Noise Trading : An Analysis of Retail Trading in the Indian Equity Market

** Saji George*
*** P. Srinivasa Suresh*

Abstract

The investment decision making in stock markets across the globe has become a cumbersome task due to the frequent fluctuations in the stock prices and trade volume that do not commensurate with the new information flows. These occurrences can be broadly attributed to 'noise trading' emanating from the naïve trading behaviour of investors. This study, on the assumption that noise trading increases trade volume and return variance, examined the trading behaviour of retail investors to find out if their trading creates noise in the price discovered. The Indian stock market is flooded with different categories of investors with varying resources, motives, information share, and behavioural instincts. By analyzing daily buy-sell activity together with changes in market liquidity and return variances, this study identified convincing evidence of noise in retail trading in the Indian equity market. Furthermore, these results demand analysis of the same issues in more dynamic frames of analysis covering other investor categories and direct the attention to investigate on the functioning of intermediaries in creating noise based trading in the Indian market.

Keywords: **information inefficiency, investor rationality, investor's behavioural traits, noise trading, return variances**

JEL Classification: G00, G020, G10, G12, G14

Paper Submission Date : December 6, 2014 ; Paper sent back for Revision : February 4, 2015 ; Paper Acceptance Date : March 3, 2015

Investment decisions are made on the expected gains which depend on the different unpredictable states that the economic system would move through over a period of time. This attributes investment activities the characteristics of risk and uncertainty. The efficient market hypothesis (EMH) argues that the price discovered in the market will be informationally efficient as rational investors update their expectations and make investment decisions based on the arrival of new information instantaneously, and any variation between individuals' expectations will be cancelled out in the market. Therefore, variation in market prices would be random and normally distributed, and the market would discount all future expectations based upon current information efficiently into current prices. The only risk priced in the market apart from time risk would be systematic risk. Thus, the expected returns would offer no abnormal profit making opportunities (Fama, 1965a, 1965b, 1970 ; Fama & MacBeth, 1973 ; Samuelson, 1965 ; Sharpe, 1964). However, Marshall, (1974), Aumann, (1976),Grossman and Stiglitz (1980), Milgrom and Stockey (1982), and Glosten and Milgrom (1985) argued for the theoretical impossibility of trading in such an informationally efficient market of investors with homogeneous expectations.

Empirical studies also have found sequences and reversals in price movements together with cross sectional return variations in relation with market capitalization, book to market equity, price earnings ratio, profitability, sales-growth, stock repurchase and issuance, and so forth (Cowels, 1960; Cootner, 1962; De Bondt & Thaler, 1985; Fama & French, 1992; Jagadeesh & Titman, 1993 ; Kross & Schroeder, 1984 ; Lo & MacKinlay, 1988 ; Loughran & Ritter, 1995; Pontiff & Woodgate, 2008 ; Taylor, 1981). These evidences drew the attention of the

* *Ph.D. Scholar,* Department of Economics, North Eastern Hill University, Shillong- 793 022, Meghalaya.
E-mail- sjtjohn2008@yahoo.co.in
** *Associate Professor,* Department of Economics, North Eastern Hill University, Shillong- 793 022, Meghalaya.
E-mail: srureshps03yahoo.co.in

academia as well as practitioners from the mechanical market analysis to behavioral analysis. Simon (1959, 1978) stated the importance of understanding the cognitive process of decision makers in a complex frame to understand the dynamic path of equilibrium formation. Likewise, Tversky and Kahneman (1973, 1974) and Kahneman and Tversky (1979, 1983) pointed out that under risky and uncertain situations, where the objective outcome is unknown with various states, decision makers resort to a limited number of heuristics to judge the probability of the outcomes and to reduce the complexity. These behavioral biases and heuristics based decision making of investors result in inefficiency and in noisy price determination process in the system.

This study on noise trading in the context of retail trading in the Indian equity market draws its importance for many reasons. The Indian market is flooded with different categories of investors with varying resource bases, motives, information share, and behavioral instincts and also with intermediaries functioning at different levels and size. Several measures are being taken up by political as well as monetary authorities to expand the retail investor base in the Indian equity market. The recent trends in the movement of equity market indicators are not in harmony with that of macro-economic fundamentals as theorized in the literature of modern finance.

The major indices of the Indian stock market such as the BSE Sensex and NSE Nifty show wide fluctuations in their movements. These observations raise certain reservations on the price discovery process, informational efficiency, and investors' trading behavior in the Indian equity market. Amongst these issues, this study specifically attempts to examine if the trading activities of retail investors lead to noisy price discovery in the Indian equity market.

Brief Survey of Literature on Noise Trading

(1) Noise Traders : Black (1986) highlighted the role of noise in the price discovery process in the market emanating from the erroneous expectation of market participants. He collectively termed traders who bring in noise to the market - which deviate the prices far from the rationally expected levels - as noise traders. According to him, they are those who trade - though from an objective point of view would be better off by not trading - thinking that the information they have is true or trade for some external reasons.

The behavioral finance literature gives a number of definitions for noise traders. Kyle (1985), in the heterogeneous agent model, defined noise traders as those who trade randomly regardless of information flow in the market, whereas for De Long, Shleifer, Summers, and Waldmann (1990), noise traders in the stock market are those who falsely believe that they have information on future price of a risky asset, and who attribute excessive subjective certainty to the pseudo-signals they get from technical analysts, stock brokers, or any other sources. To Barber, Odean, and Zhu (2009), the preference of traders to simple heuristics and their psychological biases in decision making are the source of noise in the market. Bender, Osler, and Simon (2013) defined noise traders as those investors who, with the human predilection to identify patterns backed by desire to make money, discover correlation between price patterns and their future movements that do not really exist, with the example of investors who follow head-and shoulder trading in the market.

In this way, traders who depend on heuristics in their decision making in the market due to psychological reasons or whose trading activities are not information based, fall in the category of noise traders. Limit on the extent of position that can be taken by a trader, inability of informed traders to distinguish if they trade on information that is already reflected in prices, and arbitrage limits of informed traders due to uncertainty of noise trader risk, hinder the market from eliminating the noise from the prices (De Long et al., 1990).

(2) Empirical Evidence and Impact of Noise Trading : Noise traders enter into trading irrationally, not complying with the rules of standard finance and create distortion in the market. Trueman (1988) found evidence of such behavior in investment fund managers in order to attract more investors. Sellin (1996) identified that foreign investors' trading brought in noise with temporary effect on the prices (as discovered in the Swedish market). On the examination of monthly data on purchase and sales to foreign investors, local investors, and local institutions

from the stock exchange of Thailand, Davidson and Piriyapant (n.d.) found pervasiveness of noise trading across all investor groups.

Greene and Smart's (1999) examination of changes in the pattern of abnormal returns and abnormal trading volume of 105 firms from NYSE and AMEX, in response to the analysts' recommendation of respective firms, found that a large increase in uninformed trading improved liquidity and reduced the adverse selection cost in the market. A study conducted on noise trading and market quality in Taiwan's stock market on 56 stocks from Taiwan's Stock Exchange by Lee, Chou, and Lin (2004) found a positive impact of noise trading on liquidity at the cost of higher price volatility and lower market efficiency. Koski, Rice, and Tarhouni (2004), on investigation of the effect of noise trading on volatility of stock returns in NASDAQ 100 and that had Raging Bull and Yahoo messages boards, found that noise trading (message board based trading) increases return volatility.

Flynn (2005) investigated the deviation of the market price of U.S. Closed End Funds from the net asset value and attributed this higher dispersion of funds' market price to the noise risk in the market as major investors in the funds are small investors who are considered uninformed or noise suppliers. Bloomfield, O'Hara, and Saar (2009), in their experimental study, showed that noise trading increases the trade volume, especially when price was far from the fundamental value, creating inefficiency in the market and when prices are not extreme, they make prices more efficient by providing additional liquidity in the market. Kim and Verrecchia (2007), by measuring the noise in terms of size of correction of large price movements in the absence of public information in intraday trades, found evidence of noise trading, substantial stock price movements, and strong evidence of reversals following the large stock price movements and delaying the price discovery.

Ramiah and Davidson (2007), based on the information adjusted noise pricing model, identified the presence of noise traders who created distortions in price formation in the Australian Stock Exchange. Tokic (2007), by examining the behavior of rational speculators, highlighted that false news, which is purely noise, is often spread by financial institutions through media in order to profit from the price deviations in the market for the brokerage firms, trading divisions, and investment banking divisions owned by them and also to mitigate the agency costs involved. Podolski-Boczar, Kalev, and Duong (2009), from the empirical study of daily data, revealed that noise traders only affect short term volatility with strongest effect on price volatility of small cap stocks with higher limit to arbitrage.

Thus, the empirical studies, in conformity with the theoretical arguments, have found that noise trading facilitates trading, provides liquidity, and lowers adverse selection cost in the market at the cost of higher price, higher return volatility, and market inefficiency. Based on the literature, the following suppositions are made in this analysis to identify noise trading in the market :

(1) Increase in noise trading improves liquidity;

(2) Higher level of noise trading leads to higher return variance in the market.

The Indian Stock Market and Research Issues

The Indian stock market in cash segment consists of 20 exchanges, 9195 brokers, 77163 sub brokers, 4713 corporate brokers, 1767 FIIs (foreign institutional investors), 2 depositories, 19 custodians, 6 credit rating agencies, 246 portfolio managers, and 51 mutual funds. The Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE) stand as leading exchanges in terms of trading, market cap, and all other aspects. SENSEX, of thirty companies of BSE, and CNX Nifty, of fifty companies of NSE, are the two most sensitive indices which are deemed as the barometer of the Indian economy. The data on percentage share of market turn-over of participants in equity cash segment in both BSE and NSE separately in the period from 2013-14 are given in the Table 1.

Unlike institutional investors, individual investors or retail investors are those who buy and sell securities for their personal account and often, volume of their trading activity is comparatively smaller. Retail trading accounts have witnessed an increasing trend over the years due to changes in the policy regulations, widening the use of

Table 1.Percentage Share of Market Turnover of Participants in the Equity Segment (2013-14)

Investor Category	BSE	NSE
Proprietary trades	20.5	22.7
DIIs (Domestic Institutional Investors)	14.4	5.4
FIIs (Foreign Institutional Investors)	4.8	22.9
Mfs (Mutual Funds)	0.9	4.1
Others (Retail, NRI,QFIs)	59.4	44.9

Source: SEBI Annual Report 2013-14

online trading, better access to financial information, and spurt in the number and expansion of sub-broking firms across the country. According to Padiyath and Jha (2012), based on NSE daily trade data of 25 lakh retail investors accounted in the year 2005-06, the Indian retail investors are highly influenced by behavioral factors in their investment decision making. In proprietary trading, brokerage firms trade in stocks with their own funds rather than that of the customers' money in order to make profits for themselves. The process of integration of financial markets and the huge in-flow and out-flow of foreign capital have widened the ease of transmission of international risks and have increased volatility in the domestic markets. The post global financial crisis of 2007-08 witnessed an immediate outflow of capital and its reversal in the subsequent period with the developed countries' policy actions to revamp growth. In short, the Indian market is flooded with different categories of investors with varying resources, motives, information share, and behavioral instincts.

The average growth rate of GDP at factor cost fell from 8.3% in the period from 2006-10 to 6.2% in the period from 2011-14. The year over year GDP growth rate in the year 2013 was 4.7%. Household savings accounted for 72% of the gross domestic savings (30.1% of the GDP at market price) and 32% of these savings were channeled through financial assets in the year 2012-13. Similarly, year over year growth rate of IIP (index of industrial production) also fell from 8.2% in 2010-11 to -0.1% by the year 2013-14. The wholesale price index also evinced a declining trend with many policy initiatives from 9.4% in 2010 to 3.3% by 2013-14. The statistics on net investment of FIIs also witnessed a large level of inflows and reversals after 2007, exposing the economy into serious concerns on external accounts, especially rupee value and stock market valuations. However, the price-earnings ratio, a reflection of valuation of shares in the market, showed an increasing trend in both the markets. Price-earnings ratio of Sensex increased from 13.7 in 2008-09 to 18.3 in 2013-14, while that of Nifty increased from 14.3 to18.9 in the same time period. The annualized volatility, measured by standard deviation of log returns of Sensex, increased from 12.5% to 17.5% and that of Nifty increased from 12.9% to 18.1% between 2012-13 and 2013-14. Over the period between 2007 and 2014, both BSE Sensex and CNX Nifty showed large fluctuations in their movements. Sensex was 20290.89 points and Nifty was 6097.25 points on December 11, 2007 but by November 20, 2008, both indices fell to 8451.01 points and 2553 points respectively. During 2011 to 2014, contrary to downward moving fundamental economic indicators, these two indicators moved up again to higher planes. On November 21, 2014, both Sensex and Nifty reached 28320 points and 8482 points respectively.

The above statistics indicate that the nature of movement of prices in the Indian stock market is not in consensus with the economic as well as firm fundamentals. This calls for an investigation primarily on the trading behaviour of investor categories as their differences in the distribution of information and influences of behavioural biases can bring noise into the price discovered in the market.

Data and Methodology

This study defines trading by any investor category that has a positive impact on trade-volume a proxy of market liquidity on market return and on its variability as noise trading. In a market, the total number of securities bought or sold in a specific time period is termed as trade volume. A positive movement in trade-volume indicates the realization of a larger number of buy and sell orders, which would ultimately lead to higher liquidity and lower

bid-ask spread in the market. Therefore, any trading, buy or sell, which has a positive impact on trade volume but with higher return variability, indicates broadly the presence of noise trading in the market.

This paper specifically considers the buy *(retbuy),* sell *(retsell)*, and net purchase *(retnet)* positions of retail investors that are examined together with BSE 500 index and overall trade volume (*trdvol*) movement in BSE, for the period between April 17, 2007 and November 21, 2014. Appropriate data transformations of original data are made for those variables which are non-stationary in their level form. The market return is calculated using the formula :

$$rt = In \left(\frac{\rho_t}{\rho_{t-1}}\right)$$

where,

P_t and $P_{(t-1)}$ are price levels of time period at t and t -1. *rt* is the market return, natural log value of (P_t /$P_{(t-1)}$). The use of log returns instead of actual price levels normalizes and transforms the data set to a stationary one whose joint probability distribution does not change with changes in time. The data on variables such as *retbuy*, *retsell*, and *trdvol* were first differenced to turn them stationary as *dretbuy*, *dretsell, and dtrdvol* respectively. The rate of change in trade volume (*trdvc1)* was calculated by taking the natural log of ratio of current and previous period trade volume. Net purchase ratio *(netpr)* was calculated by dividing the raw net purchase data *(retnet)* with their respective turnover values. Similarly, the return variance *(rtvar)* is the squared mean adjusted log return *(rt)*.

On the basis of the assumptions about noise trading activity, this analysis is carried out in two stages. In the first stage, we examine the impact of retail trading activity on market liquidity. In the second stage, the impact on return and market return variance is examined.

Empirical Analysis and Results

(1) Retail Trading and Market Liquidity : In this section, we examine our first supposition about noise trading in connection with the retail trading activity - that whether retail buy and sell activity increase liquidity in the market. In order to understand the relationship between the variables of interest, we first analyzed the nature of causality between them. Granger (1969) proposed an approach to determine the causality of time series data. Accordingly, given an information set Ω_t with the form (X_t, $X_{t-1...}X_{t-j}$…,Y_t, $Y_{t-1,...,}$ Y_{t-i}), the time series X_t is Granger causal for Y_t with respect to Ω_t if the variance of the optimal linear predictor of Y_{t+h} based on Ω_t has smaller variance than the optimal linear predictor of Y_{t+h}based on lagged values of Y_t for any h. Thus, X Granger causes Y if and only if σ_1^2 (Y_t: Y_{t-j}, X_{t-i}) < σ_2^2(Y_t: Y_{t-j}) with j and i = 1, 2, 3… n and representing the variance of the forecast error. Following this approach, the nature of causality between trade volume and purchase and sale ratios are examined. Hence, the equations are specified as :

$$(trdvc1)_t = \alpha + \sum_{t=1}^{i} \beta_t (trdvc1)_{t=i} + \sum_{t=1}^{j} \tau_t (dretbuy\ or\ drestsell)_{t=j} + \varepsilon_t \qquad (1)$$

$$(drestsell\ or\ dretbuy\ )_t = \alpha + \sum_{t=1}^{j} \beta_t\ (drestsell\ or\ dretbuy\ )_{t=j} + \sum_{t=1}^{i} \tau_t\ (tradvc1)_{t=1} + \varepsilon_t \qquad (2)$$

The causality is tested for 5 lags of the variables as per the Schwarz criterion. The results are summarized in the Table 2.

The pair-wise tests reject the null hypothesis of no granger causality from *dretsell* and *dretbuy* to *trdvc*1even at the 5% level of significance. The buy and sell activities of the investors granger cause relative changes in trade volume, which is unidirectional. But this test does not give an indication of the direction and magnitude of causal relationship between trade volume and retail trading. Therefore, the relationship between the retail trading activities and trade volume are examined through the following two regression equations :

$$Dtrdvol_t = c(1)\, dtrdvol\,(-1) + c(2)\, dretbuy\,(-1) + c(3)\, dretbuy\,(-2) + c\,(4)\, dretbuy\,(-3) + \varepsilon_t \qquad (3)$$

$$Dtrdvol_t = c(1)\, dtrdvol\,(-1) + c(2)\, dretsell\,(-1) + c(3)\, dretsell\,(-2) + c\,(4)\, dretsell\,(-3) + \varepsilon_t \qquad (4)$$

Table 2. Granger Causality Tests of Retail Trading and Change in Trade Volume

Schwarz Criterion Lags: 5 **Observations: 1834**	***F*- Statistic**	**Prob.**
Null Hypothesis:		
dretsell does not Granger Cause *trdvc1*	26.0945	2.E-25*
trdvc1 does not Granger Cause *dretsell*	1.11757	0.3488
dretbuy does not Granger Cause *trdvc1*	33.2767	1.E-32*
trdvc1 does not Granger Cause *dretbuy*	0.63932	0.6697

*Null hypothesis is rejected at the 0.05 level of significance
dretsell, and *dretbuy* stand for first differenced value of retail selling and buying activities, *trdvc1* stands for rate of change in trade volume

Table 3. Retail Buying and Market Liquidity

Dependent Variable: *dtrdvol*

Method: Least Squares

Included observations: 1851 after adjustments

Variable	**Coefficient**	**Std. Error**	***t* - Statistic**	**Prob.**
dtrdvol (-1)	-0.4539	0.02073	-21.897	0.0000*
dretbuy (-1)	163.117	8.13609	20.0486	0.0000*
dretbuy (-2)	150.533	9.51644	15.8183	0.0000*
dretbuy (-3)	26.7852	8.30502	3.22518	0.0013*
R - squared	0.32708			
Adjusted *R* - squared	0.32199			

*significant at the 5% level of significance. *dtrdvol* denotes the first differenced daily trade volume *(trdvol)* in BSE. *dretbuy* denotes the first differenced daily purchase of shares by retail traders *(retbuy)* from BSE.

Table 4. Retail Selling and Market Liquidity

Dependent Variable: *dtrdvol*

Method: Least Squares

Included observations: 1851 after adjustments

Variable	**Coefficient**	**Std. Error**	***t* - Statistic**	**Prob.**
dtrdvol (-1)	-0.4466	0.0208	-21.474	0.0000*
dretsell (-1)	126.402	7.11295	17.7707	0.0000*
dretsell (-2)	128.47	8.35248	15.3811	0.0000*
dretsell (-3)	44.0595	7.24285	6.08318	0.0000*
R - squared	0.2957			
Adjusted *R* - squared	0.29456			

*significant at the 5% level of significance. *dtrdvol* denotes the first differenced daily trade volume *(trdvol)* in BSE, *dretsell* denotes the first differenced daily selling of shares by retail traders *(retsell)* from BSE.

These equations are to examine the time lagged relationships between the trade volume movement and retailers' buying and selling activity in the stock market. A positive sign of coefficients of explanatory variables would indicate that a positive change in buying or selling by retail investors even at time lags leads to increased liquidity in the market. The purpose of these equations is to only examine linear dependency of the changes in trade volume upon the time lagged retail trading activity and not to fit a more comprehensive model to explain the changes in trade volume. These regression equations are run on the transformed data set. The Table 3 and Table 4 summarize the results of the analysis.

The Table 3 shows the dependency of overall changes in trade volume upon the retail investors' buying activity, whereas the Table 4 presents the dependency of the former upon the retail investors' selling activity. The coefficients of changes in both buying and selling activities individually for three lags are significant even at the 0.01% level of significance. The explanatory power of these equations is low, though different from each other, and it is clear from the R^2 values. However, as mentioned before, these equations serve the purpose of this analysis. Since the data used in the analysis are of daily frequency and lags here denote the number of trading days, the positive signs taken by all the coefficients of regressors indicate that a positive change, that is, an increase in buying or selling activity of retail investors leads to an increase in changes in the trade volume. Therefore, from this analysis, we infer that the retail investors' buying and selling has a positive impact on the changes in the liquidity in the market.

(2) Retail Trading and Market Return Variance : Various studies, in conformity with the theoretical arguments of noise trading, argued that such type of trading facilitates trading by providing liquidity, but at the cost of higher price, higher return volatility, and market inefficiency (Beer, Watfa, & Zouaoui, 2011 ; Black, 1986; Bloomfield et al., 2009; Campbell & Kyle, 1993 ; Greene & Smart, 1999; Glosten & Milgrom, 1985; Koski et al., 2004 ; Lee et al., 2004 ; Podolski-Boczar et al., 2009 ; Tetlock, 2006). Hence, in this section, we examine the linear relationship between retail trading and market return variance. As the first step, we examine the nature of causality between the net daily purchase ratio (*netpr*) of the retail investors and the market return variance (*rtvar*) based on granger causality test through the equations specified below :

$$(rtvar)_t = \alpha + \sum_{t=1}^{i} \beta_t (rtvar)_{t=i} + \sum_{t=1}^{j} \tau_t (netpr)_{t=j} + \varepsilon_t \qquad (5)$$

$$(netpr)_t = \alpha + \sum_{t=1}^{j} \beta_t (netpr)_{t=j} + \sum_{t=1}^{i} \tau_t (rtvar)_{t=1} + \varepsilon_t \qquad (6)$$

The test was carried out on the data set of discussion, and the results are summarized in the Table 5. It is clear from the test results that the causality between these variables is unidirectional in nature. The null hypothesis of the test that *netpr* does not granger cause *rtvar* is rejected based on the *p* value even at the 0.001 level of significance, whereas the null hypothesis of no causality from *rtvar* to *netpr* cannot be rejected as the lowest significance level at which the null hypothesis can be rejected (*p* - value) is 18%, which is quite higher than the acceptable level of significance in this study. Therefore, this test confirms that the net daily purchase of retail

Table 5. Granger Causality Tests of Retailers' Net Purchase Ratio and Return Variances

Schwarz criterion Lags: 3,Observations: 1850		
Null Hypothesis:	***F*-Statistic**	**Prob.**
netpr does not Granger cause *rtvar*	7.81484	3.E-05*
rtvar does not Granger cause *netpr*	1.62431	0.1817

*significant at the 5% level of significance

netpr stands for net purchase ratio of retail investors and *rtvar* stands for market return variance.

Table 6. Retail Trading and Market Return Variance

Dependent Variable: *rtvar*

Method: Least Squares

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
Constant	0.00024	1.98E-05	12.182	0.0000*
rtvar (-1)	0.1532	0.02298	6.6674	0.0000*
netpr	0.00307	0.0008	3.85806	0.0001*
netpr (-1)	0.00218	0.00083	2.63124	0.0086*
netpr (-2)	0.00103	0.0008	1.28926	0.1975
R- squared	0.22339			
Adjusted *R*- squared	0.22134			
F-statistic	26.0301	Prob(*F* - statistic)		0.0000

*significant at the 5% level of significance

rtvar denotes the market return variance and *netpr* stands for the ratio of retail investors net purchase position to turnover.

investors granger cause return variance in the market. Having identified the direction of causality between the variables, we further explore the impact of change in the net purchase ratio on return variance with a single linear regression equation (7).

$$rtvar_t = c + c(1)\,rtvar(-1) + c(2)\,netpr + c(3)\,netpr(-1) + c(3)\,netpr(-2) + \varepsilon_t \qquad (7)$$

In this equation, the return variance is regressed on its own one period lagged value and current and lagged values of the net purchase ratio. Net purchase ratio takes a positive value only when buying activity is greater than selling activity in the market. This analysis will give an indication of both the direction and magnitude of linear influence of retailer's net purchase position upon the return variance in the market. The results of the regression analysis are summarized in the Table 6.

The Table 6 shows a significant positive linear relationship between the net purchase ratio and variance of market returns. The current and one period lagged net purchase ratio of retail investors have a positive impact on return variance. The return variance and the squared mean adjusted market return increase with an increase in the net purchase ratio, which is the ratio of the difference between buy and sell activity to the total turnover in the market. Therefore, we can infer that excess buying or selling by retail investors brings in higher variance in the return movements, which is contradictory to the arguments of the market efficiency hypothesis, but at the same time, supporting the noise trading theory. A possible concern from the results can be of the low R^2 value indicating lower explanatory power of the model. Since the purpose of this analysis was to identify if retail trading brings in noise in the market, these results serve the purpose.

Research Implications, Limitations of the Study, and Scope for Further Research

The empirical results confirm a unidirectional causality and a positive linear dependency from retailers' buying and selling activity to market liquidity and a similar relationship of market return variance upon the net purchase ratio of retail investors in the Indian market. Under the given definition of noise trading, this study confirms the noisy pricing in the market emanating from the trading activities of retail investors who, together with NRI investors (refer to Table 1), share a major chunk of the market turnover in the equity segment. As noise based trading increases the possibility of distorted price discovery, high volatile and sensitive market, resource

misallocations, and improper asset redistributions, these findings substantiate reasons for the peculiar nature of the Indian stock market. A major reason for this can be attributed to the relatively limited resource base and information accessibility of the investor group. Many empirical studies have confirmed the behavioural bias of retail investors in the context of the highly volatile and sensitive Indian stock market. It was found that the retail investors attribute more importance to liquidity, quick gain, capital appreciation, and safety in equity investments as compared to other investments (Kaur & Vohra, 2012 ; Shaik, Murty, Krishna, & Kiran, 2012). Besides these, the investors' portfolio practices, preferences, risk perceptions, intentions, pattern of investment, as well as their awareness levels also play a role in their trading behaviour. Similarly, as trade orders are forwarded through the registered sub-brokers in the market, the chances of being induced to invest in stocks even on the absence of any information advantage cannot be ignored as these intermediaries' survival depends on profits from the trading.

This analysis primarily demands further detailed investigation in the trading behavior of each category of investors and their role in the price discovery process in the Indian equity market. As small scale investors are inclined to depend upon intermediaries such as broker firms as well as trade consultants, an investigation on their functioning, especially on the quality of the services delivered has to be carried out for better information dissemination in the market and to inculcate more objectivity in investment decision making. Similarly, but more importantly, policy level regulatory initiatives are to be taken for a more responsible and factual market related information delivery from all types of media that small investor categories often rely upon.

This study, in a simple regression frame of analysis, limited its investigation to two measures, such as trade volume and market return variance in daily frequency data, to examine if the trading behaviors of retail investors are noise based. Furthermore, the results demand analysis of the same issues in more dynamic frames of analysis using higher frequency data and in more comprehensive measures.

References

Aumann, R. J. (1976). Agreeing to disagree. *The Annals of Statistics, 4*(6), 1236-1239.

Barber, B.M., Odean, T., & Zhu, N. (2009). Systematic noise. *Journal of Financial Markets, 12*(4), 547-569.

Beer, F., Watfa, M. and Zouaoui, M. (2011). *Do investors care about noise trader risk?* (Working Papers) CREGO, Université de Bourgogne. Retrieved from http://leg.u-bourgogne.fr/images/stories/wp/1111201.pdf

Bender, J.C., Osler, C.L., & Simon, D. (2013). Noise trading and illusory correlations in US equity markets. *Review of Finance, 17*, 625 - 652. DOI: 10.1093/rof/rfr037

Black, F. (1986). Noise. *The Journal of Finance, 41* (3), 521-543. DOI: 10.1111/j.1540-6261.1986.tb04513.x

Bloomfield, R., O'Hara, M., & Saar, G. (2009). How noise trading affects markets: An experimental analysis. *Review of Financial Studies, 22* (6), 2275-2302. DOI: 10.1093/rfs/hhn102

Campbell, J.Y., & Kyle, A.S. (1993). Smart money, noise trading and stock price behavior. *Review of Economic Studies, 60*, 1-34.

Cootner, P.H. (1962). Stock prices: Random vs. systematic changes. *Industrial Management Review, 3* (2), 24-45.

Cowels, A. (1960). A revision of previous conclusions regarding stock price behavior. *Econometrica, 28* (4), 909-915.

Davidson, S., & Piriyapant, G. (n.d.). *Are foreign investors noise traders? Evidence from Thailand*. Retrieved from http://mams.rmit.edu.au/6plw2u1hbmy1.pdf

De Bondt, W.F.M., & Thaler, R. (1985). Does the stock market overreact? *The Journal of Finance, 40* (3), 793-805. DOI: 10.1111/j.1540-6261.1985.tb05004.x

De Long, J.B., Shleifer, A., Summers, L.H., & Waldmann, R.J. (1990). Noise trader risk in financial markets. *The Journal of Political Economy, 98*(4), 703-738.

Fama, E.F. (1965a). The behavior of stock market prices. *The Journal of Business, 38* (1), 34-105.

Fama, E.F. (1965b). Random walks in stock market prices. *Financial Analysts Journal, 21* (5), 55-59.

Fama, E.F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance, 25* (2), 383-417. DOI: 10.1111/j.1540-6261.1970.tb00518.x

Fama, E.F., & French, K.H. (1992). The cross section of expected returns. *The Journal of Finance, 47*(2), 427-465.

Fama, E.F.,& MacBeth, J.D. (1973). Risk, return, and equilibrium: Empirical tests. *Journal of Political Economy, 81*(3), 607-636.

Flynn, S.M. (2005). Noise trading, costly arbitrage, and asset prices: Evidence from US closed - end funds. *Journal of Financial Markets, 15* (1), 108-125. DOI:10.1016/j.finmar.2011.06.001

Glosten, L.R., & Milgrom, P.R. (1985). Bid, ask and transaction prices in a specialist market with heterogeneously informed traders. *Journal of Financial Economics, 14*, 71-100.

Granger, C.W.J. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica, 37* (3), 424-438.

Greene, J., & Smart, S. (1999). Liquidity provision and noise trading: Evidence from the "investment dartboard" column. *The Journal of Finance, 54* (5), 1885-1899. DOI: 10.1111/0022-1082.00171

Grossman, S.J., & Stiglitz, J.E. (1980). On the impossibility of informationally efficient markets. *The American Economic Review, 70* (3), 393-408.

Jagadeesh, N., & Titman, S. (1993). Returns to buying winners and selling losers: Implications for stock market efficiency. *The Journal of Finance, 48* (1), 65-91. DOI: 10.1111/j.1540-6261.1993.tb04702.x

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47* (2), 263-292.

Kahneman, D., & Tversky, A. (1983). Choices, values, and frames. *American Psychological Association, 39* (4), 341-350. DOI : http://psycnet.apa.org/doi/10.1037/0003-066X.39.4.341

Kaur, M., & Vohra, T.(2012). Understanding individual investor's behavior: A review of empirical evidences. *Pacific Business Review International, 5* (6), 10-18.

Kim, O., & Verrecchia, R.E. (2007). Trading volume and price reactions to public announcements. *Journal of Accounting Research, 29* (2), 302-321.

Koski, J.L., Rice, E.M., & Tarhouni, A. (2004). *Noise trading and volatility: Evidence from day trading and message boards*. DOI : http://ssrn.com/abstract=533943

Kross, W., & Schroeder, D.A. (1984). An empirical investigation of the effect of quarterly earnings announcement timing on stock returns. *Journal of Accounting Research, 22* (1), 153-176.

Kyle, A.S. (1985). Continuous auctions and insider trading. *Econometrica, 53* (6), 1315-1335.

Lee, J.H., Chou, R.K., & Lin, C.F.(2004). *Noise trading and market quality*. Retrieved from http://www.finance.org.tw/2004conference/PAPER/noise%20trading%20and%20market%20quality.pdf

Lo, A.W., & MacKinlay, A.C. (1988). Stock market prices do not follow random walks: evidence from a simple specification test. *The Review of Financial Studies, 1*(1), 41-66. doi: 10.1093/rfs/1.1.41

Loughran, T., & Ritter, J.R. (1995). The new issues puzzle. *Journal of Finance, 50* (1), 23-51.

Marshall, J.M. (1974). Private incentives and public information. *The American Economic Review, 64* (3), 373-390.

Milgrom, P., & Stokey, N. (1982). Information trade and common knowledge. *Journal of Economic Theory, 26* (1), 17-27.

Padiyath, S., & Jha, M. (2012, December 2). Indian retail investors are more 'irrational' traders. *The Hindu Business Line*. Retrieved from http://www.thehindubusinessline.com/markets/stock-markets/indian-retail-investors-are-more-irrational-traders-study/article4156830.ece

Podolski-Boczar, E., Kalev, P.S., & Duong, H.N. (2009). *Deafened by Noise: Do noise traders affect volatility and returns* (Working Paper). Australia : Monash University.

Pontiff, J., & Woodgate, A. (2008). Share issuance and cross-sectional returns. *The Journal of Finance, 63* (2), 921-945.

Ramiah, V., & Davidson, S. (2007). Information-adjusted noise model: Evidence of inefficiency on the Australian stock market. *The Journal of Behavioral Finance, 8* (4), 209 - 224. DOI:10.1080/15427560701698926

Samuelson, P.A. (1965). Proof that properly anticipated price fluctuates randomly. *Industrial Management Review, 6* (2), 41-49.

Securities and Exchange Board of India (SEBI). (2014). *Annual Report 2013-14*. Retrieved from http://www.sebi.gov.in/cms/sebi_data/attachdocs/1408513411215.pdf

Sellin, P. (1996). Inviting excess volatility? Opening up a small stock market to international investors. *The Scandinavian Journal of Economics, 98* (4), 603-612.

Shaik, A.M.P., Murty, T.N., Krishna, R.V. , & Kiran, V.H.G. (2012). Investment objectives of the retail equity investors in India. *International Journal of Social Science and Interdisciplinary Research, 1* (7), 54-88.

Sharpe, W.F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The Journal of Finance,19* (3), 425-442.

Simon, H.A. (1959). Theories of decision-making in economics and behavioral science. *The American Economic Review, 49* (3), 253-283.

Simon, H.A. (1978). Rationality as process and as product of thought. *The American Economic Review, 68* (2), 1-16.

Taylor, S.J. (1982). Tests of the random walk hypothesis against a price-trend hypothesis. *Journal of Financial and Quantitative Analysis, 17* (1), 37-61.

Tetlock, P.C. (2006). *Does noise trading affect securities market efficiency?* Retrieved from http://www.columbia.edu/~pt2238/papers/Tetlock_Noise_and_Efficiency_09_06.pdf

Tokic, D. (2007). Noise trading and market efficiency: The role of passive investors. *The Journal of Trading, 2* (3), 37-44. DOI: 10.3905/jot.2007.688946

Trueman, B. (1988). A theory of noise trading in Securities Markets. *The Journal of Finance, 43*(1), 83-95. DOI: 10.1111/j.1540-6261.1988.tb02590.x

Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology, 5* (2), 207-232. DOI:10.1016/0010-0285(73)90033-9

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science, 185* (4157), 1124-1131.