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To Study the Informational Efficiency of Indian Stock Market

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ABSTRACT

The current study sheds light on the informational efficiency of Indian stock market. This paper examines the relationship between return, return volatility, and volume in a contemporaneous and dynamic context in Indian stock market and contributes to the literature in several respects. For this purpose, a daily closing price is collected from S&P CNX NIFTY index for a period of 10 years from April, 2007 till March, 2017(i.e. 2890 observations). Granger causality test is applied to investigate information flow between the variables. In addition, it uses the GARCH models in the study of return-volume investigation. This study further checks the information asymmetry with EGARCH (1, 1) model. The study provides evidence of positive impact of volume on return using GARCH (1, 1) model. It also shows the negative impact of volume on conditional volatility because of asymmetry that is observed in significant Jarque-Bera test. The study has also used the EGARCH (1, 1) model, which allows for asymmetric shocks to volatility. It indicates the presence of leverage effect and positive impact of volume on volatility. The differential cost of taking long and short positions is the main reason for information asymmetry (leverage effect). In addition, linear Granger causality results support the sequential arrival of information hypothesis, which implies that new information is not simultaneously available to all traders and it takes time to absorb, hampering the price discovery efficiency of the market.

Keywords: Stock Returns, Trading Volume, ARCH/GARCH.

I. INTRODUCTION

The price--volume relationship depends on the rates of information flow and its diffusion to the market, the extent to which markets convey information, the size of the market, and the existence of short-selling constraints. In a stock market, return and trading volume are two prime indicators of trading activity, jointly determined by the same market dynamics and may contain valuable information about a security. Prices and trading volume build a market information aggregate out of each new piece of information. Unlike stock price behavior, which reflects the average change in investors' beliefs due to the arrival of new information, trading volume reflects the sum of investors' reactions. Differences in the price reactions of investors are usually lost by averaging of prices, but they are preserved in trading volume. In this sense, the observation of trading volume is an important supplement of stock price behavior. Trading volume is viewed as the critical piece of information which signals where prices will go next. The trading volume is thought to reflect information which stock prices cannot convey to market participants. Relying on this power of volume and to improve the understanding of the microstructure of stock market, the relationship between return, volume, and volatility has received substantial attention in the market microstructure for a number of years. Furthermore, the stock price--volume relation can be used as the basis of a trading strategy and as evidence for or against the efficiency of stock markets.

The emergence of informationally efficient financial markets is an important facet of any country's economic modernization, with far-reaching implication for its macroeconomic stability and performance. Thus, it is in the interest of the economy to achieve efficiency in the dynamics of the stock markets. More can be learned about the market by studying the joint dynamics of prices and trading volume than by focusing on the univariate dynamics of prices. Financial literature has documented various flavors of the return-volume relationship especially in US stock markets. By contrast, relatively little attention has been devoted to this relationship in India. Some researchers have made attempts to evaluate return--volume relationship in Indian stock market but these are elementary efforts and moreover, the studies have failed to take the phenomenon of volatility persistence/volatility clustering in return--volume relationship. In most cases, financial time series behave in a way that does not conform to the normality distribution. Hence, the volatility observed in the market is a natural application for the autoregressive conditional Heteroskedasticity (ARCH). To observe this phenomenon, ARCH model and generalized ARCH (GARCH) model is used in many studies. The GARCH specification allows the current conditional variance to be a function of past

conditional variances. Therefore, the current study investigates return, volume, and volatility relationship in Indian stock market using symmetric and asymmetric GARCH models.

II.REVIEW OF LITERATURE

Schwert (1989) using monthly aggregates of daily data on Standard and Poor (S&P) composite index in NYSE, documented the evidence of a positive relationship between estimated volatility and current and lagged volume growth rates, using linear distributed lag and VAR models.

Lamoureux and Lastrapes (1990) investigate using individual stocks from the S&P index. They documented positive conditional volatility--volume relationship in models with Gaussian errors and Generalized Autoregressive Conditional Heteroskedasticity (GARCH)-type volatility specifications. However, the finding was cautiously interpreted as it might be biased due to the simultaneity between stock returns and volume.

Bessembinder and Seguin (1993) Investigates for a variety of futures markets. Finally, Gallant et al. (1992), using non-parametric methods, confirmed the positive correlation between conditional volatility and volume, when examining daily S&P data from 1928 to 1987.
Kocagail and Shachmurove (1998) examined the contemporaneous relationship between volume and absolute return for sixteen futures markets. They found the relationship to be significantly positive.

Daigler and Wiley (1999) examined the effect of different categories of futures traders; and found that the uninformed groups of traders who were distant from the trading floor drove the positive volume-volatility relation.

Gurgul and Otavio (2006) also documented the evidence of significant contemporaneous interaction between return volatility and trading volume in Polish stock market, Brazilian stock market respectively.

Karpoff 1987 and Gallant (1992) A further analysis of relationship between trading volume and return needs to specify which variable is dependent and which is independent. The studies referred to above primarily focus on the contemporaneous relationship between price change and volume. Although some of these research efforts imply a dynamic relationship between price change and volume using cross-correlation, they do not further pursue causal relationship.

Kocagail and Shachmurove (1998) investigated the return-volume relationship for US commodity and financial futures contracts and reported that past trading volume did not increase the ability to forecast returns in future markets.

Chen (2001) examined the dynamic relation between returns, volume, and volatility of stock indices for nine countries and found mixed results. They demonstrated that returns significantly caused volume for US, Japan, UK and France and causal direction from volume to returns was found for Canada only whereas in Switzerland, the Netherlands, and Hong Kong they observed bi-directional causality.

Lee and Rui (2002) examined the dynamic relation between stock market trading volume and returns for the three large markets (viz., New York, Tokyo, and London). They found that returns caused trading volume in the US and Japanese markets but not in the UK market. However, there was no causality from trading volume to returns in any of these markets.
Griffin (2004) investigated the dynamic relation between market-wide trading activity and returns in forty-six stock markets and documented the evidence of a stronger relation between return and turnover in countries with restrictions on short sales.

Nguyen and Diagler (2005) examined the same relationship for S&P 500, NASDAQ, British pound, Japanese yen, Australian dollar, and Canadian dollar futures. They observed unidirectional causality from returns to volume and volatility, and bi-directional causality between volume and volatility, but returns strongly explained the changes in volatility as compared to volume.

III.OBJECTIVES OF THE STUDY

The objectives of this paper are:

1. To study the basic properties of Financial time series.
2. To study the Contemporaneous relationship between trading volume and return.
3. To examine the dynamic relationship between trading volume, return and volatility.

IV. RESEARCH DESIGN AND METHODOLOGY

The series of stock return is computed from daily closing prices for the S&P CNX NIFTY index for a period of ten years from April 2007 till March 2017 (i.e. 2890 observations). Introduction of futures trading has affected the movement of the index and volume trades in the market in different ways. So the current study attempts to evaluate the return-volume relationship after the introduction of futures trading. The daily stock returns are continuous rates of return, computed as log of ratio of present day's price to previous days. Data are obtained from website of NSE (www.nseindia.com).

Financial time series such as stock prices often exhibit the phenomenon of volatility clustering. To observe this phenomenon, ARCH model and generalized ARCH (GARCH) model are used. The GARCH specification allows the current conditional variance to be a function of past conditional variances, allowing volatility shocks to persist over time, to test whether the positive contemporaneous relationship between trading volume and returns exists. GARCH methodology is also instrumental in supporting or refusing the mixture of distribution hypothesis (MDH). According to the MDH, a serially correlated mixing variable measuring the rate at which information arrives to the market explains the GARCH effect in the returns. In general, the bulk of empirical studies has found evidence that the inclusion of trading volume in GARCH models for returns results in a decrease of the estimated persistence or even causes it to vanish. This finding, generally interpreted as empirical evidence in favors of the MDH.

However, the results based upon GARCH (1, 1) may again be doubtful because it does not account for asymmetry and non-linearity in the conditional variance. Thus it would be more appropriate to apply asymmetric GARCH model. Thus, among the specifications, which allow for asymmetric shocks to volatility, we estimate the EGARCH (1, 1) or exponential GARCH (1, 1) model. Further, in order to examine the dynamic relationship between variables, linear Granger causality test is applied with the help of E-Views software.

V. ANALYSIS AND INTERPRETATION

Table 1: Descriptive Statistics

Parameter	Return	Volume	Volatility
Mean	0.000890	2.50E+08	0.000109
Median	0.002150	2.01E+08	7.41E-06
Std. Dev.	0.020155	1.70E+08	0.001036
Skewness	-0.991582	0.834508	19.37200
Kurtosis	12.802360	5.106348	504.7258
Jarque Bera	4178.270	193.2045	154.70263
Probability	0.000000	0.000000	0.000000

Table 1 provides important information regarding the behavior of variables over the period. Mean returns and average volume are higher in the post-futures period. The standard deviation in returns, which is indicative of the unconditional variance, has come down in this phase. Thus there is decline in the daily volatility in the market after the introduction of futures. Further, the empirical distribution of the trading volume and return volatility series are positively skewed, indicating a right tail of distributions, which shows that they are asymmetrical. On the other side, negative skewness is observed for return and magnitude of skewness has significantly increased, which has led the returns to be asymmetric and non-normal and it can be verified from p value of Jarque-Bera test. In addition, Table 1 documents that the coefficient of kurtosis for all variables are significantly greater than 3, which implies that distribution of the variables does not conform to normal distribution, which is the precondition for any market to be efficient in the weak form.

Table 2: GARCH(1,1) estimates for Nifty Returns with Volume

Volume-Return Relationship

Parameter	Coefficient	P-Value
□	9.54E-02	0.0035
ω	2.47E-05	0.0000
αi	0.20874	0.0000
βj	0.98342	0.0000
αi+ βj	1.19216	-------

In table 2 we analyze that alpha square and Beta would be analyzed that the share market value is less than three basis point so return and volume exists in the GARCH (1, 1). To test whether contemporaneous relationship between return and volume exists using GARCH (1, 1) model with a volume parameter in the mean equation and the results are reported in Table 2. Coefficient of trading volume is positive and significant (i.e. there exists a positive contemporaneous relationship between trading volume and returns). Further, significant αi and βj coefficients clearly indicate that conditional variance is predominantly affected by lagged variance, which implies that previous information shock significantly affects current returns. These evidences imply that Indian stock market is not efficient in weak form. Moreover, there is volatility clustering as measured by the sum of αi+ βj (1.19216), which further supports the increase in asymmetry and inefficiency in market.

Table3: GARCH (1,1) estimates for Nifty returns with volume

Volume-Volatility Relationship

Parameter	Coefficient	P-Value
ω	0.00205	0.0000
αi	0.29001	0.0000
βj	0.80000	0.0000
□	-5.27E-15	0.0000
αi+ βj	1.09001	-------

Note: *□ is a parameter of volume included in variance equation.

In table 3 we investigate whether trading volume explains the GARCH effects for returns, GARCH (1, 1) model with a volume parameter in the variance equation is estimated. The study finds parameters αi and βj to be positive and significant where trading volume is included in the variance equation of GARCH model. The coefficient on the volume αi is significant but indicates negative impact on volatility because of asymmetry, which is further checked through EGARCH model. Further, the study shows a decline in the persistence of volatility when trading volume is included in the variance equation, since the sum αi and βj falls to (1.09001) in the Table 3 as compared to the sum of αi and βj (1.19216) in Table 2 where volume is not included in the variance equation of GARCH model. It means that the degree of persistence is absorbed by the volume series, which indicates that Indian stock market is weak support for the MDH model.

Table 4: EGARCH (1, 1) estimates with volume

Volume-Volatility Relationship

Parameter	Coefficient	P-Value
□ 1	-2.540967	0.0000
□ 2	1.205635	0.0000
□ 3	-0.524760	0.0000
□ 4	1.945624	0.0000
□ 5	6.34E-06	0.0000
□ 6	-6.23E-06	0.0000

As significant asymmetry is observed in the returns of Nifty index, it would be more informative if we examine the volume--volatility relation through EGARCH (1, 1) model to take into account impact of good and bad news on the volatility knowing the fact that both types of news have different kinds of effect on market. The results of EGARCH (1, 1) are shown in Table 4.The presence of leverage effect can be seen in Table 4, which implies that every price change responds asymmetrically to the positive and negative news in the market. A negative impact of lagged volume on volatility is observed.

The parameter □ 2 is statistically significant, which supports the previous evidences of asymmetric distribution of returns in descriptive statistics and significant □ 3indicates mean reverting behavior of returns because the value of □ 3 is negative, which implies that every price change responds asymmetrically to the positive and negative news in the market. Coefficient □ 4(which is a parameter of lagged conditional volatility) is significant which implies that Indian market is informational inefficient. Coefficient □ 5(which is a parameter of volume) shows a different picture of the role of trading volume on the volatility as compared to that in GARCH (1, 1) model. It indicates the significant positive impact of volume on volatility. On the other side, impact of lagged volume on volatility is negative.

Table 5: Granger Causality Test

Null Hypothesis	Observation	F-Statistics	P-value
Returns does not cause Volume	2650	9.34724	6.00E-9
Volume does not cause Return	2650	3.47231*	0.04245
Volatility does not cause Volume	2650	3.41720**	0.04485
Volume does not cause Volatility	2650	2.52506	0.35920

Note: * and ** indicate significant at the level of 1 % and 5 % respectively.

Table 5 indicates the robustness of relationship between trading volume, return volatility and to study the direction of information flow between these two, linear Granger causality tests has been applied. There is strong evidence of bi-directional causality (i.e. reject the null hypothesis of no Granger causality) between return and volume inconsistent with weak-form efficiency. Hence, it is concluded that Nifty index may support the sequential arrival of information hypothesis over the MDH, and trading volume helps to predict return and vice versa. Preceding return volatility can be seen as some evidence that new information arrival might follow a sequential rather than a simultaneous process. This implies that the strong form of market efficiency does not hold since some private information exists that is not reflected in stock prices.

CONCLUSIONS

This study provides evidence of positive impact of volume on return using GARCH (1, 1) model. In addition GARCH (1,1) documents that the persistence of variance over time partly declines if one includes trading volume as a proxy for information arrivals in the equation of conditional volatility but GARCH effects remain significant, which highlights the inefficiency in the market. It also shows the negative impact of volume on conditional volatility because of asymmetry that is observed in significant Jarque-Bera. Next, in the light of Information asymmetry, the study has used the EGARCH (1, 1) model, which allows for asymmetric shocks to volatility. It indicates the presence of leverage effect and positive impact of volume on volatility. The differential cost of taking long and short positions is the main reason for information asymmetry (leverage effect). In addition, linear Granger causality results support the sequential arrival of information hypothesis, which implies that new information is not simultaneously available to all traders and it takes time to absorb, hampering the price discovery efficiency of the market.

REFERENCES

[1] Schwert, G.W., 'Stock volatility and the crash of 87', Review of Financial studies, 3, 1990, pp.77-102.
[2] Schwert, G.W., 'Why does stock market volatility change over time', The Journal of Finance, Vol. 44, pp.1115-53.
[3] Lamoure, C.G., and W.D. Lastrapes, Heteroskedasticity in stock return data: Volume versus GARCH effects', Journal of Finance, 45, 1990, pp. 221-29.
[4] Lee, B.S., and O.M. Rui, 'The dynamic relationship between stock returns and trading volume: Domestic and cross-country evidence', Journal of Banking and Finance, 26, 2002, pp. 51-78
[5] Bessembinder, H. and P.J. Seguin, 'Price volatility, trading volume and market depth: Evidence from futures markets', Journal of Financial and Quantitative Analysis, Vol. 28, 1993, pp. 21-39.
[6] Daigler, Robert T., and Marilyn K. Wiley, "The impact of trader type on the futures volatility-volume relation." The Journal of Finance, 54, 1999, pp. 2297-317
[7] Kocagil, A.E., and Y. Shachmurove, 'Return--Volume Dynamics in Futures Market', The Journal of Futures Market, 1998, Vol. 18, pp. 399-426.
[8] Gurgul, Henry K., Pawel Majdorz, and Roland Mestal, 'Joint dynamics of prices and trading volume on the Polish stock market', Managing Global Transitions, 3, 2005 pp. 139-56.
[9] Karpoff, J.M., 'the relation between price changes and trading volume: A survey', Journal of Financial and Quantitative Analysis 22, 1987, pp. 109-26.
[10] Bhanupant, 'Testing dynamic relationship between returns and trading volume on the National Stock Exchange', 2001, Downloaded from www.utiicm.com/bhanupant.html on 27, March 2006.
[11] Chen, Gong-meng, G.M. Firth, and O. Rui, 'The dynamic relation between stock returns, trading volume and Volatility." The Financial Review, 36, 2001, pp. 153-74.
[12] Lee, B.S., and O.M. Rui, ' the dynamic relationship between stock returns and trading volume: Domestic and cross-country evidence', Journal of Banking and Finance, 26, 2002, pp. 51-78.
[13] Griffin, J.M., F. Nardari and R.M. Skulg, 'Stock market trading and market conditions', NBER working paper, 2004, downloaded from www.nber.org on 16, June 2006.
[14] Nguyen, Duong, and Robert Diagler, 'A return-volatility-volume analysis of futures contracts', 2005, downloaded from http://www.fma.org/ on 18 may 2006.
[15] Otavio, R., and F.N. Bernardus, 'The empirical relationship between stock returns, return volatility and trading volume in the Brazilian stock market', SSRN working paper, 2006, downloaded from www.ssm.com on 17 March 2006.