cent of sub-brokers and *33* per cent of investors have said that all the passive orders are executed. About *83* per cent of sub-brokers and *80* per cent of investors have said that all the passive orders are executed through the front end of Regular Book. Again, *83* per cent of sub-brokers have agreed that good-till-day orders are preferable than other types of orders like day, good-till-cancelled and fill-or-kill orders. Where as, *53* per cent

of investors have not reported any such preference. The difference in preferences implies an information gap on the nature and functioning of orders in the market.

In addition, *73* per cent of investors have opined that it is easy to trade with market orders than limit orders where as only *17* per cent of sub-brokers have agreed to the same. Therefore, according to investors, the limit price is seldom realized in the market. Where as, according to the majority of sub-brokers immediate best price is not available in the market. Therefore, they prefer limit orders. From this, we can conclude that the nifty price rarely reflects its true value. Therefore, asymmetric information exists in the market. In addition, *80* per cent of investors and *50* per cent of sub-brokers have agreed that order executions face basis risk with different costs. This is because of the marked difference between spot and futures price. This indicates the existence of inefficient order executions.

Most of the respondents have responded that submission of both market and limit orders are high during the initial and in-between initial and last periods of nifty trading. In these trading periods, *68* per cent of respondents have said that there are large number of hedgers. Moreover, *78* per cent of them have reported hedging experiences with futile trading. In this context, the question on 'hedging effectiveness' for nifty futures trading arises.

In addition, all sub brokers and *67* per cent of investors have said that large number of speculators exists. Moreover, *84* per cent of sub brokers and *67* per cent of investors report speculation experiences with futile trading. Therefore, the question on 'rational speculation' for nifty futures trading arises.

Almost all the respondents have said that 'arbitrage' does exist. The transaction cost is well adjusted with it. In other words, at the delivery of underlying asset the impact cost is well adjusted with the futures price, which converges to spot price through the settlement price. However, the issue of increasing or decreasing rate of transaction or impact cost in relation to the rate of market or limit order submission exists.

At *NSE F&O* market, the tick size is enough for trading activities. This is what *83* per cent and *73* per cent of both sub-brokers and investors have agreed. In addition, *67* per cent and *73* per cent of sub brokers and investors have agreed that the present tick size is enough to place market or limit orders. Most of the respondents have said that the tick size affects the submission of market and limit orders and vice versa. The tick size and hence the tick value for placing market and limit orders is high during the initial periods of the nifty trading than other periods of trading. In this case, most of the investors' responded that the tick size is under the control of both clearing and trading members. Thus, the tick size and hence the tick value is one of the important variables which determines the trading volume and hence the trading profit.

Majority of the respondents have said that the tick size is very much related with the trading margin .Sub brokers observed that all types of margin are at the satisfactory level. In this study, *60* per cent of the investors are not ready to accept that all margins except initial margin are at the satisfactory level. Hassles in margin trading are experienced according to *53* per cent of investors. This is in spite of facilities like assurance of brokerage commission, availability of resources from call money market etc.

Market participants usually have access to the call money market. This is agreed to by *50* per cent and *60* per cent of sub-brokers and investors respectively. Most of the respondents have said that there is *100* per cent fund availability through call money markets to depository participants and clearing banks. They feel that the call money rate may be an alternative to the bank rate for borrowing and lending financial resources for investment purposes.

MARKET MAKING SIGNALS

The survey conducted threw some interesting insights. About *50* per cent of the sub brokers opined that they preferred to submit the limit and market orders during the initial period of nifty trading. In the opinion of *50* per cent of the sub-brokers, the frequency of submission of orders affects the tick value. Moreover, *67* per cent of them expressed

satisfaction at the current tick size. The number of ticks for placing limit and market orders is high during the initial period of nifty trading according to *67* per cent of the respondents. Again, *67* per cent of respondents opined that the initial margin is appropriate.

Considering these observations, it can be premised that they may have some signaling effect.

Analysis of variance (*ANOVA*) is used to understand the relationship between the dependent and independent variables. In this case, 'trading volume' is considered as the dependent variable. It signals market making and its functioning. For example, using corporate announcements like earning announcement as scheduled one and acquisition, target, and Moody's bond rating change announcement as unscheduled one, Chae (2005) has found that trading volume decreases significantly to information asymmetry prior to scheduled announcement and increases significantly to information asymmetry prior to the unscheduled announcement. Considering trading volume as dependent variable and regressing with the independent variable firm size i.e. in terms of market capitalization, Chae (2005) has found the significant and positive estimated slope coefficient. This implies that information asymmetry affects the trading behaviour before schedule announcement. In this regression, average bid-ask spread is used, as the independent variable and the result is that the correlation estimator is negative and significant. Therefore, having components like order-processing costs, inventory holding costs, and adverse selection costs, the bid-ask spread variable is negatively related with the trading volume. This implies that there is the information symmetry before announcement.

Chae (2005) has also found that the informed market makers raise price sensitivity before all the corporate announcements. This implies that market makers are extracting the timing information from their order books. On the other hand, the liquidity traders do not have the correct information embedded in prices and trading volume before unscheduled announcements. These findings lead for the questions like what is the relationship between the timing information and trading volume, and what makes market makers increase price sensitivity before all types of announcements (p.441)?

Like the above study, here trading volume is considered as the dependent variable. Time of submission of limit orders, tick size, frequency of submission of orders, number of ticks, and the initial margin are considered as independent variables. The analysis is based on the responses of the sub brokers. Five null hypotheses are framed and tested. The results are discussed below (Table 1).

H_1: There is no relationship between the time of submission of limit order and the trading volume.

The sub-brokers are classified into three groups based on the trading volume. The first group consists of sub-brokers reporting trading volume $\leq$ *20, 00,000 INR*. This category is considered as poor trading performance. The second group consists of sub-brokers reporting trading volume *20, 00,001* to *50, 00,000 INR*. This category is considered as fair trading performance. The third group consists of sub-brokers reporting trading volume *50, 00,001* to *80, 00,000 INR*. This category is considered as good trading performance. Three time-periods for submission of limit order is considered. They are initial period, between period and last period. The result indicates that the submission of limit order is high during the initial period of nifty trading. It indicates that there is a significant relationship between the time of submission of limit order and the trading volume. About *60* per cent of the variance in trading volume is explained by the time of submission of limit order.

H_2: There is no significant relationship between the tick size and the trading volume.

Results indicate there is a significant relationship between the tic size and the trading volume. About *47* per cent of the variance in trading volume is explained by the tick size.

H_3: There is no significant relationship between frequency of submission of orders and the trading volume.

Table 1: Analysis of Variance

H_1: Time of submission of limit order					
Source	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
Between Groups	1.500	1	1.500	4.500	.101
Within Groups (error)	1.333	4	.333		
Total	2.833	5			$\hat{\eta}^2 = 0.595$
H_2: Tick Size					
Between Groups	1.333	1	1.333	3.556	.132
Within Groups (error)	1.500	4	.375		
Total	2.833	5			$\hat{\eta}^2 = 0.475$
H_3: Frequency of submission of orders					
Between Groups	1.500	1	1.500	4.500	.101
Within Groups (error)	1.333	4	.333		
Total	2.833	5			$\hat{\eta}^2 = 0.530$
H_4: Number of ticks					
Between Groups	1.333	1	1.333	3.556	.132
Within Groups (error)	1.500	4	.375		
Total	2.833	5			$\hat{\eta}^2 = 0.471$
H_5: Initial margin					
Between Groups	2.083	1	2.083	11.111	.029
Within Groups (error)	.750	4	.188		
Total	2.833	5			$\hat{\eta}^2 = 0.735$

Results indicate there is a significant relationship between the frequency of submission of orders and the trading volume. About *53* per cent of the variance in trading volume is explained by the frequency of submission of orders.

H_4: There is no significant relationship between number of ticks and the trading volume.

Results indicate there is a significant relationship between the number of ticks and the trading volume. About *47* per cent of the variance in trading volume is explained by the number of ticks.

H_5: There is no significant relationship between initial margin and the trading volume.

Results indicate there is a significant relationship between the initial margin and the trading volume. About *74* per cent of the variance in trading volume is explained by the initial margin.

Therefore, the time of submission of limit order, tick size, frequency of submission of orders, number of ticks, and the initial margin have the signaling effect on trading volume. Based on these market-making signals the conceptual framework follows here.

THE CONCEPTUAL FRAMEWORK

The conceptual framework for the study is that how the creditworthiness and price discreteness affect the limit order market and return. The return is calculated and maintained in relation to the tick value. The tick value determines the trading volume in terms of trading transaction and thus the profit. The tick value is obtained by multiplying tick size with the contract size, where the contract size is determined by the multiplication of the nifty price and its market lots or depth. Therefore, the tick value influences the price steps or price discreteness i.e. the value of minimum unit for price change, considering the rate of submission of limit orders. Here, the trading margin and the brokerage commission influence the submission of limit orders. If the trading margin is maintained then the trading will be ensured for next contract time-period. Otherwise, liquidity in the market is affected. Therefore, the optimal tick value is the matter of concern in nifty trading. This is because this considers the tick size and hence the price discreteness, which is one of the important factors that influence the nifty price formation.

In this context, Bali and Hite (1998) have argued that 'cum-to-ex-day stock price changes are rounded to the tick below the dividend amount. If the dividend is not a multiple of the minimum tick size, the price will fall by less than the full amount of the dividend when it goes ex-dividend (cited in Graham et. al., 2003)'. That is, greater tick size leads to lower

Here, returns i.e. trading-price-value ratio (TV_t) is defined[1] as;

$$TV_t = TV_{p/v} = \frac{Days\ \ Closing\ \ Price(DCP)}{Average\ \ Money\ \ Value\ \ (AMV)} \quad \ldots (1)$$

$$\text{Where, } AMV = \frac{Total\ \ Trading\ \ Value(TTV)}{Total\ \ Trading\ \ Quantity(TTQ)}$$

$$= \frac{The\ total\ money\ value\ of\ \ business\ that\ took\ \ place\ in\ \ the\ \ market\ during\ the\ \ day}{The\ total\ number\ of\ \ contracts\ on\ \ which\ business\ took\ \ place\ during\ the\ \ day}$$

From Equation (1), it can be observed that the closing price is the last half an hour weighted average price of the contract. The closing price may bias the trading-price-value ratio due to market frictions. The closing price is different from the trading price. Trading price is that last price at which the contract is traded with less noise. Therefore, closing price and trading price are different to each other by their nature, definition, and function.

The total money value of the business that took place in the market during the day reflects the money supply. The total number of contracts on which business took place during the day reflects the trading transaction at nifty futures market. This transaction is assumed to proxy the total output in the market. In other words, the *AMV* is equal to the total money supply divided by the transactions at nifty futures market. Where, the total money supply is the money supply × velocity. Therefore, *AMV* is equal to the general price level at nifty futures. Since, nifty constitutes around *75* per cent of the total output (from financial sector), this *AMV* is the proxy for the general price level in the economy. In this case, the real rate of interest i.e. real return to money is the matter of concern.

In financial economics world, Irving Fisher hypothesis has brought revolution having its own importance and implications. The central contribution of the Fisher hypothesis

[1] Prasanna Kumar (2005), the Ph. D. Thesis.

is that in the long run the real rate of interest is approximately constant which is determined by the time preference and changes in the nominal rate of interest. In turn, this reflects the movement in the rate of inflation in one-for-one relation domain. However, in the real world economy Fisher hypothesis is questioned. This is because; some empirical studies show that there is an approximate relationship between the nominal rate of interest and inflation. However, this is not practical as far as the real world is concern.

Carmichael and Stebbing (1983) have argued that the Fisher hypothesis only deals with the financial data. Assumptions like, the margin of substitutability between money and financial assets and the financial assets and capital exists. In this case, they have argued that if these two margins will become close to each other, the reluctance of the data to support fisher hypothesis is less paradoxical.

To validate this argument Carmichael and Stebbing (1983) have proposed the Inverted Fisher Hypothesis (*IFH*), where a logical inconstancy of the real rate of interest does exist. This *IFH* states that the real rate of interest is inversely related with inflation where, the nominal rate of interest is constant. This is because, first, the Fisher hypothesis, considers the influence of the individual time preference. In turn, this affects the marginal product of the capital. Second, there is a negligible implicit payment on the holding of money. As a result, the nominal rate of interest is too low causing negative inflation. This leads to the inverse relationship between the real rate of interest and the inflation. Third, the effect of the tax variable is ignored in Fisher hypothesis. In reality, the after-tax rate of interest only enters into the individual's income. In turn, the individual's economic activities and behaviours are determined.

Therefore, considering these three variables i.e., time preference, regulation, and tax, they have argued in favour of the high substitution between money and financial assets. This is because, apart from the medium of exchange, these two assets have very similar risk characteristics. Obviously, in this situation, the nominal rate of interest is constant because of the high substitutability between them. Individual also used to alter these assets frequently in the financial markets. Since the inflation is more negative with constant nominal rate of

interest, there is the inverse relationship between inflation and the real rate of interest. In other words, the real return to money has the one-for-one inverse relation with inflation i.e. the general price level.

On this aspect, Demirgüç-Kunt and Huizinga (1998) have found that the inflation is associated with the higher realized interest margins and higher profitability. The mechanism is that inflation entails the higher costs i.e. more transactions, extensive branch networks and the higher income from bank float. Therefore, there is positive relationship between the inflation and the bank profitability, which shows that the bank income increases because of inflation rather than its costs.

However, here one question arise like, does this positive relationship talk about the real value of the bank? May be absolute value (by monetary units) increases due to inflation but not the real value. Because, the real value depends on the relationships among other variables like velocity, transactions, derivatives index values etc. Demirgüç-Kunt and Huizinga (1998) have argued that in developing countries, the interest rates are associated with the higher interest margins and profitability. This shows that in developing countries demand deposits are being paid a zero or below the market interest rates.

All of the above logic is well captured by the trading-price-value ratio (i.e. 'TV_t') i.e. return to money in the Indian financial market. In this case, the assumption is that there is the 'regulation' on demutualized derivatives market particularly on futures market. This 'TV_t' is defined by the ratio of closing price to *AMV*. To make it as real rate of return, this ratio is deducted from the nominal rate of money return. Since there is the high substitutability between money and financial assets, the nominal rate of return is zero, positive or negative. Thereby, the real return to money is zero, positive or negative. However, if the nominal rate of return is not strictly zero, then the real rate of return will be positive, negative or zero. In equation;

$$\left.\begin{aligned} TV_t &= \frac{DCP}{AMV} \\ \Rightarrow TV_{r,t} &= i_{nt} - TV_t = i_{nt} - \frac{DCP}{AMV} \\ \Rightarrow TV_{r,t} &= i_{rt} \end{aligned}\right] \ldots (2)$$

Where, $TV_{r,t}$ = real trading-price-value ratio at time 't', i_{nt} = nominal return to money, and i_{rt} = real return to money. In this case, $TV_{r,t} > 0$, $TV_{r,t} < 0$, *or*, $TV_{r,t} = 0$.

According to the quantity theory of money, total money supply is equal to the product of price, and transaction. That is $MV = PT$, where 'M' is the money supply, 'V' is the total money circulation or velocity of money, 'P' is price level and 'T' is the transaction. Transaction represents how many times the total final product (in monetary units) is traded with the existing market price level. In the economy, this transaction may be representative of the total income. This is because; while adding each units of transaction, we will derive the total income in the economy (Mankiw, 2003). Therefore, this transaction is the proxy for the total income or the national income (Y). Hence, in the above equation, the national income is equal to the product of total money supply and velocity, divided by the price level. In equation;

$$\left.\begin{aligned} T &= \frac{MV}{P} = Y \\ \Rightarrow T = Y &= \frac{1}{P/MV} \end{aligned}\right] \ldots (3)$$

Here, the denominator part of the Equation (3) is nothing but the real return to money in the nifty futures market. Therefore, in the economy as well as in financial market, the total transaction or income is equal to one divided by the real return to money. That is;

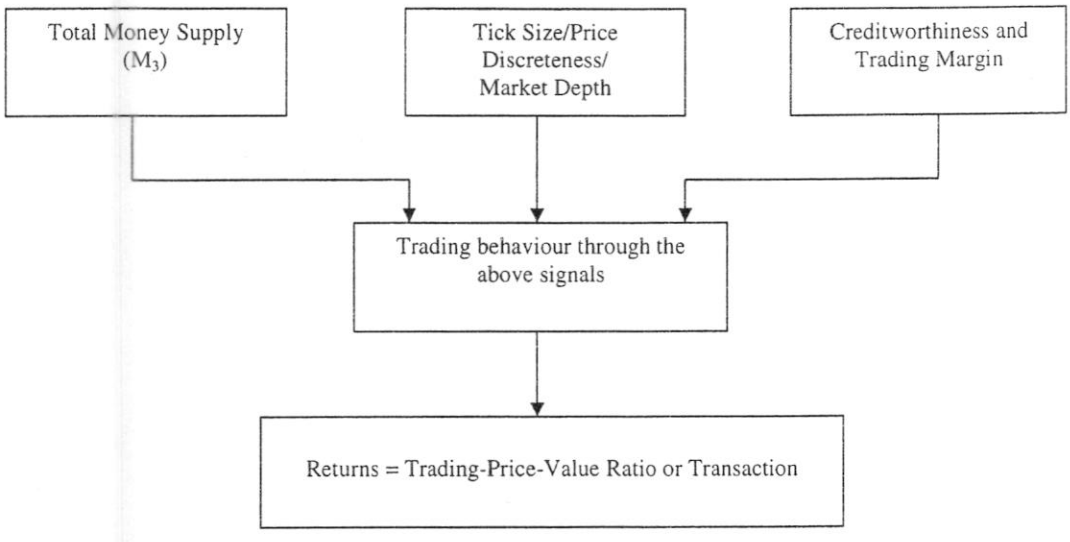
$$T_t = Y = \frac{1}{TV_{r,t}} \quad \ldots (4)$$

In day-to-day trading, if the value of '$TV_{r,t}$' is less than one but positive (i.e. $0 < TV_{r,t} < 1$), then the total transaction will be greater than one. Here, the market will be better off in reinvestment for the future profit. This is because; the ratio of one to '$TV_{r,t}$' (i.e. the ratio of closing price to *AMV*, which is the proxy for the price level) is high. Therefore, the incentives to trade take place and thereby the reinvestment and super normal profit takes place.

In contrast, if the value of '$TV_{r,t}$' is greater than one ($TV_{r,t} > 1$), the total transaction will be less than one. In this case, market will be worse off in reinvestment. In addition, if '$TV_{r,t}$' is equal to one, then the total transaction will be equal to one. Here, the incentives for business and transaction motives will be balanced for the future reinvestment at normal profit in day-to-day trading business.

In addition, this study has accepted the alternative five hypotheses from *ANOVA*. In this case, *NSE* market makers have agreed that the margining system is one of the important market characteristics, which is determining the trading volume and thereby profit. The total trading volume is the proxy for the total transaction. Therefore, the relationship between the return i.e. total transaction and trading margin including total money supply, tick value and hence the price discreteness is the matter of concern. All of these arguments are reported in Figure (1), where the market making signals and frictions are determining the trading behaviour through the buy and sell limit orders. In this case, transaction is the function of creditworthiness and trading margin through the above market making signals.

Figure 1: The Conceptual Framework



OBJECTIVES

With the above literature, perceptual and market making signals analysis, and conceptual framework, the objectives for the study are;

1. To observe the rate of market participation,

2. To evaluate and assess the valuation in the derivatives market,

3. To assess the price discreteness and its optimality, and

4. To analyze financial-resource utilization by the bank-custodian depository participants.

METHODOLOGY

The *IGARCH* two-stage model is used for this study. The *GARCH* models of Bollerslev (1986 and 1987), Bollerslev et. al. (1988), two-stage *GARCH* model of Hiraki et. al. (1995) and two-stage *IGARCH* model of Prasanna Kumar and Supriya (2005, 2007a and 2007b) are followed. The variables for the empirical study are transaction (T_t, i.e. trading return), trading margin (M_t), total money supply (M_{3t}), impact cost (C_t), number of market lots (M_{lt}) i.e. market depth and trading price (T_{pt})[2]. The *IGARCH* (*1, 1*) model[3] follows here.

In the first stage, the trading transaction depends on the trading margin. This is because, unless the trading margin is maintained, the particular order may not be executed. So, the trading margin is one of the important determinants of the profit maximization. Therefore, from Equation (4), national output or transaction is defined with '$TV_{r,t}$'. The nominal rate of interest i.e. the inter-bank call rate is used to calculate the real rate of trading return and thus the value of national output and transaction.

Here the long-run relationship between futures and spot return exists where the causality between the call rate and spot price also exists. In addition, Prasanna Kumar (2008) has estimated and found that the long run-relationship between futures and spot return does exist in relation to the inter-bank call rate. Therefore, the causality between the call rate and spot price for derivatives market does exist. Panda (2008) has also looked into this issue and empirically found the same result for other long-term and short-term interest rates, which influence the financial market, particularly the stock and derivatives market.

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[2] This trading price is the market determined equilibrium price where the risk-free financing rate (inter-bank call rate) is already used in the calculation of 'T_t'. Therefore in trading mechanism, this equilibrium trading price is the risk-neutral and reference independent variable. Here assumption is that by the last hours i.e. *15:30 IST* of the trading all informed market participants are with symmetric market information where volatile and chaotic trading does not exist.

[3] This two-stage *IGARCH* (*1, 1*) model follows the functional form of log-linear regression model, without changing the theories and empirical results of earlier and similar derivatives studies. Here the optimal order i.e. $p = q = 1$ and one lag length of the variables are accepted. For clarity, see Prasanna Kumar (2008).

Therefore, interest rates i.e. all geographically traded call rates like Mumbai and Calcutta inter-bank call rates, *5-10* years government securities rates and *15-91* treasury-bill rates are well related with the financial market and there by the economy. Hence, a long-run relationship exists between these interest rates and derivatives market and thereby the economy as a whole. Here, using Mumbai inter-bank call rate, the real rate of return is calculated and thus the trading transaction.

Following Prasanna Kumar and Supriya (2007a, 2007b), in the first stage, trading transaction is modeled as the dependent variable where trading margin is the independent variable. Here the total number of trades, which took place on the nifty instrument (*FUTIDX*) during the trading day, is considered as the proxy for the trading margin. This is because of two reasons. First, *NSE* does not have ready-made data required for the research. Second, unless the initial margin requirement is maintained, a particular trade will not take place. In addition, this is the rule of the trading. So, one can easily assume that only those who have sufficient level of other required margins with initial margin can trade. This is reflected by the variable 'the total number of trades which took place on the nifty instrument (*FUTIDX*) during the trading day'. Here transaction is different from the total number of trades. Transaction reflects as returns. The total numbers of contracts are derived from the total number of trades. Therefore, this variable is considered as the proxy for the trading margin.

Here, the maintenance of the trading margin depends on the inter-bank call rate i.e. the financing rate, which depends on daily volumes in call money market. This mechanism relies on the total money supply in the economy. Therefore, the broad money (M_{3t}) ultimately determines the financial resources for nifty trading through the maintenances of the trading margin. These trading margins heavily depend on the inter-bank call rate. This financing rate is determined with the demand for and supply of the call money trading volumes. This volume also depends on the availability and sufficient level of deposits like time deposits and narrow money (M_{1t}) in the economy. Here, the time deposit plus the narrow money is the broad money (M_{3t}).

While regressing the inter-bank call rate (i.e. 'i_{nt}') on 'M_{3t}', the 'R^2' is *0.5* and the '$\hat{\theta}_1$' in the model '$ln\ i_{nt} = \theta_0 + \theta_1\ ln\ M_{3t} + \eta_t$' is significantly negative. In other words, if the money supply decreases, then the inter-bank call rate increases and the volume of the call money increases with efficient money stock utilization. This relationship does not hold true for a rational economy.

In the above case, it seems that the lending to banks, depository participants, and other financial institutions would increase. Since the trading margin has a direct relationship with the call rate, this financing rate should be at appropriate level. In turn, the availability of resources for reinvestment in nifty futures trading withstands. Here, if banks have low cost lender then the supply of credit to relationship borrowers (investors) holds good.

The similar study for the *U.S.A.* economy is that if banks have the lower cost lenders and there are no diseconomies in relationship lending, then the banking reform will enhance the entrepreneurial activity. In effect, the entrepreneurial activity concerning bank competition, consolidation, and productivity, will have an impact on the financial market as well as the economy as a whole (Black and Strahan, 2002). Nilsen (2002) has argued that with the importance of the bank-lending channel, accounts payable to sales transactions trade credit reduces the risk of precautionary cash of the firm by enhancing the interest bearing assets. However, in this trade the product supplier has the major role than the financial intermediaries. In this trading transaction process, there is the chance of late repayment, and pecuniary penalties. This leads to the higher loan cost than the transactions trade credit cost. Therefore, the firm at monetary constraint prefers for accounts payable to sales finance trade credit against the loan or other types of credit.

From the Quarterly Financial Reports data and using Vector Autoregressive Regressions model with macro variables like GDP, Fed fund-the Treasury bond rates, inventory to sales, cash to sales and accounts payable to sales, Nilsen (2002) has found the evidence that firms have the strong demand for credit at the early stage of tight money. The accounts payable to sales increases for the small firms with the bank lending trade credit

channel. Large firms also suffer from the monetary constraints. 'When the firms are buffeted by a demand shock, they do not have as large a safety margin as other firms and thus may use trade credit to a greater extent'.

Through time series model and using the partial adjustment equation model, Nilsen (2002) has found that rated firms have more access to the trade credit than the unrated firms do. The accounts payable to sales ratio for rated firms are more than the unrated firms are. Therefore, the transaction motive for transaction trade credit is more for them than the unrated firms have. Interestingly the rated firms have the greater share of the purchase on credit from their supplier than the unrated firms do. Therefore, these results show that firms are depending on the use of finance trade credit.

Developing a two-period lending model Tassel (2002) has argued that the information on borrowers' public credit history and repayment capability are available from one lender to another lender, which creates information externalities. Therefore, the optimal lender adopts the signal jamming strategy in credit market. That is, the optimal lender follows the strategy of the first-period transaction costs for maintaining the high repayment rate and the immediate second-period rent in terms of acquiring better client information. However, this signal jamming strategy is questionable in relation to the transactions costs particularly for developing countries like India.

From demand side, Yuan (2005) has focused on the credit constraint model, which is the function of the stock price. The borrowing constraint arises at the falling stock price, where this stock price is low relative to the fundamental values. Therefore, the borrowing constrained informed investors may not be able to hold position on a falling stock to the lender and thereby on the market information efficiency on stock price. Here, the endogenous constraints on demand for financial resources carry the same intuition as endogenous constraints on wealth. According to Yuan (2005), 'The financial constraint on informed investor demand is stylized but realistic. For example, investors often establish margin accounts with dealers. Let us assume the investor has a margin account for the risky asset and the margin requirement is *30%*. At the trading date, an investor's wealth consists of a position

(long or short) in the risky asset (Q shares) and a position (long or short with a value of A) in the risk free asset ($\tilde{W} = Q\tilde{P} + A$). He can leverage up using the margin account (*70%*W). The upper bound of his position in the risky asset is $(1+70\%)Q + 70\%A/\tilde{P}$, which is endogenous in price (P. *385*)'.

In this context, with wealth $\tilde{W}_{1,k} = W_{0,k}R + D_k\left(\tilde{v} - R\tilde{P}\right)$, the borrowing constrained informed investor demand is constrained with a set $A = \left\{y \in R : y \le n(\tilde{P})\right\}$, $n(\tilde{P}) = a\tilde{P} + b$. Here, $a > 0$, $a < w_i^{uc}\rho(\tau_v + \tau_s)/w_i^c$, R = risk free asset pays 'R' units, P = price of the risky asset, D_k = Agent 'k' hold(s) risky assets, $\tilde{v}$ = payoff i.e. risky asset pays '$\tilde{v}$' units of the single consumption good, $\tilde{s}$ = noisy signal of the asset, ρ = risk aversion parameter, w_i^{uc} = wealth of unconstrained investor, and w_i^c = wealth of constrained investor. In this fictitious economy case, the equilibrium market condition is $w_i^{uc}\tilde{D}_i\left(\tilde{s}, \tilde{P}^{fic}\right) + w_i^c\tilde{D}_i^c\left(\tilde{s}, \tilde{P}^{fic}\right) = \tilde{m}^{fic}$ where, $\tilde{m}^{fic} = \tilde{m} - w_{ui}\tilde{D}_{ui}\left(\tilde{P}\right)$ = supply of asset in the economy.

With the above set up, Yuan (2005) has found that the uninformed investors' demand is a non-liner function of the equilibrium price observing his optimal demand as a fixed-point problem. The information structure variables exacerbate the uncertainty on the uninformed investors' estimation problem on the underlying asset as these variables influence the magnitude of information loss of constrained informed investors. When the information effect dominates the substitution effect, the confusion may arise as a result the uninformed investor demands more on the increased price of the stock and vice versa. In addition, from borrowing constraint and information asymmetry two-risky-asset model, the contagion effect is observed, where idiosyncratic shocks to one asset market affect the asset prices of unrelated markets. In this context, Yuan (2005) has suggested that 'If falling prices inhibit borrowing and the transmission of information through trading, government may intervene in the stock market by providing liquidity and preventing borrowing constraints that could aggravate a stock market crises or contagion'.

In addition to the above, the Indian futures market has experienced that the optimal hedge ratios for bank nifty and nifty futures are negative. This indicates that the Indian futures market is an imperfect one. (Prasanna Kumar, 2008). Therefore, for efficient financial market, the call rate should be at an appropriate level for resource diversification, generation, and utilization. All the above studies are with the evidence of the linkage between the financial market and the economy. With these justifications, the present study follows the *IGARCH (1, 1)* model specification[4] as;

$$\begin{aligned} T_t &= \beta_0 + \beta_1 M_t + \beta_2 w_t + u_t \\ h_t &= \alpha_0 + \alpha_1 u_{t-1}^2 + \alpha_2 h_{t-1} + \alpha_3 w_{t-1}^2 \end{aligned} \quad \ldots (5)$$

Equation (5) contains both the mean and variance trading return where the independent dummy variable 'w_t' is included in the mean equation to measure the creditworthiness position in the market. The positive impact of this creditworthiness is considered in variance returns. Theory suggests that the credit or lending in the economy should be at an appropriate level for best use of money stock. Therefore, in variance regression, square of one lag of '$w_t = w_{t-1}^2$' is included as an independent variable where, both $\hat{\alpha}_1$ and $\hat{\alpha}_3$ represents the error term and creditworthiness effect in variance return equation. Here, 'T_t' depends on 'M_t' and 'w_t', where 'w_t' = *1* if creditworthiness position for investment holds and 'w_t'= *0* otherwise.

Considering the above model with $E\ (u_t) = 0$, the mean value of the creditworthiness position is $E\ (T_t / M_t,\ w_t = 1) = (\beta_0 + \beta_2) + \beta_1(M_t)$ and alternatively the mean value of lower opportunity to credit position is $E\ (T_t / M_t,\ w_t = 0) = \beta_0 + \beta_1(M_t)$. These are the endogenous conditional expected values of 'T_t' for all the market makers. In addition, the mean effect of the creditworthiness is included as positive independent variable in the variance

[4] These relationships are explained with *IGARCH (1, 1)* model where the model specifications are $\alpha_0 > 0$, $\alpha_1 \geq 0$, $\alpha_2 \geq 0$, $\alpha_3 \geq 0$ and $\alpha_1 + \alpha_2 \approx 1$. After several rigorous empirical estimations through the standard *GARCH* model, it is seen that the specification $\alpha_1 + \alpha_2 < 1$ does not hold for the Indian derivatives market. This is observed in both the present study and previous studies. Therefore, the Integrated Generalized Autoregressive Conditionally Heteroskedastic model is used. Hence, the variance return regression model is with the specification $\alpha_1 + \alpha_2 \approx 1$.

return the square of one lag of '$w_t = w_{t-1}^2$'. In these situations, if the conditional expected value is realized with significant level, then there is logical reason to measure and evaluate the level of realization in relation to market making. This is estimated in the following second stage *IGARCH (1, 1)* model specification.

$$M_{3t} = \gamma_{01} + \gamma_{11}u_{t-1} + \gamma_{21}u_{t-2} + \gamma_{31}w_{t-1} + \gamma_{41}T_{pt} + \gamma_{51}\sum_{i=1}^{3} D_i + \varepsilon_{m3t} \quad \ldots (6)$$
$$h_{1t} = \delta_{01} + \delta_{11}\varepsilon_{m3t-1}^2 + \delta_{21}h_{1t-1} + \delta_{31}w_{t-1}^2$$

In Equation (6, 7, and 8), market participants' exogenous conditional probabilistic values are clustered with 'T_t' of nifty futures. Therefore, '$u_{t-1} = u_t - u_{t-1}$', '$u_{t-2} = u_t - u_{t-2}$', '$w_{t-1} = w_t - w_{t-1}$' and '$w_{t-1}^2 = (w_t - w_{t-1})^2$' are derived from the first stage regression and used as independent variables in the second stage regressions. In this second stage model, the effect of total money supply in the economy, the number of market lots i.e. the market depth on transaction and impact cost is incorporated. This is because; trading transaction depends on the broad money through the volume of call-money market. Here, the inter-bank call interest rate is the significant factor that determines financial resources for investment in derivatives market. Equation (6) shows the market determined equilibrium-trading price that provides incentives to borrow for investment purposes. Through this reference-trading price i.e. the market determined risk free price, the volume of borrowing or lending i.e. the financial resources is utilized efficiently.

$$M_{lt} = \gamma_{02} + \gamma_{12}u_{t-1} + \gamma_{22}u_{t-2} + \gamma_{32}w_{t-1} + \gamma_{42}T_{pt} + \gamma_{52}\sum_{i=1}^{3} D_i + \varepsilon_{mlt} \quad \ldots (7)$$
$$h_{2t} = \delta_{02} + \delta_{12}\varepsilon_{mlt-1}^2 + \delta_{22}h_{2t-1} + \delta_{32}w_{t-1}^2$$

From Equation (7), the impact of the number of market lots and hence the impact of tick value and price discreteness on the nifty transaction can be assessed. Here depending upon the equilibrium 'T_{pt}' and considering the appropriate price discreteness, the appropriate 'M_{lt}' can be identified in the next day of the trading to either long or short for hedging in the

nifty futures. Hence, the transaction is hedged efficiently where both the systematic and unsystematic risks are reduced.

$$C_t = \gamma_{03} + \gamma_{13} u_{t-1} + \gamma_{23} u_{t-2} + \gamma_{33} w_{t-1} + \gamma_{43} T_{pt} + \gamma_{53} \sum_{i=1}^{3} D_i + \varepsilon_{ct} \quad \ldots (8)$$
$$h_{3t} = \delta_{03} + \delta_{13} \varepsilon_{ct-1}^2 + \delta_{23} h_{3t-1} + \delta_{33} w_{t-1}^2$$

The relationship between the impact costs and the risk-neutral trading futures price is established. This is because; the daily last trading price motivates to reduce the losses in trading and hence it ensures profitable transaction. In this context, one can observe the study of Graham et. al. (2003). This study has examined the effect of transaction costs (bid-ask spread) on premium and returns. Graham et. al. (2003) have found that as the transaction costs falls, the ex-dividend day abnormal trading return does not rise significantly.

In all the mean equations, the dummy variables 'D_i' are modeled where 'i' represents the trading hours of *1* = the initial period of the nifty trading, *2* = in between the initial and the last periods of trading and *3* = the last period of the nifty trading. These trading hours affect the borrowing from banks and financial institutions or lending to the market participants, number of market lots to be hedged, impact cost, and the trading transactions. Therefore, with these three models in second stage *IGARCH* (*1, 1*), the exogenous conditional probabilistic values for the first stage *IGARCH* (*1, 1*) dependent variable are measured and evaluated.

In Equation (6, 7 and 8), '$\hat{\gamma}_{51}$', '$\hat{\gamma}_{52}$', and '$\hat{\gamma}_{53}$' measures the percentage change in total money supply in the derivatives market, number of market lots and impact costs for a given percentage change in trading hours. In the same equations, '$\hat{\gamma}_{41}$', '$\hat{\gamma}_{42}$', and '$\hat{\gamma}_{43}$' measures the percentage change in total money supply in the derivatives market, number of market lots and impact costs for a given percentage change in trading price. Again, '$\hat{\gamma}_{31}$',

'$\hat{\gamma}_{32}$', and '$\hat{\gamma}_{33}$' measures the percentage change in total money supply in the economy, number of market lots and impact costs for a given percentage change in other exogenous factor involved with creditworthiness.

Finally, '$\hat{\gamma}_{11}$', '$\hat{\gamma}_{21}$', '$\hat{\gamma}_{21}$', '$\hat{\gamma}_{22}$', '$\hat{\gamma}_{31}$', and '$\hat{\gamma}_{32}$' measures the percentage change in total money supply in the economy, number of market lots and impact costs for a given percentage change in other exogenous factors like non-trading hours etc., which are derived from the first stage estimation. All of these estimates affect the nifty trading transaction. In the second stage of variance return model, the effect of the positive independent creditworthiness is modeled with other properties of *IGARCH* (*1, 1*) model.

Therefore, in all Equations (1) to (8), both endogenous and exogenous conditional probabilistic beliefs for market participants are measured for the study sample period. That is returns (in monetary value) are maximized with creditworthiness and market making characters. These two are counted for the trading motives that are inherited, generated, initiated, and realized by all the market makers. Following empirical results are driving forces to analyze, assess, and judge market making and creditworthiness for nifty futures with signaling and screening equilibrium market model.

DATA

In this study, daily data are used. The National Stock Exchange of India Ltd. has provided these data. These daily data consist of *506* observations from December *02, 2002* to November *30, 2004*. In total, *5,060* observations in the model, including the data for the variables like 'i_{nt}'[5], '*DCP*', '*TTV*' and '*TTQ*' that are used for this study. Monthly broad money data are collected from *RBI*[6] where these are used as daily data for that particular

[5] www.rbi.org.in
[6] www.rbi.org.in

respective month. Monthly nifty impact cost data are collected from *NSE*[7], where these are used as daily data for that particular respective month.

Let us assume that the betas of each traded securities in *NSE* is one. During the study period, the market lot on the nifty futures was *200*. Therefore, nifty contract size is say base price i.e. *1000* × *200* = *200, 000 INR*. Now, assume that the total money value of the business in particular nifty trading day reflects as the total money supply, which was traded to sell or buy of nifty futures. Nifty market lots are bought or sold for long or short nifty position. Therefore, depending on these market positions and market sentiments the returns in terms of profit or loss is determined. Here, the movements of nifty influence these returns on market positions. In the first stage of the model, the nifty closing prices are used to evaluate the values where as in the second stage of the model, it is assumed that the base value for nifty is *1000*. This is because; the impact of the number of nifty market lots, those are traded for hedging purposes is calculated thereafter.

The tick value is equal to the multiplication of the tick size and the contract size. Tick size is Re. *0.05*, which is constant. The contract size is equal to the price of it multiplied with the market lot, which is determined by *NSE*. For hedging purpose, investor takes long positions of this nifty to gain or cover the losses. In this case, appropriate 'lot size' and 'the number of market lots' which are traded determines the appropriate tick-value-size ratio and thus the transaction and profit. Therefore, the calculation for 'the number of the nifty market lots (M_{lt}) or contract size at base price' that has been traded in the market is 'the total money value of the nifty business' divided by the value of one nifty market lot at nifty base price[8]. Therefore, daily *506* observations for 'M_{lt}' are calculated. Then in the two-stage modeling, the impact of the tick-value-size ratio on transaction through the trading price and other independent variables is focused. In all of the above models, logarithmic transformation for all the variables takes place where the functional form follows the log-linear model.

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[7] www.nseindia.com

[8] According to Circular No.: NSE/F&O/010/2007, dated February 6, 2007 the nifty market lot is revised for *50* than the preceding *100* and *200* consecutively.

In market, nifty futures contracts expire on the last 'Thursday' of each month. On the Friday following the last Thursday, usually new contracts with a three-month expiry are traded. Therefore, the day of the week 'Thursday Effect' is represented as the contract expiration effect on returns. This is because in an earlier study Prasanna Kumar and Supriya (2005) have shown that there is the 'Thursday Effect' on nifty trading. Badhani (2007) found that there is a significant expiration-day effect of derivatives contracts on price and volume of cash segment. The trading volume increases before and on expiration-day with increased selling pressure from the arbitrageurs who liquidate their positions. This makes a falling price situation. After expiration-day with correction process, again the trading volume decreases and the price increases. Choudhary and Choudhary (2008) have found that (1) '....the stock market of Australia, USA, Japan, Singapore, Switzerland, and Korea exhibited significant highest positive return on Thursday'. (2) '90 per cent of markets studied across the world had highest positive return on the days other than Monday...' (3) In the Asia-Pacific region, only two stock market i.e. India (SENSEX Index) and Japan could not accept the null hypothesis of equal average returns across the trading day exhibiting statistically significant differences in mean returns. This study is an additional argument to examine the 'Thursday Expiration Effect' on nifty returns.

In addition, all Thursdays of a complete three-month nifty future contract are also matter of concern when making decisions to hold the nifty contract at a particular market position. This is because of the variability and instability in securities market. Therefore, in this study period, the expiry Thursdays and all three-month Thursdays are assigned with dummy values *1* and 0 otherwise. Here these dummy values have an impact on trading as the proxy of credit availability. This is because without the financial resource either the contract will expire before the time period or reinvestment will be difficult. This will affect liquidity in the market.

To examine the impact of the time of submission of limit order i.e. trading hours, dummy value of *1* is assigned with the following logic. During the initial and developing stage of the nifty market (in between December *02, 2002* to November *30, 2004*), each one third of the study period is assigned with the dummy value of *1*. The first *1/3* of the study period is for

'the initial period of the nifty trading'. The second *1/3* of the study period is for 'in between the initial and the last period of the nifty trading'. The remaining *1/3* of the study period is for 'the last period of the nifty trading'. This is with the assumption that as the market matures there is no random and asymmetric limit order submission.

EMPIRICAL FINDINGS

Before empirical estimation, the Granger, Geweke-Meese-Dent *GMD* and Sim causality tests are conducted. These tests show that market margin and creditworthiness cause the transaction. The trading price, and timings of limit order submission cause the total money supply, the number of market lots traded and impact cost. This study also conducted the test on the long-run relationship between the dependent and independent variables in both stages of the *IGARCH* (*1, 1*) model. It is estimated that dependent and independent variables are perfectly contemporaneously correlated and cross-autocorrelation does not exist. Through the Engle-Granger-2-step procedure, the coefficients of Equation (9) are estimated. Here, with $T_{ct} = T_{ct} - T_{ct-1}$, $M_{ct} = M_{ct-1}$, $\Delta T_{ct} = T_{ct} - T_{ct-2}$, $\Delta M_{ct} = M_{ct} - M_{ct-2}$, $\Delta T_{ct-1} = \Delta T_{ct} - \Delta T_{ct-1}$, $\Delta M_{ct-1} = \Delta M_{ct} - \Delta M_{ct-1}$, and $\Delta \hat{u}_{ct} = \psi_1 \hat{u}_{ct-1} + e_{ct}$, the nifty equilibrium correction or error correction model[9] is,

$$\begin{aligned} T_{ct} &= \beta_{c0} + \beta_{c1} M_{ct} + u_{ct} \\ \Delta T_{ct} &= \delta_{e0} + \delta_{e1} \hat{u}_{ct-1} + \delta_{e2} \Delta T_{ct-1} + \delta_{e3} \Delta M_{ct-1} + v_{et} \end{aligned} \quad \ldots (9)$$

The equilibrium correction term '$\delta_{e1} \hat{u}_{ct-1}$' is included as independent variables in Engel-Granger-2 step error correction model, where the cointegrating vector is $(1 - \hat{\beta}_{c0} - \hat{\beta}_{c1})$. From Table (2), the estimated slope coefficient '$\hat{\beta}_{c0}$' in the cointegrating regression is negative and the estimated slope coefficient '$\hat{\beta}_{c1}$' in the cointegrating regression is with lower

[9] Bollerslev, Engle, and Wooldridge (1988), have stated that '.... a natural simplification is to assume that each covariance depends only on its own past values and surprises. Throughout this paper we shall therefore, take $p = q = 1$ and ... (p.120)'. This study is restricted at one lag length of variables same as Bollerslev, Engle, and Wooldridge (1988). This study also assumes the need for the second lag length of variables for trading transaction and margin. In latter stage of the study, these variables' logarithm transformations are considered.

positive value and approaching to zero. From Table (2), one can observe that $\left(1-\hat{\beta}_{c0}-\hat{\beta}_{c1}\right)$ is close to unity. The *DF T*-test statistics on residuals with one lag is |*-24.0156*| which, is greater than the *DF* critical value |*-3.43*| at *1%* significance level.

Therefore, the residual in Equation (9) is stationary in nature. The null hypothesis of a unit root in the regression residual corresponding to the no cointegration case is rejected[10]. Thus, the results indicate that transaction and trading margin variables are cointegrated. The alternative hypothesis of unit root is thus accepted. Hence, the long-run relationship between the transaction and trading margin holds good.

From Table (3) one can observe that the estimator '$\hat{\delta}_{e0}$' has a lower positive value and is approaching zero. The estimated coefficients like '$\hat{\delta}_{e1}$' and '$\hat{\delta}_{e2}$'suggest that the endogenous factors affect the trading transaction. In other words, if the endogenous factors rise by *1* per cent, on average, the trading transaction will rise by about *0.59* per cent. Similarly, if the two lag of trading transaction rises by *1* per cent, on average, the trading transaction will rise by about *0.50* per cent. This indicates that informed market participants may take the information advantage in the market. That is, market participants will get better profit if they will consider yesterday's trading transaction in relation to today's trading transaction.

The estimator '$\hat{\delta}_{e3}$' is negative (Table 3). This shows that if the trading margin rises by *1* per cent, on average, the trading transaction rises by about *-7.5747e-09* per cent. In other words, there is an inverse relationship between trading margin and transactions. In this context, it appears that there is a need for appropriate lending policy in relation to the trading transaction. Therefore, to achieve equilibrium and stable transaction, there is a need for balanced and sustainable creditworthiness and appropriate level of trading margin for the market participants.

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[10] Empirically it is tested that other variables in second stage *IGARCH (1, 1)* model are stationary in nature.

The first-stage regression estimation results are depicted in Table (4). The skewness statistics is *-0.28* at *1%* significance level. The kurtosis statistics is *2.19* at *0%* significance level. The Jarque-Bera statistics is *107.87* at *0%* significance level. Therefore, we reject the null hypothesis that the residuals do follow the normality condition. Results show the non-normality condition in the first-stage mean equation residuals. From Figure (2), it is clear that the autocorrelated disturbance terms exhibit higher cluster around zero ranging from *-1* to *+1*.

Table 2: Cointegration test

Estimates First Stage Model	**Estimated value with constant**
$\hat{\beta}_{c0}$	-2.7308e-04
$\hat{\beta}_{c1}$	1.1729e-08
DF test on residuals	**Test statistics**
$\hat{u}_{ct}$	-24.0156

Table 3: Estimated error correction model

Estimates First Stage Model	**With constant**	
	Estimated value	***t*-ratio**
$\hat{\delta}_{e0}$	7.6298e-05	0.0692
$\hat{\delta}_{e1}$	0.5912*	23.5012
$\hat{\delta}_{e2}$	0.4999*	28.5740
$\hat{\delta}_{e3}$	-7.5747e-09	-0.0806

* Significant at *1%* level. The present and the successive '*t*'-test statistics are with two-tailed test.

Therefore, the returns in terms of transactions are lower in volume and volatile in nature. These results clearly show that autocorrelation exists. To ensure equilibrium and stable transaction variance return, the Integrated Generalized Autoregressive Conditionally Heteroskedastic model is applied.

From Table (4), the constant slope coefficient '$\hat{\beta}_0$' i.e. *-2.27* is significant at *0%* level. This implies that the rate of transaction is changed by *-2.27* with the rate of change of other factors. Significant estimated slope coefficients '$\hat{\beta}_1$' and '$\hat{\beta}_2$' are negative (i.e. *-0.11* and *-0.004* respectively). We have seen that the estimated slope coefficient '$\hat{\beta}_2$' is negatively related with 'T_t' for the study sample period at appropriate significance level. Here, the study rejects the null hypothesis of equal mean value of credit availability and otherwise. It denotes that credit availability is restricted. The estimator '$\hat{\beta}_1$' is also negative.

These results show that the conditional probabilistic belief for transaction is negatively related with the coefficient of creditworthiness dummy. Therefore, this leads to inefficient valuation in the futures market. In variance return, there is the positive impact of credit availability but with lower value. That is, if the credit availability rises by *1* per cent, on average, the variance return rises by about *0.009* per cent. It can be seen in Figure (3) that the variance return varies from *0.00* to *0.56* over the study sample period.

From first-stage regression estimation result, it is concluded that the creditworthiness positions are not realized with significant endogenous conditional probabilistic values for the market participants. Thus the reasons for negative and low estimated coefficients in first-stage mean equation are explained in the second stage *IGARCH (1, 1)* regression models where 'M_{3t}', 'M_{1t}', and 'C_t' are used as dependent variables and 'u_{t-1}', 'u_{t-2}'[11], 'w_{t-1}', 'T_{pt}' and 'D_t' are used as independent variables. Here, the estimated coefficients explain the exogenous conditional probabilistic values.

From Table (5), significant estimated slope coefficients '$\hat{\gamma}_{511}$', '$\hat{\gamma}_{512}$', and '$\hat{\gamma}_{513}$' are *0.62*, *0.67*, and *0.77*. This implies that if the trading hours increase by *1* per cent of each *1/3* of total trading time-period (around *1.12* minutes of *111.67* minutes), on average, the total money supply will increase by about *0.62*, *0.67*, and *0.77* per cent respectively. This shows that the increase in money supply has significant effect on transaction during all the trading

[11] It is tested that the two-lag length of 'u_t' i.e. 'u_{t-2}' is significant and stationary.

hours. Therefore, the significant estimated coefficient '$\hat{\gamma}_{41}$' is *0.12*. This implies that, if the equilibrium-trading price rises by *1* per cent, on average, the total money supply will rise by about *0.12* per cent. In effect, this will affect the trading transactions and hence returns.

The estimated slope coefficients '$\hat{\gamma}_{31}$', '$\hat{\gamma}_{21}$', and '$\hat{\gamma}_{11}$' are negative with low significance level. The estimator '$\hat{\delta}_{31}$' in variance return (which is volatile in nature, see Figure 4) is also negative. This implies that money supply has a negative relationship with creditworthiness. Results supports the implication from inter bank call rates. If the inter-bank call rate rises, then demand for the financial resources will fall, and the volume of the call money will fall and the money stock will be unutilized. Therefore, the lending to banks, depository participants and other financial institutions will fall and vice-versa. Since the trading margin has a direct relationship with the call rate, this financing rate should be at an appropriate level, so that the availability of resources for reinvestment in nifty futures trading is ensured.

From Table (6), significant estimated slope coefficients '$\hat{\gamma}_{521}$', '$\hat{\gamma}_{522}$', and '$\hat{\gamma}_{523}$' are *-2.51*, *-1.49*, and *-1.56*. This implies that if the trading hours will increase with *1* per cent of each *1/3* of total trading time-period (around *1.12* minutes of *111.67* minutes), on average, the number of market lots will increase by about *-2.51*, *-1.49*, and *-1.56* per cent respectively. This shows that the number of market lots has a significant negative effect on transaction in all trading hours.

Therefore, the tick-value-size ratio has a negative effect on transaction. This is because, if market lot is inefficient, then the incentive for investment in nifty market will be low. Again, inefficient market lot causes inefficient tick value and thus inefficient discreteness. This discreteness has an important role in nifty pricing. Since this is empirically inefficient, the role of it in nifty trading is also inefficient. Therefore, one can conclude that discreteness is negatively affecting the trading transaction through the inefficient number of nifty market lots.

Table 4: First stage *IGARCH (1, 1)* regression

In first stage, *IGARCH (1, 1)* regression results estimates consists of the daily data from December *02, 2002* to November *30, 2004*. Mean and conditional variance equations are $T_t = \beta_0 + \beta_1 M_t + \beta_2 w_t + u_t$, and $h_t = \alpha_0 + \alpha_1 u_{t-1}^2 + \alpha_2 h_{t-1} + \alpha_3 w_{t-1}^2$. Standard errors are in parenthesis. Figure (1) and (2) represents the first-stage estimated mean and variance returns respectively.

Estimates	First stage model
$\hat{\beta}_0$	-2.2663* (0.1105)
$\hat{\beta}_1$	-0.1117* (0.0109)
$\hat{\beta}_2$	-0.0037*** (0.0118)
$\hat{\alpha}_0$	0.0079* (0.0013)
$\hat{\alpha}_1$	0.9556* (0.0557)
$\hat{\alpha}_2$	0.0444*** (0.0557)
$\hat{\alpha}_3$	0.0087* (0.0032)
Log-Likelihood	745.7772
Skewness	-0.2754**
Kurtosis	2.1939*
Jarque-Bera	107.8696*

* Significant at *0%* level.
** Significant at *1%* level.
*** Significant at lower than *1%* level.

Figure 2: $u_t = T_t - \beta_0 - \beta_1 M_t - \beta_2 w_t$

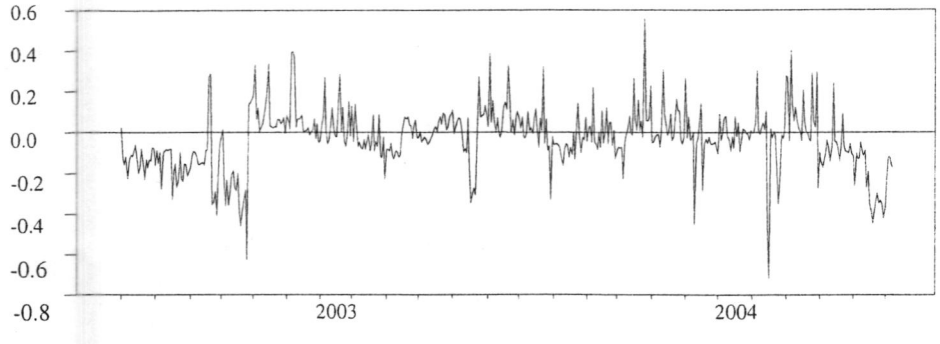
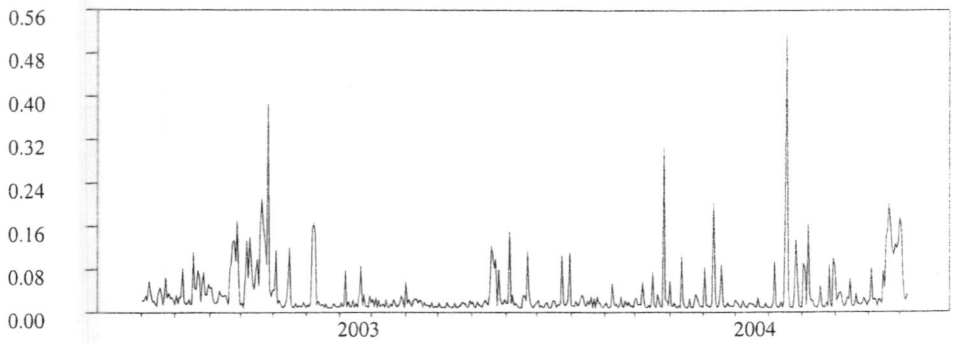


Figure 3: $h_t = \alpha_0 + \alpha_1 u_{t-1}^2 + \alpha_2 h_{t-1} + \alpha_3 w_{t-1}^2$



From Table (6), it can be seen that the significant estimated slope coefficient '$\hat{\gamma}_{42}$' is *2.35*. This implies that, if the equilibrium-trading price increases by *1* per cent, on average, the number of market lots will increase by about *2.35* per cent. In effect, this will affect the trading transactions positively. Therefore, here one can conclude that there is a positive relationship between the number of market lots and the trading transactions.

The estimators '$\hat{\gamma}_{22}$' and '$\hat{\gamma}_{12}$' are negative with low significance level. This means that other factors are negatively affecting the number of market lots traded in the market. The estimator '$\hat{\gamma}_{32}$' is positive but insignificant. Here one can say that the creditworthiness has an insignificant positive impact on the number of market lots and on transactions. The estimator '$\hat{\delta}_{32}$' in variance return (which is volatile in nature ranging from *0.0* to *3.5*, Figure 5) is positive and close to zero by *0.009*. This implies that the number of market lots and thus the discreteness have the low or negative impact on transaction with lower creditworthiness.

Table 5: Second stage *IGARCH (1, 1)* regression (M_{3t})

In first stage, *IGARCH (1, 1)* regression results estimates consists of the daily data from December *02, 2002* to November *30, 2004*. Mean and conditional variance equations are $M_{3t} = \gamma_{01} + \gamma_{11}u_{t-1} + \gamma_{21}u_{t-2} + \gamma_{31}w_{t-1} + \gamma_{41}T_{pt} + \gamma_{51}\sum_{i=1}^{3} D_i + \varepsilon_{m3t}$,

and $h_{1t} = \delta_{01} + \delta_{11}\varepsilon^2_{m3t-1} + \delta_{21}h_{1t-1} + \delta_{31}w^2_{t-1}$.

Standard errors are in parenthesis. Figure (3) represents the estimated second-stage variance returns.

Estimates	Second stage model (M_{3t})
$\hat{\gamma}_{01}$	12.8999*
	(0.0736)
$\hat{\gamma}_{11}$	-0.0002
	(0.0009)
$\hat{\gamma}_{21}$	-0.0011**
	(0.00097)
$\hat{\gamma}_{31}$	-0.00002
	(0.0002)
$\hat{\gamma}_{41}$	0.1196*
	(0.0011)
$\hat{\gamma}_{511}$	0.6217*
	(0.0660)
$\hat{\gamma}_{512}$	0.6658*
	(0.0656)
$\hat{\gamma}_{513}$	0.7728*
	(0.0656)
$\hat{\delta}_{01}$	0.000003*
	(0.000001)
$\hat{\delta}_{11}$	0.9667*
	(0.0353)
$\hat{\delta}_{21}$	0.0333**
	(0.0353)
$\hat{\delta}_{31}$	-0.000001**
	(0.0000007)
Log-Likelihood	2121.2453

* Significant at *0%* level, ** Significant at lower than *1%* level, ** Significant at lower than *1%* level

Figure 4: $h_{1t} = \delta_{01} + \delta_{11}\varepsilon^2_{m3t-1} + \delta_{21}h_{1t-1} + \delta_{31}w^2_{t-1}$

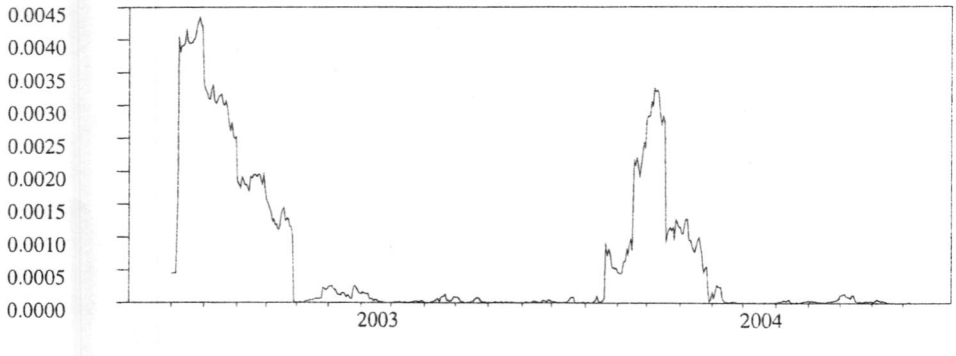


Table 6: Second stage *IGARCH* (*1, 1*) regression (M_{lt})

In first stage, *IGARCH* (*1, 1*) regression results estimates consists of the daily data from December *02, 2002* to November *30, 2004*. Mean and conditional variance equations are $M_{lt} = \gamma_{02} + \gamma_{12} u_{t-1} + \gamma_{22} u_{t-2} + \gamma_{32} w_{t-1} + \gamma_{42} T_{pt} + \gamma_{52} \sum_{i=1}^{3} D_i + \varepsilon_{mlt}$,

and $h_{2t} = \delta_{02} + \delta_{12} \varepsilon^2_{mlt-1} + \delta_{22} h_{2t-1} + \delta_{32} w^2_{t-1}$

Standard errors are in parenthesis. Figure (4) represents the estimated second-stage variance returns.

Estimates	Second stage model (M_{lt})
$\hat{\gamma}_{02}$	-4.1270*
	(0.4645)
$\hat{\gamma}_{12}$	-0.1762**
	(0.1083)
$\hat{\gamma}_{22}$	-0.2340**
	(0.1346)
$\hat{\gamma}_{32}$	0.0085
	(0.0177)
$\hat{\gamma}_{42}$	2.3486*
	(0.1280)
$\hat{\gamma}_{521}$	-2.5089*
	(0.4198)
$\hat{\gamma}_{522}$	-1.4930*
	(0.4865)
$\hat{\gamma}_{523}$	-1.5580*
	(0.4832)
$\hat{\delta}_{02}$	0.0416**
	(0.0197)
$\hat{\delta}_{12}$	0.8875*
	(0.2047)
$\hat{\delta}_{22}$	0.1125**
	(0.2047)
$\hat{\delta}_{32}$	0.0086**
	(0.0129)
Log-Likelihood	266.2920

* Significant at *0%* level, ** Significant at lower than *1%* level

Figure 5: $h_{2t} = \delta_{02} + \delta_{12} \varepsilon^2_{mlt-1} + \delta_{22} h_{2t-1} + \delta_{32} w^2_{t-1}$

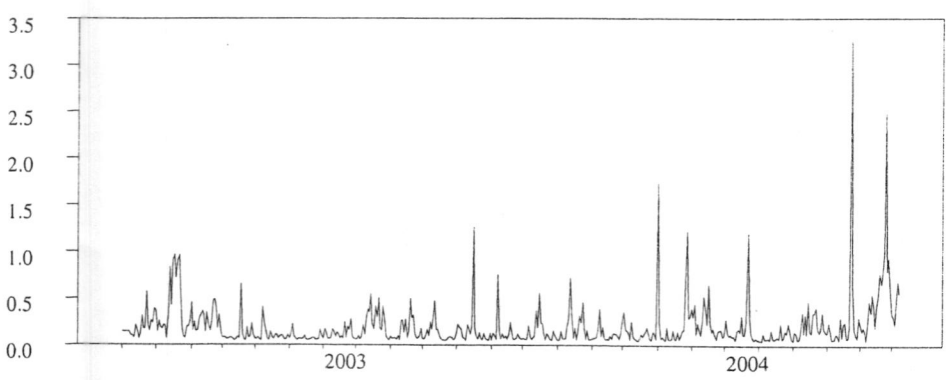


Table 7: Second stage *IGARCH* (*1, 1*) regression (C_t)

In first stage, *IGARCH* (*1, 1*) regression results estimates consists of the daily data from December *02, 2002* to November *30, 2004*. Mean and conditional variance equations are $C_t = \gamma_{03} + \gamma_{13} u_{t-1} + \gamma_{23} u_{t-2} + \gamma_{33} w_{t-1} + \gamma_{43} T_{pt} + \gamma_{53} \sum_{i=1}^{3} D_i + \varepsilon_{ct}$,

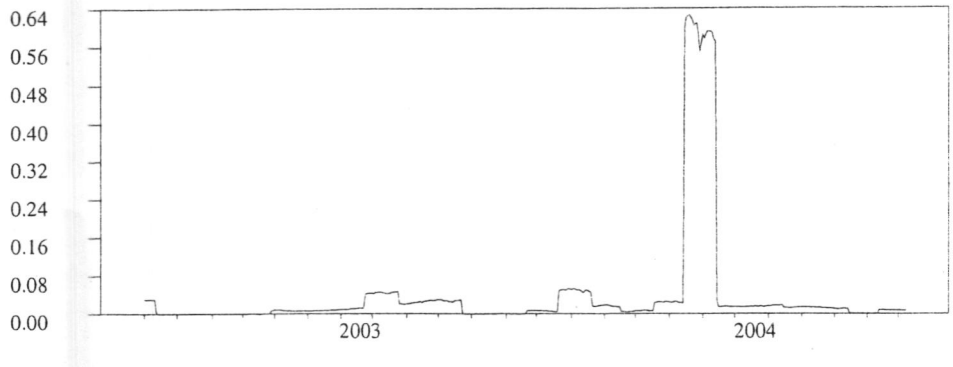
and $h_{3t} = \delta_{03} + \delta_{13} \varepsilon_{ct-1}^2 + \delta_{23} h_{2t-1} + \delta_{33} w_{t-1}^2$

Standard errors are in parenthesis. Figure (5) represents the estimated second-stage variance returns.

Estimates	Second stage model (C_t)
$\hat{\gamma}_{03}$	-0.4141*
	(0.0135)
$\hat{\gamma}_{13}$	1.0487e-03
	(2.2688e-03)
$\hat{\gamma}_{23}$	1.8638e-04
	(2.6162e-03)
$\hat{\gamma}_{33}$	1.9693e-05
	(1.3000e-03)
$\hat{\gamma}_{43}$	-0.1660*
	(1.6096e-03)
$\hat{\gamma}_{531}$	-0.8345*
	(3.9022e-03)
$\hat{\gamma}_{532}$	-0.6754*
	(4.1123e-03)
$\hat{\gamma}_{533}$	-0.9036*
	(4.8527e-03)
$\hat{\delta}_{03}$	-1.8979e-07
	(2.6256e-06)
$\hat{\delta}_{13}$	0.9731*
	(8.2868e-03)
$\hat{\delta}_{23}$	0.0269*
	(8.2868e-03)
$\hat{\delta}_{33}$	4.2952e-06**
	(5.3691e-06)
Log-Likelihood	1122.0544

* Significant at *0%* level, ** Significant at lower than *1%* level

Figure 6: $h_{3t} = \delta_{03} + \delta_{13} \varepsilon_{ct-1}^2 + \delta_{23} h_{2t-1} + \delta_{33} w_{t-1}^2$



In Table (7), the significant estimated slope coefficients '$\hat{\gamma}_{531}$', '$\hat{\gamma}_{532}$', and '$\hat{\gamma}_{533}$' are *-0.84*, *-0.68*, and *-0.90*. That is if the trading hours increase by *1* per cent of each *1/3* of total trading time-period (around *1.12* minutes of *111.67* minutes), on average, the impact cost increases by *-0.84*, *-0.68*, and *-0.90* per cent respectively. Therefore, the impact cost has a significant reduction effect on transactions at 'the last period of the nifty trading hours' than other trading hours as compared to other trading hours. Surprisingly this impact cost is more 'in between the initial and the last period of the nifty trading.

Table (7), shows that the significant estimator'$\hat{\gamma}_{43}$' is *-0.17*. This implies that, if the trading price will increases by *1* per cent, on average, the impact cost will increase by about *-0.17* per cent, which is more than the other variables. In effect, this will affect the trading transactions and hence returns. Therefore, equilibrium price where the change in it affects more than the other variables on the change in impact costs. This justifies for the symmetric information nature of the last trading price.

The estimated slope coefficients '$\hat{\gamma}_{13}$', '$\hat{\gamma}_{23}$', and '$\hat{\gamma}_{33}$' are positive but close to zero by *0.0010487*, *0.00018638*, and *0.000019693* at lower significance level. This means that other factors including the creditworthiness of market participants affects the impact cost negligibly. Here, one can say that creditworthiness has negligible effect on impact cost when efficient money supply management through inter-bank call rate exists. Thus, the efficient effect of impact cost on the trading transaction will withstand.

The estimator '$\hat{\delta}_{33}$' in variance return (which is volatile in nature ranging from *0.00* to *0.64*, Figure 6) is very low by *0.0000042952*. This implies that the impact cost is negligibly related with creditworthiness through its variance return. From these empirical results, it is observed that impact cost has a negative effect on transactions. This is because of inefficient hedging in nifty derivatives market. The risk reduction in securities is less even in spite of usage of derivatives.

From both stages of empirical estimation, it is observed that the independent variables cause the dependent variables. All variables in the two-stage *IGARCH* (*1, 1*) model are stationary in nature. In first stage of estimation, it is observed that the trading transaction and trading margin are cointegrated thereby indicating a long-run relationship between them. In the first stage of *IGARCH* (*1, 1*) model, heteroscedasticity with the mean return is observed where the estimated coefficients are negative. This indicates that, for efficient transaction, there is a need for efficient trading margin and creditworthiness. The first stage estimation shows that the transaction value is negative for market participants. This is because the efficient trading margin and effective creditworthiness positions are not realized due to other endogenous and exogenous conditional probabilistic values. These are estimated with the second stage *IGARCH* (*1, 1*) regression models.

From second stage regression estimation, it is observed that there is a direct relationship between the trading price and money supply and thus the trading transaction. This money supply increases gradually until the last trading hour. In variance return, money supply is negatively related with the creditworthiness of market participants. In this case, the efficient inter-bank call rate is necessary to maintain the trading margin for efficient trading transaction. In effect, efficient returns will be achieved.

The tick value is the product of tick size and contract size. Contract size is equal to the product of the base nifty price and the number of market lots, which are traded in the market. Here, the nifty base value is constant and the tick size is constant. The tick-value-size ratio, so the price discreteness depends on the number of market lots (market depth). Therefore, price discreteness and its optimality are judged through the number of market lots. In this stage, it is observed that there is a positive relationship between the trading price and number of market lots. However, with negative creditworthiness the number of market lots has negative impact on trading transactions in all trading hours. Therefore, the price discreteness has a negative impact on trading transactions.

The impact cost is negatively related with all of the nifty trading hours. Impact cost is also negatively related with trading price. Creditworthiness has lower effect on impact cost.

Therefore, impact cost negatively affects the trading transaction. This indicates that the trading risks and losses are not minimized with hedging positions. From this, one can easily suggest that with more creditworthiness through efficient money supply management impact cost will have a positive impact on the trading transaction. Thus, the efficient returns will be achieved.

CONCLUSION

From the analysis, it is seen that creditworthiness, trading margin, price discreteness, time of submission of limit orders, number of market lots are derived market making signals. These derived market making signals have an important role as decision making signals. Through these signals, investors will be able to infer the market knowledge and accordingly participate in trading for efficient returns. These results explain the objectives like to observe the rate of market participation and to evaluate and assess the valuation in the derivatives market.

The objective i.e. to assess the price discreteness and its optimality, is judged through the number of market lots. It is empirically observed that there is a positive relationship between the trading price and number of market lots. However, with negative creditworthiness the number of market lots has negative impact on trading transactions in all trading hours. Therefore, the price discreteness has a negative impact on trading transactions.

The objective i.e. to analyze financial-resource utilization by the bank-custodian depository participants, it is empirically observed that there is a direct relationship between the trading price and the total money supply and thus the trading transaction. Increase in the total money supply increases the money supply in the derivatives market gradually until the last trading hour. In return, the total money supply is negatively related with the creditworthiness of market participants. In this case, the efficient inter-bank call rate is necessary to maintain the trading margin for efficient trading transaction and thus returns.

In addition to the above, the valuation estimator '$\hat{\beta}_1$' is not constant over time. This is because, the empirical result shows that the estimator '$\hat{\beta}_1$' (the percentage change in transaction in response to a one percent change in margin) is $|-0.1117|$. This shows that the nifty or price elasticity does not lead to perfect competitive character[12]. This is because in pure or perfect competitive market, the elasticity of demand is highly elastic, where a small decrease in margin results in a more than proportional increase in transactions, marginal revenue is positive, and the total revenue or return increases. This is not the case with the nifty, where the elasticity of demand is less elastic (i.e. $|-0.1117| < 1$). Therefore, with this noncompetitive character, monopoly may emerge and take the advantage of price discrimination with imbalance nifty pricing.

In another dimension, one may judge for the degree of monopoly nifty in futures market. Result shows that the market elasticity is $|-0.1117|$. Therefore, marginal revenue for this entire nifty trading is,

$$MR = p\left(1 - \frac{1}{e_m}\right)$$

$$\Rightarrow \quad MR = p\left(1 - \frac{1}{|-0.1117|}\right)$$

$$\Rightarrow \quad MR = p(1 - 8.9526)$$

$$\Rightarrow \quad MR = p(-7.9526)$$

$$\Rightarrow \quad MR = Mar.(-7.9526)$$

In $MR = Margin$ (- 7.9526), the margin or price is positive and the other part of the equation of *R.H.S* is negative. Therefore, marginal revenue is negative. This negative or falling marginal revenue indicates that the total revenue or profit curve for nifty trading is concave and it is with global optima. In this case, the total cost minimization is with global optima. The

[12] Here transaction represents the demand for trading and hence returns and market margin represents price for this trading. One should not confuse with the term nifty elasticity and price elasticity, as here both are having the same definition. Therefore, the elasticity is considered with the price elasticity measurement.

second stage of estimation shows that if the trading price will increase by *1* per cent on average the impact cost will increase by about |*-0.17*| per cent. This elasticity or responsiveness is greater than the effect of other variables in the model. From this, one can conclude that the change in marginal cost (MC)[13] is more or less with constant state of situation. This is because the trading price is the risk neutral factor. Therefore, the marginal cost burden will be almost |*-0.17*|. Where as comparing with it the marginal revenue is more negative or falling state of nature. In this case, the burden of the marginal cost is greater leading to loss in trading. Hence, this inequality of marginal revenue and marginal cost leads to the inefficient profit maximization.

In addition, the nifty (firm) in futures market is with the economic set up of $p = \frac{MC}{1-(1/e_m)} = \frac{MC}{1-(1/|-0.1117|)} = \frac{MC}{1-(8.9526)} = \frac{MC}{-7.9526} = -0.1257(MC)$. Here, the demand (transaction) is less elastic therefore the price (margin) is not close or equal to the marginal cost. Therefore, the inequality of marginal revenue and marginal cost clearly shows that the perfect competitive nifty does not exist where the total return is falling. In this case, the appropriate credit policy through inter-bank call rate mechanism is required to ensure the liquidity position.

Together these results indicate that there is the adverse selection effect on valuation, resource mobilization, and trading direction with the monopoly power 09. The competitive profit maximization is not achieving in the nifty restricting the market efficiency, and transparency. Hence, the asymmetric information in nifty trading withstands. However, this is expected that in course of time nifty futures will evolve into a competitive market leading to the efficient valuation.

These empirical results are the driving forces to analyze, assess, and judge market making and creditworthiness for nifty futures with signaling and screening equilibrium market model.

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[13] Here this impact cost is the proxy for the total cost in nifty trading.

DIRECTION FOR FUTURE RESEARCH

Future research can focus on the hedging effectiveness and efficiency in other market activities like speculation and arbitration. In this context too significance of market making signals is underscored.

APPENDIX

A1: List of NSE F&O sub-brokers in Hubli-Dharwad City

NSE F&O sub-brokers		
Sl. No.	**Name and Address**	**Trading Registration Number at NSE/SEBI**
1	Mr. Ishwar Ningappa Yenagi Kotak Securities Ltd., Achyut Arcade, P. B. Road, Besides Corporation Bank, Dharwad, 580 001, Karnataka.	INB 230808130
2	Mr. Santosh Holihosur Asit C Mehta Investment Intermediaries Ltd. Shakti Securities, Holihosur Building, Near H.P.O,Station Road, Dharwad, 580 001, Karnataka.	INS 232030911/23-05072
3	Mr. Manoj M. Bhandari IL&FS Investment Securities Ltd., Shop No.6, 1st Flr., Corporation Building, Subhash Road, Dharwad, 580 001, Karnataka.	INB 231020833
4	Mr. Rajashekhar N Chakalabbi Bulz-I Securities, Horkeri Building, 1st Flr., Citi Complex, City Market, Dharwad, 580 001, Karnataka.	INB 231041238
5	Mr. Basavaraj S Moolge Apollo Sindhoori Capital Investments Ltd. Prasad Drug Emporium Municipal No. 10402, P. B. Road, Dharwad, 580 006, Karnataka.	INS 232344213/23-10539
6	Mr. Muralidhar Singonamalli Anagram Securities Ltd. # 36, Vatsalya Hastinapur Layout, Hubli, 580 023, Karnataka.	7197013/NSE/BSE

A2: NSE F&O Investors at Kotak Securities Ltd., Achyut Arcade, P. B. Road, Dharwad, 580 001, Karnataka.

Sl. No.	Name and Address	Trading Number at Kotak Securities Ltd., for NSE F&O trading.
1	Mr. Mahesh S Tallur Shrinagar, 2nd Cross, Dharwad, Karnataka.	Y32V4
2	Mr. Khajachasanali L Nadaf J.C., Dharwad, Karnataka. Ph. No.: 9448304795	KGRQ0
3	Mr. Arjun N Kambogi Gandhi Nagar, Dharwad, Karnataka. Ph. No.: 9448751625	AZPZ3
4	Mr. Mallikarjun A M Sreenagar Circle, Dharwad, Karnataka. Ph. No.: 9242851844	XPO60
5	Mr. Namdev Gurunathappa Bhasme Siddharoda Nagar, Behind Radhakrishna Nagar, Dharwad, Karnataka. Ph. No.: 9449354580	NKQF0
6	Mr. Vrushabhaling Kallapa G Navodaya Nagar, Dharwad, Karnataka. Ph. No.: 9845541089	VXAP0
7	Mr. Rajendra S Hosamath # 93, Shivagiri, Dharwad, Karnataka.	RNUI7
8	Mr. Shivakumar Anad # 23, Tahasildar Galli, Dharwad, Karnataka.	Q2313
9	Mr. Shashidhar Kadlur KY5 Avenue, Hariyal Road, Shrinagar, Dharwad, Karnataka. Ph. No.: 9448111886	YHNI3
10	Mr. Irfan Ahmed M Shaikh Hoayallpur Road, Dharwad, Karnataka. Ph. No.: 9448838571	IAG86
11	Mr. Achuyt Narayan Tejesvi Nagar, Dharwad, Karnataka. Ph. No.: 9448368569	XHO89
12	Mr. Prakash G M Shrinagar Circle, Near Railway Gate, Dharwad, Karnataka. Ph. No.: 9845333642	YBSI3
13	Mr. Mahantesh B Bankapur Narayanpur, Dharwad, Karnataka. Ph. No.: 9448371577	M6B85
14	Mr. Ramachandra N Karpur Tejesvi Nagar, Dharwad, Karnataka. Ph. No.: 9448916335	XRVN1
15	Mr. Nijaguna Prabhu S Kongi # 9, Srinagar, Dharwad, Karnataka. Ph. No.: 9886222140	Inv. Con./Investor

A3: Questionnaire for *NSE F&O* sub-brokers

Please make a tick mark '√' for the following information(s) wherever it is applicable.

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1. Name and address: ☐

2. Trading registration number at NSE/SEBI: ☐

3. Age: ≤ 20 ☐ , ≤ 30 ☐ , ≤ 40 ☐ , ≤ 50 ☐ , ≤ 60 ☐

4. Education: Under-graduate ☐ , Graduate ☐ , Post-graduate ☐

5. I have a professional course on securities or derivatives market.

Yes ☐ , No ☐

6. I have undergone the training on securities and derivatives market.

Yes ☐ , No ☐

7. Profession / Designation: Investor ☐ , Sub-broker ☐ , Broker ☐ , Investment Consultant ☐

8. Year(s) of securities market experience:

≥ 01 ☐ , ≥ 02 ☐ ,, ≥ 03 ☐ , ≥ 04 ☐ , ≥ 05 ☐ , ≥ 10 ☐ , ≥ 15 ☐ , ≥ 20 ☐

9. Year(s) of derivatives market experience:

≥ 01 ☐ , ≥ 02 ☐ , ≥ 03 ☐ , ≥ 04 ☐ , ≥ 05 ☐ , ≥ 10 ☐ , ≥ 15 ☐ , ≥ 20 ☐

10. Total number of clients: ☐

11. It is expected that the total number of clients will increase. Yes ☐ , No ☐

12. Daily nifty trading volume (Rs.): ☐

A3: Continued

Please make a tick mark '√' for the following statements wherever it is applicable.

S.N.	Statements	Yes	No
1.	CNX nifty trading is comfortable with Dealers, Brokers, and Investors.		
2.	Daily nifty trading volume is enough for assuring the commission / profit.		
3.	Daily nifty open interest is enough for assuring the commission / profit.		
4.	Open interest and trading volume heavily depend on the local market.		
5.	For local market, the online trading is more convenient.		
6.	Local online trading depends on the local advertisement of the nifty futures.		
7.	Out-of-state and foreign online trading does exist.		
8.	Local online trading is preferable than the out-of-state and foreign online trading.		
9.	Usually all the order values are entered through the front end of Regular Book.		
10.	It is easy to trade with market orders than the limit orders for the nifty futures.		
11.	It is easy to trade with limit orders than the market orders for the nifty futures.		
12.	Submission of limit orders is high during;		
	a. The initial periods of nifty trading.		
	b. The last periods of nifty trading.		
	c. In between initial and last periods of nifty trading.		
13.	Submission of market orders is high during;		
	a. The initial periods of nifty trading.		
	b. The last periods of nifty trading.		
	c. In between initial and last periods of nifty trading.		
14.	Usually a high difference between nifty spot and futures price does exist.		
15.	All passive orders are used to be executed.		
16.	All active orders are used to be executed.		
17.	All good-till-day orders are preferred in trading than day, *GTC* and fill/kill orders.		
18.	Always the order execution faces the basis risk with costs (at least time wise).		
19.	Small hedgers do exist in nifty trading.		
20.	Large hedgers do exist in nifty trading.		
21.	For nifty, 'hedging' experiences with futile trading.		
22.	Small speculators do exist in nifty trading.		
23.	Large speculators do exist in nifty trading.		
24.	For nifty, 'speculation' experiences with futile trading.		

A3: Continued

S.N.	Statements	Yes	No
25.	'Arbitrage' is one of the important trading activities for nifty trader.		
26.	Transaction cost is well adjusted with arbitrage in cash market.		
27.	The present tick size is enough for trading activities.		
28.	Present tick size is enough to place buy and sell limit/market orders.		
29.	Tick size does affect the submission of limit/market orders.		
30.	Submission rate of limit/market orders do affect the tick size.		
31.	Usually number of ticks for placing limit/market orders are high during		
	a. The initial periods of nifty trading.		
	b. The last periods of nifty trading.		
	c. In between initial and last periods of nifty trading.		
32.	Number of ticks is under the control of clearing members.		
33.	Number of ticks is under the control of trading members.		
34.	Number of ticks is under the control of clients.		
35.	Tick size is very much related with the trading margins.		
36.	For derivatives trading all types of margin are at satisfactory level.		
37.	The initial margin is appropriate at both client and proprietary level.		
38.	There is no hassle for initial margin collection at client level.		
39.	For client, the proper and correct information on initial margin is available.		
40.	Clients are easy to deposit the initial margins.		
41.	The brokerage commission is ensured satisfactorily.		
42.	Market participants may have the access of the call money market.		
43.	Call rate may be an alternative to bank rate for nifty trading if (42) is satisfied.		
44.	Depository participants and clearing banks may use the call money market.		
45.	The availability of funds and securities by pay-in time is;		
	a. = 100%		
	b. < 100%		
	c. > 100%		
	d. Not sure		

A4: Questionnaire for *NSE F&O* investors

Please make a tick mark '√' for the following information(s) wherever it is applicable.

---

1. Name and address: ☐

2. Client membership number: ☐

3. Age: ≤ 20 ☐ , ≤ 30 ☐ , ≤ 40 ☐ , ≤ 50 ☐ , ≤ 60 ☐

4. Education: Under-graduate ☐ , Graduate ☐ , Post-graduate ☐

5. I have a professional course on securities or derivatives market.

Yes ☐ , No ☐

6. I have undergone the training on securities and derivatives market.

Yes ☐ , No ☐

7. Profession / Designation: Investor ☐ , Sub-broker ☐ , Broker ☐ , Investment Consultant ☐

8. Year(s) of securities market experience:

≥ 01 ☐ , ≥ 02 ☐ , ≥ 03 ☐ , ≥ 04 ☐ , ≥ 05 ☐ , ≥ 10 ☐ , ≥ 15 ☐ , ≥ 20 ☐

9. Year(s) of derivatives market experience:

≥ 01 ☐ , ≥ 02 ☐ , ≥ 03 ☐ , ≥ 04 ☐ , ≥ 05 ☐ , ≥ 10 ☐ , ≥ 15 ☐ , ≥ 20 ☐

A4: Continued

Please make a tick mark '√' for the following statements wherever it is applicable.

S.N.	Statements	Yes	No
1.	CNX nifty trading is comfortable with Dealers, Brokers, and Sub-brokers.		
2.	Daily nifty trading volume is enough for assuring the profit.		
3.	Daily nifty open interest is enough for assuring the profit.		
4.	Open interest and trading volume heavily depend on the local market.		
5.	For local market, the online trading is more convenient.		
6.	Local online trading depends on the local advertisement of the nifty futures.		
7.	Out-of-state and foreign online trading does exist.		
8.	Local online trading is preferable than the out-of-state and foreign online trading.		
9.	Usually all the order values are entered through the front end of Regular Book.		
10.	It is easy to trade with market orders than the limit orders for the nifty futures.		
11.	It is easy to trade with limit orders than the market orders for the nifty futures.		
12.	Submission of limit orders is high during;		
	a. The initial periods of nifty trading.		
	b. The last periods of nifty trading.		
	c. In between initial and last periods of nifty trading.		
13.	Submission of market orders is high during;		
	a. The initial periods of nifty trading.		
	b. The last periods of nifty trading.		
	c. In between initial and last periods of nifty trading.		
14.	Usually a high difference between nifty spot and futures price does exist.		
15.	All passive orders are used to be executed.		
16.	All active orders are used to be executed.		
17.	All good-till-day orders are preferred in trading than day, GTC and fill/kill orders.		
18.	Always the order execution faces the basis risk with costs (at least time wise).		
19.	Small hedgers do exist in nifty trading.		
20.	Large hedgers do exist in nifty trading.		
21.	For nifty, 'hedging' experiences with futile trading.		
22.	Small speculators do exist in nifty trading.		
23.	Large speculators do exist in nifty trading.		
24.	For nifty, 'speculation' experiences with futile trading.		

A4: Continued

S.N.	Statements	Yes	No
25.	'Arbitrage' is one of the important trading activities for nifty trader.		
26.	Transaction cost is well adjusted with arbitrage in cash market.		
27.	The present tick size is enough for trading activities.		
28.	Present tick size is enough to place buy and sell limit/market orders.		
29.	Tick size does affect the submission of limit/market orders.		
30.	Submission rate of limit/market orders do affect the tick size.		
31.	Usually number of ticks for placing limit/market orders are high during		
	a. The initial periods of nifty trading.		
	b. The last periods of nifty trading.		
	c. In between initial and last periods of nifty trading.		
32.	Number of ticks is under the control of clearing members.		
33.	Number of ticks is under the control of trading members.		
34.	Number of ticks is under the control of clients.		
35.	Tick size is very much related with the trading margins.		
36.	For derivatives trading all types of margin are at satisfactory level.		
37.	The initial margin is appropriate at both client and proprietary level.		
38.	There is no hassle for initial margin collection at client level.		
39.	For client the proper and correct information on initial margin is available.		
40.	Clients are easy to deposit the initial margins.		
41.	The brokerage commission is ensured satisfactorily.		
42.	Market participants may have the access of the call money market.		
43.	Call rate may be an alternative to bank rate for nifty trading if (42) is satisfied.		
44.	Depository participants and clearing banks may use the call money market.		
45.	The availability of funds and securities by pay-in time is;		
	a. = 100%		
	b. < 100%		
	c. > 100%		
	d. Not sure		

A5: Responses from *NSE F&O* sub-brokers, Hubli-Dharwad city

Characteristics	Res. Inst.	No. of TR	TR (%)
1. Number of Respondents		06	
2. Number of Registered Respondents (Sub-brokers).		06	100
3. Age	20 – 30	03	50.00
	30 – 40	01	16.67
	Above 40	02	33.34
4. Education	Graduate	03	50.00
	Post Graduate	03	50.00
5. Knowledge in Trading (Professional Course)	Yes	04	66.67
	No	02	33.33
6. Knowledge in Trading (Practical Trading)	Yes	05	83.33
	No	01	16.67
7. Designation	Sub-broker	06	100
8. Securities Trading Experience	Less than 5 years	02	33.33
	5-15 years	03	50.00
	Above 15 years	01	16.67
9. Derivatives Trading Experience	Less than 3 years	01	16.67
	3-5 years	02	33.33
	Above 5 years	03	50.00
10. Total Clients	Above 100	04	66.67
	Below 100	02	33.33
11. Clients' participation in trading	Increase	05	83.33
	Decrease	-	-
12. Trading Volume (in Rs. Lakh)	20	02	33.33
	50	03	50.00
	80	01	16.67

Res. Inst. : Response instructions
No. of TR: Number of total responders
TR (%): Percentage of responders to the number of respondents.

A5: Continued

S.N	R	No. of TR	TR (%)	S.N	R	No. of TR	TR(%)
1.	Y	04	66.67	25.	Y	05	83.33
	N	01	16.67		N	01	16.67
2.	Y	02	33.33	26.	Y	06	100.00
	N	03	50.00		N	00	0.00
3.	Y	00	0.00	27.	Y	05	83.33
	N	06	100.00		N	01	16.67
4.	Y	01	16.67	28.	Y	04	66.67
	N	05	83.33		N	01	16.67
5.	Y	03	50.00	29.	Y	03	50.00
	N	03	50.00		N	03	50.00
6.	Y	02	33.33	30.	Y	03	50.00
	N	04	66.67		N	03	50.00
7.	Y	03	50.00	31a.	Y	04	66.67
	N	03	50.00		N	01	16.67
8.	Y	04	66.67	31b.	Y	02	33.33
	N	01	16.67		N	04	66.67
9.	Y	05	83.33	31c.	Y	01	16.67
	N	00	0.00		N	04	66.67
10.	Y	05	83.33	32.	Y	02	33.33
	N	01	16.67		N	04	66.67
11.	Y	04	66.67	33.	Y	01	16.67
	N	02	33.33		N	04	66.67
12a.	Y	03	50.00	34.	Y	01	16.67
	N	02	33.33		N	04	66.67
12b.	Y	01	16.67	35.	Y	04	66.67
	N	04	66.67		N	01	16.67
12c.	Y	02	33.33	36.	Y	04	66.67
	N	01	16.67		N	02	33.33
13a.	Y	03	50.00	37.	Y	04	66.67
	N	02	33.33		N	02	33.33
13b.	Y	02	33.33	38.	Y	05	83.33
	N	03	50.00		N	01	16.67
13c.	Y	04	66.67	39.	Y	06	100.00
	N	00	0.00		N	00	0.00
14.	Y	05	83.33	40.	Y	04	66.67
	N	01	16.67		N	02	33.33
15.	Y	03	50.00	41.	Y	05	83.33
	N	03	50.00		N	01	16.67
16.	Y	04	66.67	42.	Y	03	50.00
	N	02	33.33		N	02	33.33
17.	Y	05	83.33	43.	Y	03	50.00
	N	00	0.00		N	02	33.33
18.	Y	03	50.00	44.	Y	04	66.67
	N	02	33.33		N	02	33.33
19.	Y	01	16.67	45a.	Y	05	83.33
	N	04	66.67		N	00	0.00
20.	Y	05	83.33	45b.	Y	00	0.00
	N	01	16.67		N	01	16.67
21.	Y	05	83.33	45c.	Y	00	0.00
	N	01	16.67		N	01	16.67
22.	Y	03	50.00	45d.	Y	01	16.67
	N	02	33.33		N	01	16.67
23.	Y	06	100.00				
	N	00	0.00				
24.	Y	05	83.33				
	N	01	16.67				

A6: Responses from *NSE F&O* investors, Hubli-Dharwad City

Characteristics	Res. Inst.	No.of TR	TR (%)
1. Number of Respondents		15	100.00
2. Total Respondents (Investors).		15	100.00
3. Age	20-30	08	53.33
	30-40	04	26.67
	Above 50	03	20.00
4. Education	Graduate	10	66.67
	Post Graduate	05	33.33
5. Knowledge in Trading (Professional Course)	Yes	05	33.33
	No	10	66.67
6. Knowledge in Trading (Practical Training)	Yes	-	27.00
	No	11	73.33
7. Designation	Investor	15	100.00
8. Securities Trading Experience	Less than 5 years	14	93.34
	5-15 years	-	-
	Above 15 years	01	06.67
9. Derivatives Trading Experience	Less than 3 years	07	46.67
	3-5 years	06	40.00
	Above 5 years	01	06.67

Res. Inst. : Response instructions.
No. of TR: Number of total responders.
TR (%): Percentage of responders to the number of respondents.

A6: Continued

S.N	R	No. of TR	TR (%)	S.N	R	No. of TR	TR(%)
1.	Y	13	86.67	25.	Y	12	80.00
	N	02	13.33		N	03	20.00
2.	Y	12	80.00	26.	Y	11	73.33
	N	03	20.00		N	04	26.67
3.	Y	06	40.00	27.	Y	11	73.33
	N	07	46.67		N	04	26.67
4.	Y	04	26.67	28.	Y	11	73.33
	N	10	66.67		N	04	26.67
5.	Y	11	73.33	29.	Y	10	66.67
	N	04	26.67		N	05	33.33
6.	Y	06	40.00	30.	Y	11	73.33
	N	09	60.00		N	04	26.67
7.	Y	09	60.00	31a.	Y	10	66.67
	N	06	40.00		N	04	26.67
8.	Y	11	73.33	31b.	Y	05	33.33
	N	04	26.67		N	04	26.67
9.	Y	12	80.00	31c.	Y	04	26.67
	N	03	20.00		N	06	40.00
10.	Y	11	73.33	32.	Y	15	100.00
	N	05	33.33		N	00	0.00
11.	Y	08	53.33	33.	Y	12	80.00
	N	07	46.67		N	02	13.33
12a.	Y	07	46.67	34.	Y	05	33.33
	N	05	33.33		N	09	60.00
12b.	Y	06	40.00	35.	Y	09	60.00
	N	06	40.00		N	06	40.00
12c.	Y	02	13.33	36.	Y	05	33.33
	N	08	53.33		N	09	60.00
13a.	Y	10	66.67	37.	Y	07	46.67
	N	03	20.00		N	08	53.33
13b.	Y	06	40.00	38.	Y	07	46.67
	N	04	26.67		N	08	53.33
13c.	Y	03	20.00	39.	Y	12	80.00
	N	06	40.00		N	03	20.00
14.	Y	11	73.33	40.	Y	10	66.67
	N	04	26.67		N	05	33.33
15.	Y	05	33.33	41.	Y	11	73.33
	N	10	66.67		N	04	26.67
16.	Y	08	53.33	42.	Y	09	60.00
	N	06	40.00		N	05	33.33
17.	Y	06	40.00	43.	Y	09	60.00
	N	08	53.33		N	05	33.33
18.	Y	12	80.00	44.	Y	07	46.67
	N	02	13.33		N	07	46.67
19.	Y	08	53.33	45a.	Y	07	46.67
	N	07	46.67		N	02	13.33
20.	Y	08	53.33	45b.	Y	04	26.67
	N	07	46.67		N	05	33.33
21.	Y	11	73.33	45c.	Y	04	26.67
	N	04	26.67		N	04	26.67
22.	Y	10	66.67	45d.	Y	01	6.67
	N	05	33.33		N	05	33.33
23.	Y	10	66.67				
	N	05	33.33				
24.	Y	10	66.67				
	N	05	33.33				

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